A treatise on man and the development of his faculties / By M.A. Quetelet ... Now first translated into English [Under the superintendence of R. Knox].

Frederick Wood,

Sept^r 1848.

A TREATISE ON MAN

AND THE DEVELOPMENT OF HIS FACULTIES.

By M. A. QUETELET,

PERPETUAL SECRETARY OF THE ROYAL ACADEMY OF BRUSSELS, CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE, ETC.

NOW FIRST TRANSLATED INTO ENGLISH.

EDINBURGH:

PUBLISHED BY WILLIAM AND ROBERT CHAMBERS.

1842.

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PUBLISHERS' NOTICE.

The present work was first printed and issued in Paris in 1835, with the title, "Sur L'Homme, et le Développement de ses Facultés, par M. A. Quetelet, Secrétaire Perpetuel de l'Académie Royale de Bruxelles," &c. &c. (2 volumes 8vo.) Previous to its appearance, the author had attained a high reputation among men of science, being distinguished peculiarly by the cautious, accurate, and comprehensive character of all his researches, and by his skill and acumen in applying the important science of numbers to every subject which he investigated. The treatise "Sur L'Homme" brought him a large accession of well-merited fame. It was the first attempt made to apply the art of calculation to the social movements of the human being, and to examine by it his moral anatomy, with the view of detecting the real sources and amount of the evils under which he labours, and, ulteriorly, of remedying them when known. Of the nature of the remarkable truths developed by M. Quetelet, it would not be proper here to speak; nor is it necessary, as the work itself will sufficiently indicate and explain them. Suffice it to state, that the impression made by the treatise over the whole of continental Europe, through criticisms, republications, and translations, has been very great. Fully convinced of its value, Messrs Chambers gladly embraced a proposal which was made to them to publish an English translation, and to present it in such a form and at such a price as might be most calculated to promote its diffusion throughout all sections of the community.

On learning that a British edition was in progress, M. Quetelet came forward in the most handsome manner, and proffered a new preface, which accordingly is presented here in a translated form. In this composition, the object of the author has been, at once to defend his treatise from objections brought against it subsequently to the issue of the original Parisian edition, and also to point out in what manner he intended, in his projected continuations of the work, to follow up and elucidate the principles already laid down by him. It will probably be admitted by the majority of readers, that he has most ably defended his views and estimate of the physical, moral, and intellectual qualities of man, with their results upon his position in society. He has refuted the objections brought against his mode of reasoning; and has cleared himself of the charge of being either a materialist or a fatalist. He shows, also, that he is no theorist or system-maker, but simply wishes to arrive at truth by the only legitimate way, namely, the examination of *facts* —the incontrovertible facts furnished by statistical data. Lastly, he conveys the important information, that the experience of every additional year, since the first publication of his treatise, proves, in the most remarkable manner, the accuracy both of his statistical tables and the inferences founded upon them. His section on crime, in particular, however startling it may have appeared to the world, has been shown, by fresh statistical information, to merit credit in every particular. On these accounts, the publishers are confident that the prefatory matter with which they have been favoured by the distinguished Belgian philosopher, will be felt by the public greatly to enhance the value of the present edition.

It seems only necessary to add, that the present translation has been effected under the able superintendence of Dr R. Knox, F.R.S.E., Corresponding Member of the French Academy of Medicine, and Lecturer on Anatomy in Edinburgh; and that the work, in its passage through the press, has been indebted to the editorial care of Mr Thomas Smibert, who has also translated the manuscript preface of M. Quetelet. Considering its native value, and these acquired advantages, the publishers present it with the confident hope that it will form a valuable addition to the philosophical literature of their country.

Edinburgh, *November* 5, 1841.

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PREFACE OF M. QUETELET,

DRAWN UP EXPRESSLY FOR THE PEOPLE'S EDITION OF HIS WORK ON MAN.

The plan which has been pursued by me in the composition of this work, is a vast and comprehensive one. It was therefore natural, that, before drawing up a sequel to it, I should endeavour to learn the opinions of competent persons respecting the character of my researches, and the mode of execution which had been adopted in my treatise.* But in presenting, as it were, only the vestibule of the edifice, I might justly entertain fears lest sufficient light had not been cast on the matter, and lest I should not have been able to make it clear how all the portions of the vast whole were to arrive at agreement and consistency among themselves. In this state of things, it struck me that I could not do better than show, by particular examples, in what manner it is expedient in general to proceed in this line of inquiry, and in what light I viewed the analysis of man, under the triple relations of his physical, moral, and intellectual qualities.

The development of the three examples which I have chosen, will themselves give birth to as many works, the materials of which I am collecting with all the activity and speed that other engagements incidental to my position will permit. Whilst waiting till I can terminate these labours, I have deemed it right to give here an indication of them, and this will afford me, at the same time, an opportunity of clearing up some points in my published treatise, which may have been imperfectly understood.

As regards the *physique* of man, subjects of research are not wanting; but, besides that many of these subjects—as, for example, that of population—have frequently been discussed, and by men of great ability, they do not appear to me to be all equally suited to the end which I propose to attain; some are even complicated by their intimate dependence on moral phenomena, and these I wish to steer clear of as far as possible. The interest excited by the first researches into the growth of the human being, and the happy applications made of them in England, determined my choice of a subject, leading me to direct attention to the proportions of the human frame at different ages, and the causes which modify them. The subject appertains at once to science and the fine arts; and my relations in society permitted me to count upon the assistance of men of enlightenment, who promised to co-operate with me in my inquiries.

The study of the proportions of the human frame was carried very far by the Grecian artists, but they have left us no other monuments of their knowledge than those admirable works of sculpture, which the moderns regard to this day as models, and to which they resort for their finest inspirations. The principal artists of the era of the revival of letters, such as Leon Baptista Alberti, Michael Angelo, Leonardo da Vinci, Albert Durer, with many others who comprehended what art ought to borrow from science, felt the necessity of resorting to observation, in order to rebuild in some sort the ruined monument of ancient artistical skill. They studied nature in a philosophical manner; sought to strike out the limits within which they ought to confine themselves in order to be truthlike, without taking away from each age, and one may say from any passion, its individual character; and from those profound studies which kept them ever before the face of nature, they deduced original views and new models, destined to distinguish for ever that celebrated age. The proportions of the human body did not alone attract their attention: anatomy, perspective, and chemistry, formed parts of their studies; nothing was neglected; and some of these great artists even gained for themselves a first place among the geometers of their day. Their successors have not devoted themselves to such serious studies, and hence it so frequently happens that they are reduced to content themselves, either with copying from those who went before them, or with working after individual models, whose proportions they modify according to mere caprice, without having any just or proper ideas of the beautiful.

It would be an error, doubtless, to suppose that science *makes* the artist; yet it lends to him the most powerful assistance. In general, it is difficult to keep it within due limits; and I shall even freely admit, that Albert Durer, in his work upon the proportions of the human frame, has imparted to it a certain scientific dryness, which lessens its utility. One finds there more of the geometer than the artist, and the geometer, moreover, such as he was at a time when it had not yet been discovered how much the rules of style enhance the value of scientific works, and, above all, of those which appertain at the same time to the domain of the fine arts.

After the example of Leon Baptista Alberti, whom he followed closely in the order of time, Albert Durer commences by stating the divisions of the body, in parts or proportions of the total height taken by him as *unity*. Changing afterwards his measure of proportions, he takes as unity the size of the head, and assigns successively the proportions of several individuals, giving them seven, eight, nine, and even ten heads of height [or, in other words, a body corresponding to the measurement of so many heads]. The scale thus formed by him has been received into all studios; and, without reverting *very* often to the measurements which their predecessors had taken from nature or from the works of the Greeks, artists have, for the most part, bound themselves down to follow a blind routine. Noble exceptions, however, have presented themselves. Nicholas Poussin, one of the most profound thinkers whom the arts have produced, took care to correct and regulate by the *antique* the proportions which Leon Baptista Alberti and Albert Durer had given from the living model. At a later period, also, some labours have been undertaken on this subject; and I may mention, in particular, those of the sculptor, Shadow of Berlin.

My aim has been, not only to go once more through the task of Albert Durer, but to execute it also on an extended scale. The German artist had his art exclusively in view, and confined himself to the obser-

* The work upon Man was published at Paris in 1835. In the year following, a copy of it was printed at Brussels; and, in 1838, Dr Riecke gave a German translation of the work, enriched with notes. The Brussels copy was published without my participation, and indeed against my will; such was not the case with the German version, concerning which I had communications with Dr Riecke.

vation and exhibition of man when fully developed, and at an age when he presents himself under the most advantageous forms. In order to keep faithfully by the plan which I had chalked out, I have viewed the individual from the hour of his birth; I have sought to determine, for that epoch, the different relations of bulk, subsisting between the various parts of his frame; and to ascertain how far these relations become modified during his development, what they are in the flower of his age, and in what position they remain up to the instant of decay. It is only by long and laborious study, and by the comparison of a vast number of individuals, that it will be possible to succeed in establishing correct average proportions for each age, and in settling the limits betwixt which they can be made to vary, without ceasing to be accurate and faithful to nature—our first and great guide in this difficult study.

If the inquiry into the average bodily proportions be of high importance, in order to attain to the type of beauty in the arts, not less great is the interest attached to the subject of the limits within which variations of them must be kept, in order not to shock the taste, and in order to retain the means of giving character to individual forms, of shadowing forth strength, grace, and dignity of figure, and of preserving to art that variety which constitutes its principal charm. Although *artistical* limits will always be less extended than the *natural* limits, yet it is to be observed that, by the term natural limits, I understand those within which the human proportions may vary, not only without constituting deformities and monstrous aberrations from nature, but also without wounding the eye by a want of harmony.

In order that the taste may be satisfied, it is necessary to present to it a whole of which it can seize readily all the parts, and mark their relations of bulk. But what are the natural limits spoken of? They are doubtless difficult to establish; nevertheless, every one has an idea of them, more or less exact, which he carries with him in his decisions. It is to determine these in a more precise manner that our endeavours ought to be directed. "This statue is beautiful," people will say; but they will agree in finding that the arms are too long. Without such a defect, it would have possessed more grace. The defect, at the same time, does not constitute a monstrosity, not even an anomaly; it may be conceived to exist in nature, and even without displeasing the taste; but it wounds the eye in a work of art, open to more severe rules of judgment.

In order to discover to what extent tastes and forms might vary in different countries, I have endeavoured to compare the proportions of the models, which, in the opinion of the artists of Paris, Rome, Belgium, and other places, united the most perfect graces of form; and I have been surprised to find how little variety of opinion exists, in different places, regarding what they concurred in terming the beautiful. Changes of bodily proportions characterise nations to a much smaller degree than differences in physiognomical expression, in delicacy and suppleness of members, and in ease, greater or lesser, of gait—all of them qualities modified singularly by education, climate, and habitudes.

Nor am I to confine myself, in my extended inquiry, to the comparison of actual models, estimated as types of the beautiful; I propose also to unite my results to those which artists left to us at the revival of the arts, and, above all, to what we can gather of the knowledge of the ancients on this point, from a study of their works. These comparisons, I conceive, will present hints interesting to history and art; they will prove of not less importance to the natural history of man. Analogous labours, undertaken in different quarters of the globe, would enable us to appreciate all that distinguishes race from race, and to discover the relative points of bulk most liable to variation; they would also furnish for the future valuable elements of comparison, not yet possessed by science.

All the sciences tend necessarily to the acquirement of greater precision in their appreciations. The study of diseases, and of the deformities to which they give place, has shown the benefit derivable from corporeal measurements, effected under enlightened views; but in order to recognise whatever is an anomaly, it is essentially necessary to have established the type constituting the normal or healthy condition. In order to be of use to science, I have deemed it necessary to direct my researches in a particular manner to the dimensions of the chest, which seem most frequently to merit consideration in the state of illness; and the same region is the one where the greatest malformations are most often to be observed.

The relative proportions of the human head merit equally our serious attention, serving, as they do at this day, for a basis, so to speak, of a new science. One of the individuals whose writings have spread the greatest interest respecting the study of phrenology, Mr George Combe, addressed to me, on the subject of the work on Man, the following words, which I shall beg leave to transcribe here, on account of the ingenious hints which they convey on the subject under consideration:—"Allow me to observe, that I desire much to see the physiology of the brain made the basis of such investigations, because I am convinced that the size, quantity, and proportions of the brain in individuals, have an influence over the development of their faculties, which is fundamental—that is to say, the brain determines the strength and the bent of the natural dispositions, and also the kind and degree of the intellectual capacity; and all external influences merely direct these to certain objects in preference to others, excite them to action, or impede their manifestations, but without changing the primitive character. Criminals, for instance, have the animal organs largely developed, and those of the moral and intellectual faculties, or at least the moral, deficient; and the causes of the regularity in the number of crimes will be found in the causes which produce a given number of defective brains annually; and crimes must be diminished by lessening the production of imperfect brains, or by treating those who have them as moral patients, and preventing them from abusing their propensities. Your researches are exceedingly interesting and useful, and all that I mean to say is, that this element is wanting to render them complete."

Nothing, doubtless, could be more interesting, above all in studying the moral development of man, than to be able to follow simultaneously the development of the organs which seem most directly connected with our actions, and to estimate to what extent the instrument is in concord with the effects produced by it. But for that purpose, it would be necessary that the science should be farther advanced than it really is; and that we should know the modifications which the head and brain of man undergo, from birth to the period of complete development, as well as the epochs at which the divers organs, regarded as the seats of such and such passions and propensities, manifest themselves, and what are their degrees of increase, actual and proportionate. This science, it seems to me, leaves as yet much to desire, and for the mere reason that it is yet in its infancy. I conceive that, in its actual condition, time would be more profitably expended in separating two kinds of studies which, in their results, might respectively control each other, than in seeking to amalgamate them, by which might be incurred the risk of falling into theoretic ideas, and quitting the path to truth. I shall explain myself by an example. Observation shows, that, in our state of society, it is about the age of twenty-five when the propensity to crime is at the maximum, especially as far as murder is concerned; this is a fact fully established, and of which new evidence is given every year by the statistical records of France. Now, supposing that phrenology had made sufficient inquiries

into the development of the organs, it might be possible to determine whether or not the age of twenty-five is really that at which the destructive organs have reached their greatest development, and if they sustain a progressive diminution afterwards, or are repressed by other and more powerful organs.

In considering matters under this point of view, it would be necessary first to study the progressive and proportionate growth of the brain and its several parts, and the development also of our moral and intellectual qualities. Comparisons might then be established to determine if the development of the faculties, and of the cerebral organs regarded as specially connected with them, takes place in a simultaneous manner. But to explain the actions by the organs, to render the one subordinate to the exercise of the other, would be to ramble widely from the course I have followed; for I am less desirous to explain phenomena than to establish their existence.

I have always comprehended with difficulty, moreover, how persons, pre-occupied doubtless by other ideas, have seen any tendency to materialism in the exposition of a series of facts deduced from statistical documents. In giving to my work the title of Social Physics, I have had no other aim than to collect, in a uniform order, the phenomena affecting man, nearly as physical science brings together the phenomena appertaining to the material world. If certain deplorable facts present themselves with an alarming regularity, to whom is blame to be ascribed? Ought charges of materialism to be brought against him who points out that regularity? What I have read and heard on the subject of my work, proves to me that I have not carried conviction to every mind, and that I have frequently been judged with prejudice. Judgments upon books are formed with even more haste and levity than judgments upon men. Writings are talked of without being known; and people take up an opinion for or against, in consequence of decisions of which it would cost them some trouble to determine the source. These are evils which must be borne with patience, and the more so because they are common. "There are few works on political economy," said Malthus to me, "which have been more spoken of and less read than mine." All the absurdities which have been spoken and written respecting the illustrious English author, are well known. Certainly, by an appeal against such decisions, he would have all to gain, and nothing to lose, before a less prejudiced tribunal.

One of the facts which appears to have excited the greatest alarm, out of all pointed to in my work, is naturally that relating to the constancy with which crime is committed. From the examination of numbers, I believed myself justified in inferring, as a natural consequence, that, in given circumstances, and under the influence of the same causes, we may reckon upon witnessing the repetition of the same effects, the reproduction of the same crimes, and the same convictions. What has resulted from this exposition? Timorous persons have raised the cry of fatalism. If, however, some one said, "Man is born free; nothing can force his free-will; he underlies the influence of no external causes; cease to assimilate him to a machine, or to pretend to modify his actions. Therefore, ye legislators, repeal your laws; overturn your prisons; break your chains in pieces; your convictions and penalties are of no avail; they are so many acts of barbarous revenge. Ye philosophers and priests, speak no more of ameliorations, social or religious; you are materialists, because you assume to mould society like a piece of gross clay; you are fatalists, because you believe yourselves predestined to influence man in the exercise of his free-will, and to direct the course of his actions." If, I say, any one held such language to us, we should be disgusted with its excessive folly. And wherefore? Because we are thoroughly convinced that laws, education, and religion, exercise a salutary influence on society, and that moral causes have their certain effects. Am I a fatalist, then, when I declare that you have greater reason for so thinking than you had imagined? That is the real state of the question; we differ only about degrees. Which of us is in error? To determine this, it is necessary to examine our motives for conviction. Mine, like yours, rest first of all on observation. We both call in experience to the support of our opinions; but, in your case, the experience is based on vague uncertainties, whilst I, more circumspect, strive never to lose sight of those scientific principles which ought to guide the observer in all his investigations. My aim is not to defend systems, or bolster up theories; I confine myself to the citation of facts, such as society presents to our view. If these facts be legitimately established, it follows that we must accept of and accommodate our reason to them.

Now, what do these facts teach us? I repeat, that in a given state of society, resting under the influence of certain causes, regular effects are produced, which oscillate, as it were, around a fixed mean point, without undergoing any sensible alterations. Observe, that I have said *under the influence of the same causes*; if the causes were changed, the effects also would necessarily be modified. As laws and the principles of religion and morality are influencing causes, I have then not only the hope, but, what you have not, the positive conviction, that society may be ameliorated and reformed. Expect not, however, that efforts for the moral regeneration of man can be immediately crowned with success; operations upon masses are ever slow in progress, and their effects necessarily distant.

But, it may be again asked, what becomes of human free-will and agency? In the face of facts, I have not to occupy myself with that question, so often debated. I cannot altogether pass it by, nevertheless, in silence, because it seems to me to involve one of the most admirable laws of conservation in nature—a law which presents a new proof of the wisdom of the Creator, and of which you have not caught even a glimpse in your narrow views of the moral organisation of man. It is necessary, then, to admit that free-will exercises itself within indefinite limits, if one wishes not to incur the reproach of denying it altogether. But, with all the follies which have passed through the head of man, with all the perverse inclinations which have desolated society, what would have become of our race during so many past ages? All these scourges have passed by, and neither man nor his faculties have undergone sensible alterations, as far at least as our observations can determine. This is because the same finger which has fixed limits to the sea, has set similar bounds to the passions of men—because the same voice has said to both, "Hitherto shalt thou come, and no farther!"

What! when it is necessary to take the most simple resolve, we are under the domination of our habitudes, our wants, our social relations, and a host of causes which, all of them, draw us about in a hundred different ways. These influences are so powerful, that we have no difficulty in telling, even when referring to persons whom we are scarcely acquainted with, or even know not at all, what is the resolution to which they will lead such parties. Whence, then, this certainty of foresight, exemplified by you daily, if you were not convinced, at the outset, that it is extremely probable the empire of causes will carry it over free-will. In considering the moral world *a priori*, you give to this free-will the most entire latitude; and when you come to practice, when you speak of what passes around you, you constantly fall into contradiction with yourselves. You foretell the conduct of individuals, in whose case oscillations may take place within limits so large, that it would be contrary to all the principles of the theory of probabilities to take them for the types of calculations, or to found upon

them the most petty inferences. Be more consistent with yourselves.

Could you possibly be afraid of applying the calculation of chances to moral phenomena, and of the afflicting consequences which may be inferred from that inquiry, when it is extended to crimes and to quarters the most disgraceful to society? "I should guard myself," said a scientific friend, whose philanthropic views I otherwise respect—"I should guard myself, had I arrived at the afflicting results of which you speak, against grieving others with the relation of them. Draw a veil over the hideous spectacle; and if you believe that you possess the truth, imitate with respect to it the sage circumspection of Fontenelle." But is the anatomy of man not a more painful science still?—that science which leads us to dip our hands into the blood of our fellow-beings, to pry with impassible curiosity into parts and organs which once palpitated with life? And yet who dreams at this day of raising his voice against the study? Who does not applaud, on the contrary, the numerous advantages which it has conferred on humanity? The time is come for studying the moral anatomy of man also, and for uncovering its most afflicting aspects, with the view of providing remedies.

This study is a difficult one. Speculative philosophy has long been occupied with it; but there are questions not to be resolved by such means; speculation has its limits, as observation also has. Every propensity and every passion, develops itself in a manner more or less rapid, attains a degree of maximum intensity, and declines in general by shades not yet fully recognised. It is with the intellectual as with the moral faculties of man; they both have their laws of development. With regard to some of them, these laws march in a parallel relation; others are interwoven in their growth, or stand in manifest opposition. Now, these are the laws which it is necessary to ascertain and comprehend, not in a vague manner, but with such precision as to enable us to establish numerically the degree of intensity for each age. There lay, if I do not deceive myself, the novel feature of my labours; thence sprung, at least, the chief meed of praise, and the criticisms which I have received; and it is this principle which I must strive to justify by my ulterior labours, because I was compelled to limit myself, in a first essay, to simple indications.

The analysis of the moral man through his actions, and of the intellectual man through his productions, seems to me calculated to form one of the most interesting parts of the sciences of observation, applied to anthropology. It may be seen, in my work, that the course which I have adopted is that followed by the natural philosopher, in order to grasp the laws that regulate the material world. By the seizure of facts, I seek to rise to an appreciation of the causes whence they spring.* As I could only indicate this course summarily, and the difficulties embarrassing it, I have been desirous to show, by two examples, selected and treated in a searching manner, how the course in question should be followed. The one has for its object the examination of works of literature, philosophy, science, the fine arts, &c., and of the ages at which they have been produced, with the results to be deduced from the whole. The other example concerns the development of the propensity to crime, upon a scale more extended than I had yet had an opportunity of forming. After these last new researches, I conceive I may now confidently say, that the *tables of criminality* for different ages, given in my published treatise, merit at least as much faith as the tables of mortality, and verify themselves within perhaps even narrower limits; so that crime pursues its path with even more constancy than death. Twelve years have elapsed since the data furnished by the tribunals of justice in France were collected with great care and exactitude, and since the ages of criminals were first marked; and, in each succeeding year, they have reckoned from about 7000 to 8000 individuals accused before the courts of assize; and it is still betwixt the ages of twenty-one and twenty-five, that, all things being equal, the greatest number of persons are to be found in that position. I have taken, for the same years, and for the city of Paris, the mortality of a period of ten years, and have found, that, though my observations included a much larger number of persons, and these pertaining to a much more homogeneous population, the mortality of the capital proceeded with less regularity than the crimes of the kingdom, and that each age paid a more uniform and constant tribute to the jail than to the tomb.

An objection has been made to my views, which appears somewhat valid at a first glance. It has been forcibly reproduced by a writer of merit, who, while treating my work with liberality, has drawn together all the gravest objections brought forward against it. I shall take leave to cite his words. "We now reach the most delicate portion of M. Quetelet's work—the development of the intellectual and moral qualities, the social system. Here the field is not the same; we have no longer to do with phenomena vital and regular, or with those laws to which man is subjected along with the brutes, and which operate continually without his intervention, or constitute instincts in him too powerful to be resisted. We have to consider things which he is at liberty to do or not to do—acts which he may consummate or not consummate at choice. We enter into the domain of the human will—free, bold, and independent. Can science follow man in this new route? Will it be able to appreciate, in a manner at once comprehensive and exact, the results of the physiological and moral constitution of the mind and soul which distinguish him from other animals? Contented to follow, up to this point, the material phenomena revealed by evident facts, can science sound the heart of man, dive into the mysteries of spiritual being, and tear away for the human race the veil which the moralist can with

* This appreciation is in general very difficult, and has given rise to grave errors. One of the chief causes of these errors seems to me to spring from the *incomplete enumerations*, made when it is sought to give an account of the causes which have led to any result. Thus, it is recognised that in some locality crimes are very numerous, and an attempt is made to explain that unfavourable state of things. How do most writers and even statisticians proceed in such a case? In place of passing in review all the causes which can lead to crime, of weighing their influences, and of inquiring into those, above all, which have there acted with the greatest energy, they only attend, in the prejudiced state of their minds, to one alone, often the least influential of all, to which they ascribe the effects produced by the whole. They have been led in this manner to conclude that popular instruction produces crime, because, in such and such a kingdom, the provinces where it chiefly abounds send the greatest number of children to schools; as if the degree of instruction, and the kind of instruction, and other elements, did not all enter equally into the question. The true talent of the observer, it seems to me, whatever be the phenomena of which he seeks to estimate the causes, consists in a complete enumeration of these, and in distinguishing between such as are entitled to weight, and such as may be overlooked without inconvenience. It is this fine insight, this delicate tact, principal attributes of superior intelligences, which constitute the great observer, the true philosopher. To wander from this course is to step into error, and to become entangled in those interminable disputes which afflict the sciences, and, above all, those whose phenomena are most complex. The medical sciences offer sad examples of this evil. Maladies are in general the result of an infinity of causes; and wherefore attribute them, then, to one of these more than to another? It may be conceived that two physicians, in citing each a different cause as the origin of one disease, may be both in the right, since each may have found the cause stated by him to have predominated in the case under his notice; they only err in neglecting the other influential causes which they have not had the chance of observing, because the number of their observations was too limited. This is the history of many of the theories and systems, alternately adopted and rejected in medicine.

difficulty raise in order to judge one individual? Risks she not being stranded in the conflict with these supreme mysteries of intelligence? Upon what constant facts, upon what fundamental points, can she lean for support? The facts of birth, growth, and decay, are the same for all men; but what are held by one people to be intelligence, genius, morality, and crime, will these not be deemed by another people error, poverty of intellect, immorality, and lawful actions? Finally, will not the free-will and agency of man disconcert all calculations? Or, at least, will not the errors in such calculations be too considerable in number and extent to leave them any real value?"*

I have already spoken of free-will, and have shown how little it influences the number of crimes, and the ages of criminals; I shall not return, therefore, to that subject. The next most serious objection which seems to present itself here is, that the facts upon which one is compelled to rest have not the same identical value, as in the case of birth, death, and marriage, when the population is treated of; but that these facts may vary through many different shades, and may even be qualified amongst different nations, in consequence of what is crime with one being viewed as something lawful with another.

We must here understand ourselves fully. I can admit that a certain act, which is punished before the French tribunals, may not be so in other places, or have been so in other times. This is, then, an error of denomination which should be corrected, and which would but prove at most that virtues and crimes, estimated in relation to different times, have a contingent value merely, not an absolute one. The essential point here is, that the fact, qualified in one manner or another, should be the same. But it will be said, that it is not identically the same, and that even where the laws take care to specify and define different crimes, those which are ranged under the same head may still vary within pretty extensive limits. This is equivalent to saying, that the observations have not all the precision necessary, and that the estimate cannot be perfect. Now, this is a fact which I myself readily admit and regret; for, if the observations were precise, I should march on, in the new path which I have sought to open up, with as much assurance as in other quarters of the vast field of the sciences of observation. In every instance, it is not my method that is defective; proper observations alone fail me. But will it be ever impossible to have them perfectly precise? I believe that even at present we have them sufficiently so to enter, at least, on the great problem under consideration. Name them as you will, the actions which society stamps as crimes, and of which it punishes the authors, are reproduced every year, in almost exactly the same numbers; examined more closely, they are found to divide themselves into almost exactly the same categories; and, if their number were sufficiently large, we might carry farther our distinctions and subdivisions, and should always find there the same regularity. It will then remain correct to say, that a given species of actions is more common at one given age than at any other given age.

Is it really true, moreover, that the designation of crime may be so very arbitrary, and that that which has been set down as poisoning or assassination, for example, may testify to no evil inclination? Although we are here in a new field, where facts cannot be estimated mechanically, as in the physical sciences, the difference, nevertheless, is not to be held so great as it may appear at first sight. Even the physical sciences sometimes rest on facts which are not identically the same, as deaths and births should be; and which may lead to appreciations and conclusions more or less great. With the use even of an instrument, when one wishes to discover a temperature, a magnetic declination, or the force and direction of a wind, does one really find the quantities which are sought? When one measures an individual, is the real height positively discovered? Errors, greater or lesser, may be committed; and observation alone can recognise the limits within which they range. Has the consideration of the average life of man been rejected, because that average rests upon numbers which vary, without doubt, within limits as extended as can be conceived?

But, to reply by the same argument brought against myself, if, in place of reckoning diseases, one wished to specify their nature, and to indicate, as statisticians do, the number of voluntary, violent, and accidental deaths, as well as those produced by natural maladies, without entering at all into the classifications which might be formed of these, would not one lie open to the same objections? Must we refrain from making up a list of suicides, because death may there have been caused by unknown hands, or by accidents of which no one is cognisant, or by some natural means which have operated instantaneously, and left no visible traces behind? And how often does it happen that the author of a suicide only lends his hands involuntarily to a crime of which another has guiltily reduced him to become the victim? One would require to renounce entirely the sciences of observation, if every such difficulty in the way were to be admitted as a let and barrier; and these are only more apparent in my researches, because we are less familiarised with their character.

The same writer whom I have cited, combats me on another point. I have attempted to give an example of the analysis of the development of the passions, which tends to show that their maximum energy is reached about the age of twenty-five years. "So that," said I, "if there existed an art which, in its exercise, developed itself in a ratio with the passions, and without requiring preliminary studies, its maximum of development would occur about the age of twenty-five."* "To this reasoning let us oppose an example," says the Genevese philosopher. "If there has been a writer who has shone brilliantly, and deeply impressed the public, by reason, not of his works and learning, but of the impulses of the passions, certainly Jean Jacques Rousseau is that man. Now, it was not before the age of forty, fifteen years later than the period signalised as the maximum one of his passions, that Rousseau commenced to write." What would be the reply of the author now quoted, whose writings on population are justly esteemed, if I were to say to him in my turn, that the death of J. J. Rousseau did not take place till after the age of 65 years; that is to say, a long period after the epoch signalised by the law of mortality calculated for Geneva, and after he had long passed the average life of man. Must we then conclude that the tables of mortality for Geneva should be rejected? What does one individual example prove in such matters?

I would remark, besides, that the words cited from my work, when viewed isolatedly, are far from expressing the idea which I wished to attach to them. The works of genius upon which our judgments bear are in general complex; for there is no work, constructed by genius, which does not suppose the exercise of various of its faculties. A skilful analysis could alone make out the part of each of them; I would suggest for this purpose the idea of a work which should have for its object the analytic examination of the development of our intellectual faculties for each age. Now, I have aimed to present, in the work here reproduced, only an essay, only a particular example, of such an analysis, "which *tends* to show that the maximum of energy of the passions occurs about the age of twenty-five." The minimum is not then determined; and even when it shall be, by a sufficient number of observations, one will no more be able to apply it to any given individual in particular, than

* Bibliothèque Universelle de Genève, July 1835, p. 313. Article of M. E. Mallet.

* "On Man," vol. ii. page 119, Brussels edition.

one could make use of a table of mortality to determine the period of his decease. It should be well understood that social physics never can pretend to discover laws which will verify themselves in every particular, in the case of isolated individuals. The science will have rendered a service sufficiently vast, in giving more precise views upon a host of points, of which vague glimpses only were before possessed. Thus, men speak generally of the age of the passions; they admit, then, that there is an epoch of the life at which the passions act with greater energy? How know they this? Doubtless, by the observation of man. Well, it is observation which the science of social physics will employ, but observation conducted in a more certain manner, after scientific principles, and not resting on fugitive glances of which one can preserve no durable traces.

I trust I may be permitted to notice here another objection which has been made, on the subject of the value which I believed it proper to attribute to average qualities. "You believe, then," it has been said to me, "that the type of health would be a mean betwixt all the constitutions existing—all the states of health? But then you must grant at least that your type would be more perfect if the average were struck upon those alone who were in health." This argument may appear at first sight an embarrassing one; but, when examined more closely, it may easily be shown to rest upon no solid foundations. I believe I might even say, retorting in some measure the argument, that, if the average were taken upon all men, the healthy excepted, it would remain still the same. This only would result, that, in order to obtain that average with an equal degree of precision, it would be necessary to draw it from an infinitely greater number of individuals. We may consider maladies like deviations from the normal state, be it more or be it less; and it is betwixt these contrary conditions that the state of health would be found.

We aim at a target—an end—marked by a point. The arrows go to right and left, high or low, according to the address of the shooters. In the mean time, after a considerable number of trials, the butt, which has not yet been touched, perhaps, a single time, becomes so well pointed out by the marks around it, that they would aid at once in rediscovering it, if it should chance to be lost sight of. Nay, more than this; even aims the most unfortunate may be made to conduce to this end; commencing with those marks which are farthest away, if they be sufficiently numerous, one may learn from them the real position of the point they surround.

This figurative reasoning is applicable, it may easily be conceived, to all inquiries into the physical sciences, and even the moral also, where the point in view is to arrive at means or averages. As stated in the considerations presented at the close of my work, every quality, taken within suitable limits, is essentially good; it is only in its extreme deviations from the mean that it becomes bad. The study of these deviations or anomalies may serve to aid in the determination of the normal state, if it cannot be established in a direct manner. This presumes, it is true, that human nature, in its aberrations, has not a tendency to deviate from the mean in one sense in preference to another, as those who aim at a mark might have a tendency to shoot always too high or too low. Now, nothing proves the existence of any such tendency.

It may be imagined, after the preceding remarks, how much importance I attach to the consideration of *limits*, which seem to me of two kinds, *ordinary* or natural, and *extraordinary* or beyond the natural. The first limits comprise within them the qualities which deviate more or less from the mean, without attracting attention by excess on one side or the other. When the deviations become greater, they constitute the extraordinary class, having itself its limits, on the outer verge of which are things preternatural, or monstrosities. Thus, the men who fall, in respect of height, outside of the ordinary limits, are giants or dwarfs; and if the excess or the deficiency of height surpasses the extraordinary limits, they may be regarded as monstrosities. From the view of the human constitution, also, we may find the state of health and of sickness, and also a condition to be called extraordinary or preternatural. We must conceive the same distinctions in the moral world.

Narrow as may be the natural limits, they are yet too extended, as I have pointed out, when we wish to approach the beautiful in the arts. Artistical limits do not tolerate certain proportions, which nevertheless constitute neither physical defects nor infirmities.

The consideration of limits, upon which I insist, has convinced me more and more of the important part which they play in the social order. One of the most interesting observations which I have had occasion to make, is, that they narrow themselves through the influence of civilisation, which affords, in my eyes, the most convincing proof of human perfectibility. On the one side we approach more closely to what is good and beautiful; on the other, vice and suffering are shut up within narrower limits; and we have to dread less the monstrosities, physical and moral, which have the power to throw perturbation into the social framework. The distinctions which I had already established with care in my work, ought to have proved, methinks, to some less prejudiced judges, how far I am from a blind fatalism, which would regard man as unfit to exercise free-will, or meliorate the future condition of his race.

ON MAN.

INTRODUCTORY.

MAN is born, grows up, and dies, according to certain laws which have never been properly investigated, either as a whole or in the mode of their mutual reactions. Hitherto, the science of Man has been limited to researches, more or less complete, respecting some of its laws, to results deduced from single or insulated observations, and to theories often based on mere glimpses; and these constitute pretty nearly all the materials it possesses. It must be admitted, however, that for nearly two centuries various distinguished men have studiously inquired into the rate of reproduction and mortality of mankind; the differences which age, sex, profession, climate, and seasons, produce in regard of births and deaths, have been assiduously studied. But they have neglected to put forward, with sufficient prominence, the study of his physical development (*bodily growth*), and they have neglected to mark by numbers how individual man increases with respect to weight and height—how, in short, his forces are developed, the sensibility of his organs, and his other physical faculties. They have not determined the age at which his faculties reach their maximum or highest energy, nor the time when they commence to decline. Neither have they determined the relative value of his faculties at different epochs or periods of his life, nor the mode according to which they mutually influence each other, nor the modifying causes. In like manner, the progressive development of moral and intellectual man has scarcely occupied their attention; nor have they noted how the faculties of his mind are at every age influenced by those of the body, nor how his faculties mutually react.

It will be evident that I do not speak here of the speculative sciences, which, for a long time, have unravelled with great acuteness the greater part of the questions within their scope, and which they could attempt directly, avoiding, however, all numerical appreciation of the facts. The void resulting from this neglect must be filled up by the sciences of observation; for, either from a distrust in their own strength, or a repugnance in supposing it possible to reduce to fixed laws what seemed to flow from the most capricious of causes, it has hitherto been deemed expedient by learned men to abandon the line of inquiry employed in the investigation of the other laws of nature, so soon as the moral phenomena of mankind became the object of research. It must also be admitted, in explanation, that observations having for their object the *Science of Man*, present difficulties exceedingly great, and, to merit confidence, must be collected upon a scale far too extended to be attempted by an individual philosopher. Thus, we need not be at all surprised if facts respecting the increase of human weight and height from birth, be not readily found—if even the development of man's bodily strength be not exactly known; and it ought to excite no surprise, if, on these interesting points, the results be confined to mere sketches.

The study of the development of the intellectual qualities present, perhaps, still greater difficulties; but the result will show that these difficulties are more apparent than real.

With respect to the physical or animal forces, it is readily enough admitted that their development depends on the action of nature, and is thus regulated by laws which in certain cases admit of being determined by numbers; but it is asserted, that in respect of the moral or intellectual faculties, over which our volition exercises an influence, it would seem to approach an absurdity, to inquire into laws influenced by a cause at once so capricious and so anomalous as the human will. Hence it has happened that, in the study of man, a difficulty, seemingly insurmountable, was encountered at the very first step; but this difficulty is connected principally with the solution of a question which we shall now examine.

Are Human Actions regulated by Fixed Laws?

Experience alone can with certainty solve a problem which no *à priori* reasoning could determine. It is of primary importance to keep out of view man as he exists in an insulated, separate, or in an individual state, and to regard him only as a fraction of the species. In thus setting aside his individual nature, we get quit of all which is accidental, and the individual peculiarities, which exercise scarcely any influence over the mass, become effaced of their own accord, allowing the observer to seize the general results.

Thus, to explain our meaning by an example—we may instance the case of a person examining too nearly a small portion of a very large circle, and who, consequently, would see in this detached portion merely a certain quantity of physical points, grouped in a more or less irregular manner, and so, indeed, as to seem as if they had been arranged by chance, notwithstanding the care with which the original figure may have been traced. But, placing himself at a greater distance, the eye embraces of necessity a greater number of points, and already a degree of regularity is observable over a certain extent of the segment of the circle; and, by removing still farther from the object, the observer loses sight of the individual points, no longer observes any accidental or odd arrangements amongst them, but discovers at once the law presiding over their general arrangements, and the precise nature of the circle so traced. But let us suppose, as might happen, that the different points of the arch, instead of being material points, were small animated beings, free to act according to their will, in a very circumscribed sphere, yet these spontaneous motions would not be perceived by the eye placed at a suitable distance.

It is in this way that we propose studying the laws which relate to the human species; for, by examining them too closely, it becomes impossible to apprehend them correctly, and the observer sees only individual peculiarities, which are infinite. Even in those cases where the individuals exactly resemble each other, it might still happen that, by examining them separately, some of the most singular laws to which they are

subject, under certain influences, might escape for ever the notice of the observer. To him, for example, who had examined the laws of light merely in a single drop of water, the brilliant phenomenon of the rainbow would be totally unintelligible—it might even happen that the idea of the possible existence of such an appearance would never have occurred to him unless accidentally placed in favourable circumstances to observe it.

What idea should we have of the mortality of mankind by observing only individuals? Instead of the admirable laws to which it is subject, our knowledge would be limited to a series of incoherent facts, leading to a total misapprehension of the laws of nature.

The remarks we make respecting human mortality, may be equally extended to man's physical and moral faculties. To attain a knowledge of the general laws regulating these latter (moral) faculties, a sufficient number of observations must be collected, in order to bring out what is constant, and to set aside what is purely accidental. If, in order to facilitate this study, all human actions could be registered, it might be supposed that their numbers would vary from year to year as widely as human caprice. But this is not what we in reality observe, at least for that class of actions of which we have succeeded in obtaining a registry. I shall quote but a single example; but it merits the attention of all philosophic minds. In every thing which relates to crimes, the same numbers are reproduced so constantly, that it becomes impossible to misapprehend it—even in respect to those crimes which seem perfectly beyond human foresight, such as murders committed in general at the close of quarrels, arising without a motive, and under other circumstances to all appearance the most fortuitous or accidental: nevertheless, experience proves that murders are committed annually, not only pretty nearly to the same extent, but even that the instruments employed are in the same proportions. Now, if this occurs in the case of crimes whose origin seems to be purely accidental, what shall we say of those admitted to be the result of reflection?*

This remarkable constancy with which the same crimes appear annually in the same order, drawing down on their perpetrators the same punishments, in the same proportions, is a singular fact, which we owe to the statistics of the tribunals. In various writings, I have done my utmost to put this evidence clearly before the public:† I have never failed annually to repeat, that there is a *budget* which we pay with frightful regularity—it is that of prisons, dungeons, and scaffolds. Now, it is this budget which, above all, we ought to endeavour to reduce; and every year, the numbers have confirmed my previous statements to such a degree, that I might have said, perhaps with more precision, "there is a tribute which man pays with more regularity than that which he owes to nature, or to the treasure of the state, namely, that which he pays to crime." Sad condition of humanity! We might even predict annually how many individuals will stain their hands with the blood of their fellow-men, how many will be forgers, how many will deal in poison, pretty nearly in the same way as we may foretell the annual births and deaths.

Society includes within itself the germs of all the crimes committed, and at the same time the necessary facilities for their development. It is the social state, in some measure, which prepares these crimes, and the criminal is merely the instrument to execute them. Every social state supposes, then, a certain number and a certain order of crimes, these being merely the necessary consequences of its organisation. This observation, so discouraging at first sight, becomes, on the contrary, consolatory, when examined more nearly, by showing the possibility of ameliorating the human race, by modifying their institutions, their habits, the amount of their information, and, generally, all which influences their mode of existence. In fact, this observation is merely the extension of a law already well known to all who have studied the physical condition of society in a philosophic manner: it is, that so long as the same *causes* exist, we must expect a repetition of the same *effects*. What has induced some to believe that moral phenomena did not obey this law, has been the too great influence ascribed at all times to man himself over his actions: it is a remarkable fact in the history of science, that the more extended human knowledge has become, the more limited human power, in that respect, has constantly appeared. This globe, of which man imagines himself the haughty possessor, becomes, in the eyes of the astronomer, merely a grain of dust floating in the immensity of space: an earthquake, a tempest, an inundation, may destroy in an instant an entire people, or ruin the labours of twenty ages. On the other hand, when man appears most influenced by his own actions, we see paid an annual tribute to nature of births and deaths, as regular as may be. In the regular reproduction of crime, we see again reproduced another proof of the narrow field in which he exercises his individual activity. But if each step in the career of science thus gradually diminishes his importance, his pride has a compensation in the greater idea of his intellectual power, by which he has been enabled to perceive those laws which seem to be, by their nature, placed for ever beyond his grasp.

It would appear, then, that moral phenomena, when observed on a great scale, are found to resemble physical phenomena; and we thus arrive, in inquiries of this kind, at the fundamental principle, that *the greater the number of individuals observed, the more do individual peculiarities, whether physical or moral, become effaced, and leave in a prominent point of view the general facts, by virtue of which society exists and is preserved.* It belongs only to a few men, gifted with superior genius, to alter sensibly the social state; and

* The following is the result of the reports of criminal justice in France, &c.:—

	1826.	1827.	1828.	1829.	1830.	1831.
Murders in general, -	241	234	227	231	205	205
Gun and pistol, - -	56	64	60	61	57	88
Sabre, sword, stiletto, poniard, dagger, &c.,	15	7	8	7	12	20
Knife, - - - - - - -	39	40	34	46	44	34
Cudgels, cane, &c., -	23	23	31	24	12	21
Stones, - - - - - - -	20	20	21	21	11	9
Cutting, stabbing, and bruising instruments,	35	40	42	45	46	49
Strangulations, - - -	2	5	2	2	2	4
By precipitating and drowning, - - - -	6	16	6	1	4	3
Kicks and blows with the fist, - - - - -	28	12	21	23	17	26
Fire, - - - - - - - -	..	1	..	1	..	..
Unknown, - - - - -	17	1	2	..	2	2

† See page 43 of the *Recherches Statistique*, &c., 1829; page 178 of the fifth volume of the *Corresp. Mathematique*; page 214 of the same collection, in the observations on the constancy observed in the number of crimes committed; page 99 of the *Recherches sur le Penchant au Crime*, &c. [Inquiries into the Propensity to Crime, &c.] After having repeated positively the same statement so many times, I read the following words I confess with surprise, in 1833, in an Essay on the Moral Statistics of France (*Statistique Morale de la France*), the author of which honours me with his correspondence, and is acquainted with my writings:—

"Each year reproduces the same number of crimes, in the same order, in the same regions. Each class of crimes has its peculiar and invariable distribution, according to the sex, age, season; all are accompanied, in equal proportions, with accessory facts, unimportant in appearance, and, but for their return, inexplicable. It becomes necessary to give examples of this fixity in this constancy in the reproduction of facts *hitherto considered as inexplicable* (insaisissables dans leur ensemble), *and as being subject to no law.*" I shall make only *one* observation, which is, that I never considered the number of crimes invariable. I believe, on the contrary, in the perfectibility of the human species.

even this alteration, or action, requires a considerable time to transmit fully its effects. If the power which man possesses of modifying his actions, was communicated immediately to the social system, every kind of prevision or prejudgment would become impossible, and we should expect in vain to find in the past lessons for the future.* But it is not so: when active causes have once established themselves, they display an evident action, even for a long time after efforts have been made to oppose and destroy them; and too much care, therefore, cannot be bestowed in pointing them out, and in suggesting the most efficacious means to modify them in a useful manner. This reaction of man upon himself, is one of his noblest attributes; it offers, indeed, the finest field for the display of his activity. As a member of the social body, he is subjected every instant to the necessity of these causes, and pays them a regular tribute; but as a man, employing all the energy of his intellectual faculties, he in some measure masters these causes, and modifies their effects, thus constantly endeavouring to improve his condition.

How the Laws relative to Man ought to be Studied and Interpreted.

We have just seen that man is placed under the influence of regular and periodic causes, affecting not merely his physical qualities, but likewise his actions; and that these lead to effects equally regular and periodic. Now, these causes, and their mode of action, or the laws to which they give rise, may be determined by a close inquiry; but, as has been already said, in order to succeed, we must study the masses, with the view of separating from our observations all that is fortuitous or individual. Every thing being equal, the calculation of probabilities shows, that in the direct ratio to the number of individuals observed, we approach the nearer to the truth.

By the manner, then, in which these laws have been determined, they present no longer any thing individual; and, consequently, can be applied to individuals only within certain limits. Every application which one might attempt to make to a man in particular, must be essentially false, in the same way as if we were to pretend to determine the precise period of a person's death by looking into the tables of mortality.

Such tables, in respect to particular cases, can give only approximations; and the doctrine of probabilities shows here also that the results deduced from them, and the results observed, agree always the better the greater the number of the individuals to whom they refer. Thus, although the tables of mortality teach us no direct application to an individual, yet they offer very certain results when applied to a great number of persons; and upon these general results, assurance societies calculate their annual profits. We endeavour here to be well understood respecting the nature and value of the laws we propose inquiring into. It is the social body which forms the object of our researches, and not the peculiarities distinguishing the individuals composing it. This study interests, in an especial manner, the philosopher and the legislator: the literary man and the artist, on the contrary, will endeavour to understand, in preference, those peculiarities which we endeavour to separate from our results, and which constitute, as it were, the physiognomical and pictorial aspect of society.

Moreover, the laws which relate to the social body are not essentially invariable; they change with the nature of the causes producing them. The progress of civilisation, for example, has changed the laws respecting mortality, and must have exercised an influence over the physical and moral condition of man. Tables constructed to show the intensity of the disposition to crime at different ages, although for several years they may have offered pretty nearly the same results, may yet become gradually modified: it is to effect this modification that the friends of humanity ought to turn their attention. The study of the social body, which we have in view, has for its object to leave this important subject no longer to a kind of empiricism, but to offer the means of recognising directly the causes which influence society, and to measure even that influence itself.

These causes, once known, present no sudden changes, but are modified gradually. Future events may be foreseen by a knowledge of the past, or conjectures may even comprise a period of several years, without fear of experience producing results unconfined by the limits previously assigned them. Now, these limits are proportionally widened as our conjectures embrace a wider series of years.

Of the Causes which Influence Man.

The laws presiding over the development of man, and modifying his actions, are in general the result of his organisation, of his education or knowledge, means or wealth, institutions, local influences, and an endless variety of other causes, always very difficult to discover, and some of which may probably never be made out.

Of all these influencing causes, some are purely physical, others inherent in our nature. Man, in fact, possesses in himself a moral force securing to him the empire over all living beings on this globe; but their destination forms a mysterious problem, whose solution will probably escape us for ever. By means of these moral forces, man is distinguished from other animals. By means of them, also, he possesses the power of modifying, at least to appearance, the laws of nature affecting him, and perhaps by causing a progressive movement, tends to approach a happier physical condition.*

The forces which characterise man, are living forces in their nature; but do they act in a constant manner, and has man, at all epochs, possessed the same quantity—in a word, does there exist any thing analogous to the active or living forces in nature? What, moreover, is their destination? Can they influence the progress of the system, or compromise its existence? or, perhaps, like the internal forces of a system, may they not modify in something its progress, or the conditions of its stability? Analogy leads us to believe, that in the social state we may expect to find in general all the principles of conservation observed in the natural phenomena.

Plants and animals appear to obey, like the planets, the eternal laws of nature, and were it not for the intervention of man, these laws could be verified just as easily in the one case as in the other; but man exercises, both on himself and on all around, *a disturbing action*, the intensity of which takes a development in proportion to his intellect, and the effects of which are such, that society does not resemble itself at any two different epochs.

It would be important to determine, in all the laws affecting the human species, what belongs to nature and what belongs to the disturbing force of man; it appears at least certain, that the effects of this force are slow, and might almost be called *secular perturbations*. However this may be, if they really were

* [The supposed civilisation of Russia by Peter the Great, and of Prussia by Frederick II., form no real exceptions to the statements of M. Quetelet.]

* Buffon explains very well the power possessed by man in modifying nature's works:—"All these modern and recent examples prove, that man has but recently known the extent of his power, and that even yet he does not know it sufficiently; it depends entirely on the exercise of his intellect: thus, the more he observes, the more he will cultivate nature, and the more extensive will be his means to subject nature's works to himself. And what might he not effect upon himself—I mean on his own species—if the will were always governed by the judgment? Who could predict limits to the moral and physical perfectibility of human nature?" &c.—*Epoques de la Nature.*

developed with much rapidity, we could not, with the few elements we possess in respect to the past, draw important conclusions in regard to the future.

We must then do as astronomers have done in the theory of arbitrary constants—and as the early statisticians did in calculating the laws of human mortality—make an abstraction at first of the effects of the disturbing force, and return to it afterwards when a long series of documents permits us to do so.

Thus, to bring out my meaning, in calculating the different tables of mortality, the medium duration of human life has been shown to vary for different countries, and even for different provinces, though these may be quite contiguous. But these differences might depend as much on the nature of the climate as on man himself; and hence the necessity of determining what belonged to the one, what to the other. For this purpose, one might select an assemblage of circumstances proving that the forces of nature remain the same; and if the results obtained at different epochs were also identical, then follows the natural conclusion that the disturbing force of man amounted to nothing. Now, this attempt has been made, and at Geneva, for example, it has been found that the average duration of life, or the medium life, has successively become longer. Now, we are at least entitled to conclude from this the existence of the disturbing force of man, and to form the first idea of the energy of its effects on this point of the globe, so long as it is not proved that causes foreign to man may have altered the fertility of the soil, the state of the atmosphere, temperature, or given rise to some other alteration in the climate. But hitherto we know only the result of different forces, which it would be impossible to estimate individually, and of which we cannot even furnish a complete list. Thus we are disposed to believe that the forces which have prolonged at Geneva the duration of the average life of man, have arisen from the circumstances of his having improved his habitations, rendering them more healthy and more commodious; of his having ameliorated his pecuniary circumstances, his food, and institutions; of his having been able to withdraw himself from the influence of certain diseases, &c.; and it might even have happened that the disturbing force of man may have altered for the better the nature of the climate, by drainage, clearing the forests, or by other changes.

Of the Object of this Work.

The purpose of this work is to study in their effects the causes, whether natural or disturbing, which influence human development; to endeavour to measure the influence of these causes, and the mode according to which they mutually modify each other.

It is not at all my intention to propose a Theory of Man, but merely to ascertain by proof the facts and the phenomena which affect him, and to endeavour, by observation, to discover the laws forming the connecting links of these phenomena. The *social* man, whom I here consider, resembles the centre of gravity in bodies: he is the centre around which oscillate the social elements—in fact, so to speak, he is a fictitious being, for whom every thing proceeds conformably to the medium results obtained for society in general. It is this being whom we must consider in establishing the basis of social physics, throwing out of view peculiar or anomalous cases, and disregarding any inquiry tending to show that such or such an individual may attain a greater or less development in one of his faculties.

Let us suppose, for example, that we endeavoured to discover the disturbing influence of man in modifying his physical strength. By means of the *dynamometer* (measurer of strength), we may first estimate the strength of the hands, or of the loins, in a great number of persons of different ages, from infancy to extreme old age, and the results obtained in this way for a country will give two scales of forces deserving of our confidence in the direct proportion of the number of observations made, and in the care with which they have been made. By comparing at a later period these scales, obtained by the same means and under the same influences, but at different periods of time, we shall discover whether the disturbing action or influence of man has diminished or augmented the quantity of this strength. Now, it is this variation which the whole system undergoes, that it is important to point out in social physics. We may even in this way determine changes happening in the different classes of society, but without descending to individuals. A man, in consequence of gigantic height, or by herculean strength, may attract the attention of the naturalist or the physiologist; but in social physics his importance would disappear before that of another individual, who, after having ascertained experimentally the means of developing advantageously the height and strength, may succeed in putting them in practice, thus producing results either affecting the whole system or one of its parts. After having considered man at different epochs, and as belonging to different nations—after having successively ascertained the several elements of his physical and moral condition, and pointed out, at the same time, the variations in the quantity of materials which he produces and which he consumes, in the increase or decrease of his wealth, and the changes occurring in his position with respect to other nations—we must next determine the laws to which man has been subject in the different races, from their origin; that is to say, we must follow the progress of the centres of gravity in each part of the system, just as we determined the laws relating to man in each nation, by the entire mass of the observations made upon the individuals composing that nation. Under this point of view, nations would be, in respect to the social system, what individuals are in respect to nations; each would have their laws of increase and decrease, and have a share, more or less important, in the perturbations of the system. Now, it is only from the whole of the laws which relate to different races, that we can afterwards decide on what belongs, whether to the equilibrium or to the movement of the system; for we do not know at present which of these two states actually exists. What we see daily proves to us sufficiently the effects of internal actions and forces reacting on each other; but the centre of gravity of the system, if we may so say, and the direction of the movement, are unknown; it may even happen, that whilst the motion of all the parts of the system is progressive or retrograde, the centre may remain unvaryingly in equilibrio.

Perhaps we may be asked, how it can be possible to determine absolutely the value of the disturbing power of man—that is to say, the differences, more or less great, which the social system produces, from that state or condition in which he would be placed if left to the forces of nature alone? Such a problem, if it could be solved, would unquestionably be interesting, but scarcely useful, since such a condition does not exist in nature, seeing that man has at all times been in possession of an intellectual force, and has never been reduced to live merely as animals do. It is of more consequence, indeed, to determine if the effects of his disturbing power vary in a manner more or less advantageous.

From what we have said, the object of scientific research, then, should be to inquire—

1. What are the laws of human reproduction, growth, and physical force—growth of his intellectual powers, and of his disposition, more or less great, to good or evil; the laws regulating the development of his passions and tastes; the mode of succession of the materials he produces or consumes; the laws of human mortality, &c.

2. What influence has nature over man; what is the measure of its influence, and of its disturbing

forces; what have been their effects for such and such a period; and what the social elements chiefly affected by them.

3. Finally, can human forces compromise the stability of the social system? I am not sure if these questions may ever be answered; but to me it seems that their solution would form some of the noblest and most interesting results of human research. Convinced of this truth, I have already made some efforts to reply to the first series of these questions; and still more, to make my ideas understood, and to point out the route which ought to be followed, I have endeavoured also to demonstrate how to detect the influencing causes, and to determine the degree of their respective actions. Whatever idea may be formed of these researches, I trust it will still be admitted, that in respect to the development of the human faculties, a great number of observations and results have been accumulated which science did not previously possess.

I wish it also to be understood, that I consider this work as but a sketch of a vast plan, to be completed only by infinite care and immense researches. I have room, therefore, for hope that the leading idea, as to the composition of the work, may be alone criticised; and that, in respect to the filling up of the details, necessarily very incomplete in some parts, from want of materials, a lenient criticism may also be vouchsafed. I have thought it my duty, however, in the suitable place, to point out these deficiencies.

On the Importance or Dignity of the Inquiries Relative to Man.

The nature of the researches in this work, and the view which I have taken of the social system, have in them a something positive, which at first sight may startle some minds. Some may be disposed to see in it a tendency to materialism; others, misunderstanding my ideas, may view them as an attempt to exaggerate the field of the exact sciences, and to place the geometrician upon ground which does not belong to him; they may reproach me for engaging in absurd speculations, and with inquiring into measures where things do not admit of being measured.

In respect to the charge of materialism, it has been reproduced so often and so regularly on every occasion when science attempted to make a new step, and when the spirit of philosophy, breaking through its ancient barriers, attempted a new road, that it seems almost superfluous at the present day to reply to it, the more especially that the fanatical spirit is no longer backed with chains and tortures. It can scarcely now be esteemed an insult to the Divinity, that man exercises the noblest of his faculties by directing his meditations towards the sublimest laws of the universe, by endeavouring to explain the admirable economy and the infinite wisdom which presided at its formation. Who would venture to accuse of dryness those philosophic minds, which have substituted for the narrow and paltry world, as known to the ancients, the knowledge of our magnificent solar system, and have so vastly removed the limits of our starry heaven, that genius can no longer guess its extent but with religious awe? Certainly, the knowledge of the wonderful laws which regulate the system of the world, gives us a much nobler idea of the power of the Divinity, than that of the world which sublime superstition wished to impose upon us. If the animal pride of man be lowered, on observing how small the spot is which he occupies upon the grain of dust of which he at one time made his universe, how much, on the other hand, ought his intelligence to be pleased at the extent of its power, shown in investigating so deeply the secrets of the heavens!

Having thus observed the progress made by astronomical science in regard to worlds, why should not we endeavour to follow the same course in respect to man? Would it not be an absurdity to suppose, that, whilst all is regulated by such admirable laws, man's existence alone should be capricious, and possessed of no conservative principle? We need not hesitate in asserting, that such a supposition, and not the researches we propose making, would be injustice to the Creative Power.

In respect to the second objection, I shall endeavour to answer it when estimating the moral and intellectual faculties of man.

BOOK FIRST.

DEVELOPMENT OF THE PHYSICAL QUALITIES OF MAN.

1. The Determination of the Average Man in General.

We have said that, in the course of our researches, the first step to be made would be to determine the average man, amongst different nations, both physical and moral. Perhaps the possibility of such an appreciation of physical qualities, which admit of direct measurement, will be granted us: but what is the course to be pursued in regard of the moral qualities? How can we ever maintain, without absurdity, that the courage of one man is to that of another as five is to six, for example, almost as we should speak of their stature? Should we not laugh at the pretension of a geometrician, who seriously maintained that he had calculated that the genius of Homer is to that of Virgil as three to two? Certainly, such pretensions would be absurd and ridiculous. It is proper, then, first of all, to agree upon the meaning of words, and to examine if that which we aim at is possible, not in the actual state of science, but in such a state as science will some day arrive at. We cannot, indeed, demand from those who employ themselves with social physics, more than we should have done from those who foresaw the possibility of forming an astronomical theory, at a period when defective astronomical observations and false theories, or their total absence, with insufficient means of calculation, only existed. It was especially necessary to be certain of the means of performing such a task; it was afterwards necessary to collect precise observations with zeal and perseverance, to create and render perfect the methods for using them, and thus to prepare all the necessary elements of the edifice to be erected. Now, this is the course which I think it proper to pursue in forming a system of social physics. I hold that we should examine if it is possible to obtain the means of performing the desired task, and, firstly, if it is possible to determine the average man.

This determination will be the subject of the three first books of this work. We shall, first of all, consider man in a physical relation; then we shall consider him with respect to his moral and intellectual qualities.

2. Of the Determination of the Physical Qualities of the Average Man.

Amongst the elements pertaining to man, some are susceptible of a *direct* appreciation, and the numbers which represent them are true mathematical quantities: such are, in general, the physical qualities. Thus the weight and stature of a man may be measured directly, and we may afterwards compare them with the weight and stature of another man. In comparing the different men of a nation in this manner, we arrive at average values, which are the weight and stature proper to be assigned to the average man of this nation: as a sequel to such an inquiry, we might then say that the Englishman is of greater height and larger size than the Frenchman or Italian. This mode of proceeding is analogous to that pursued

in physics,* in determining the temperature of different countries, and comparing them with each other: thus, we say justly, that at Paris, the mean temperature of the summer is 18 degrees cent., although the thermometer has almost always been either higher or lower than this point. We conceive, moreover, that the ratio which exists between the weight or stature of the average man peculiar to one of the three mentioned countries, may vary in course of time.

In certain cases, we employ *non-material* measures, as when we attempt to appreciate the average duration of life for any particular nation, or to estimate at what age the average man of that nation ceases to exist. Life is measured by duration, and this measurement admits of quite as much precision as we employ in physics.

Lastly, we may employ *conventional* measurements, as when we estimate the riches, productions, and consumption of one country, and compare them with those of another. All these calculations have already been made by economists, with greater or less accuracy; therefore they cannot appear strange to us.

There are elements pertaining to man, which cannot be measured directly, and which are only appreciable *by their effects:* of this number is the strength of man. We are of opinion that it is not absurd to say that such a man is twice as strong as another when pressing with his hands, if this pressure, applied against an obstacle, produces effects which are as two to one. Only, it then becomes necessary to admit that causes are proportionate to effects; and it is necessary to take great care, in estimating the effects, to place the individuals in similar circumstances. Thus, for example, we might make serious errors in employing the dynamometer of Régnier indiscriminately for all persons, because the size of the hands, or the height of the stature, may have some influence, so that one handles the instrument with a greater or less degree of facility.

It results from what has preceded, that, in the determination of the average man, considered with respect to physical qualities, the greatest difficulty consists in collecting exact observations in sufficient number to arrive at results which deserve some degree of confidence.

In the first book, we shall examine all which relates to the life of man, his reproduction, and mortality; in the second, we shall be occupied with the development of his stature, weight, strength, and his physical qualities in general.

CHAPTER I.

OF BIRTHS IN GENERAL, AND OF FECUNDITY.

1. Of Births.

The act of birth is connected with conception, in the same manner as the effect is connected with the cause which produces it: to the first we attach the idea of necessity, and to the second that of free will.† As in other subjects, we generally lose sight of causes which have acted long anterior to the effects we observe; our attention is not attracted to the regularity with which births are produced—we are accustomed to regard them as natural phenomena, with which the will of man is but feebly concerned. If we observe the influence of seasons, places, years of abundance or scarcity, &c., it is rather as acting on our physical than on our moral qualities—it is as modifying the facility and not the volition which we have in reproduction. Moreover, we have a very natural dislike to consider our will as influenced by physical causes.

Whatever be the nature of the causes which produce births in greater or less number, with more or less regularity, the thing most important to be known is the result which follows; we shall afterwards be able to inquire what nature performs, and what belongs to the disturbing action of man. In order to facilitate this inquiry, we shall first examine successively how births are produced, taking into consideration the times, places, sexes, seasons, hours of the day, and other causes which are external to the man; and thereby we shall be more able to compare the influence of these causes with those which man exercises, in virtue of his mode of existence and of his political and religious institutions.

2. Of Fecundity.

Taken in an absolute sense, the annual number of births of a country has only an indifferent degree of importance, but it acquires a very great value when we compare it with the other elements of population of this country. We may first employ it to measure the *fecundity*, by comparing it with the actual number of the population or with the annual number of marriages. In the first case, we obtain a measure of the *fecundity of the population*, and in the second case of that of the *fecundity of marriages*. Statisticians avail themselves of both these measures or data, which nevertheless require to be used with great care.

When we compare two countries with respect to the fecundity of marriages, we must be very cautious only to compare the number of *legitimate* births with the number of marriages. We conceive, indeed, that in a country where all the births were indiscriminately reported, with the number of registered marriages, the fecundity would appear too great, and the error would be more considerable, according as there were more illegitimate births and fewer marriages regularly confirmed. The opposite error would take place in a country where more importance was given to establishing the annual number of marriages than that of births. In general, it is necessary to distrust the number expressing the fecundity of the marriages of a country, when the civil records are carelessly kept, or when the registrations are not made uniformly. I think England may be especially pointed out as presenting numbers which have often led those inquirers into error who have availed themselves of them.*

Malthus observes, that the ratio of births to marriages, taken as a measure of fecundity, supposes a stationary population: if the population were increasing, for example, its increase would be more rapid, and the real fecundity of marriages would the more exceed the proportion of births to marriages.† This able economist points out several other circumstances which it is proper to consider in estimating fecundity, such as marriages for the second or third time, late marriages sanctioned by local customs, and frequent emigrations or immigrations.‡

As it respects political economy, the number which expresses the fecundity of a population is perhaps more important than that which expresses the fecundity of marriages. Indeed, the economist is generally more concerned with the increase which the population receives than with the manner in which this increase takes place. The fecundity of marriages might be exactly the same in two different countries, without the population being the same. In countries, for example, where prudent foresight renders marriages less numerous, there will be fewer births; on

* [The term physics, as here used, is synonymous with the terms natural or experimental philosophy, as used in this country.]

† We generally consider the duration of pregnancy to be nine months. I do not know whether researches have been made to ascertain if any causes exist influencing this duration, and if their influence has been calculated.

* Malthus—Essai sur le Principe de Population, tome ii. p. 212. Geneva Edition: 1830.

† The words of Mr Malthus are (3d ed., vol. ii. p. 6)—"The more rapid is the increase of population, the more will the real prolificness of marriages exceed the proportion of births to marriages in the registers."

‡ Ibid., tome ii. p. 219. English Edition, book ii. ch. 9.

the contrary, in countries whose inhabitants are improvident and careless, and in new countries, where the immigrations are numerous and where the settlements are formed by persons generally at a reproductive age, we find a great fecundity in the population. These are important distinctions to be made, to avoid all kinds of error, either in making estimates or in the approximating of numbers.

Another very common error in statistical works proceeds from an erroneous estimate of the population: scarcely sufficient attention has been hitherto paid to this subject. When census are not accurately made, we generally obtain too small a number as the amount of the population, and the fecundity, calculated from it, must appear too great. This is an error which I point out here, because I have committed it myself in my first essays on statistics and in speaking of the fecundity of the ancient kingdom of the Netherlands: it resulted from this circumstance that certain provinces were found in a very unfavourable state compared with others; but a deeper examination has shown me what caused my mistakes, and has led me to solicit the government, with active entreaty, for a census, henceforth become necessary; which was effectually accomplished in 1829.

There is one particular case in which the ratio between the fecundity of one country and that of another remains exactly the same, whether we estimate it according to the population or according to the annual number of marriages; this is when the populations of the countries which we compare are homogeneous or composed of the same elements—when, on both sides, we annually count the same number of marriages to the same number of inhabitants.*

I thought I ought to present the preceding observations on the calculation of fecundity, before examining all which relates to births. We shall now proceed more safely in endeavouring successively to appreciate the influence which *natural* and *disturbing* causes exercise over births.

CHAPTER II.

OF THE INFLUENCE OF NATURAL CAUSES ON THE NUMBER OF BIRTHS.

1. Influence of the Sexes.

THERE is a very remarkable fact, which has been long ago observed, although we do not yet know the true causes of it. It is this—that more boys are born annually than girls. Now, since the proportion of male to female births does not differ much from unity, or is almost the same for the different countries for which it has been calculated, it has been necessary to have recourse to numerous observations to determine it with some precision. After more than fourteen and a half millions of observations made in France, from 1817 to 1831, the value of this ratio has been as 106·38 to 100; and its average value has varied but little, taking one year with another.*

To know whether climate influences the ratio in question, thirty of the most southern departments of France have been considered separately. The births in these departments, from 1817 to 1831, have been 2,119,162 males, and 1,990,720 females; the ratio of the first number to the second is as 105·95 to 100—nearly the same as for the whole of France. This result would lead us to conclude, that the superior number of male to female births does not depend, in any sensible degree, on climate.†

However, in order to ascertain more decidedly the influence exercised by climate, it will be proper to extend our researches beyond the limits of France. Taking our data from the principal European states, we find the following results, according to M. Bickes, who has collected more than seventy millions of observations:‡—

States and Provinces.	Males to 100 Females.
Russia,	108·91
The province of Milan,	107·61
Mecklenburg,	107·07
France,	106·35
Belgium and Holland,	106·44
Brandenburg and Pomerania,	106·27
Kingdom of the Two Sicilies,	106·18
Austrian Monarchy,	106·10
Silesia and Saxony,	106·05
Prussian States (*en masse*),	105·94
Westphalia and Grand Dutchy of the Rhine,	105·86
Kingdom of Wurtemburg,	105·69
Eastern Prussia and Dutchy of Posen,	105·66
Kingdom of Bohemia,	105·38
Great Britain,	104·75
Sweden,	104·62
Average for Europe,	106.

Some travellers have thought that hot climates are more favourable to female births; but numbers have not confirmed this opinion, at least from what we have just seen in Europe. However, more observations than we possess are necessary, and especially observations collected near the equator, before we can affirm that the influence of climates is absolutely insensible. The following are the observations made at the Cape of Good Hope, on the white population§ residing there, and also on the slave population:‖—

Years.	Free Births.		Slave Births.	
	Males.	Females.	Males.	Females.
1813,	696	706	188	234
1814,	802	825	230	183
1815,	833	894	221	193
1816,	895	892	325	294
1817,	918	927	487	467
1818,	814	832	516	482
1819,	810	815	506	509
1820,	831	898	463	464
Total,	6904	6789	2936	2826

Thus, among the free births, the females numerically exceed those of the males; and this result is reproduced every year.¶

* Some calculations which I shall advance will make this easily understood. Let f be the fecundity of a country, n the annual number of births, m that of marriages, c the remainder of the population, and f'', n', m', and c', respectively, the same numbers for another country; we shall have for the fecundity of marriages the proportion

$$f : f' :: \frac{n}{m} : \frac{n'}{m'}.$$

Now, if the populations be homogeneous, as in the case which we are supposing, we shall also have

$$\frac{n}{c+m} = \frac{n'}{c'+m'}.$$

Now, if we multiply both terms of the latter ratio of the proportion by this equality, we shall have

$$f : f' :: \frac{n}{c+m} : \frac{n'}{c'+m'};$$

—a result agreeable to what is advanced in the text, since the terms of the latter ratio represent the fecundity of the population.

† Ibid.

‡ Memorial Encycl. Mai 1832.

§ Journal Asiatique, Juillet 1826; and Sadler, tome ii. p. 371.

‖ Elements of Medical Statistics, by Hawkins, p. 51.

¶ [It appears to the translator, that the predominance of female over male births, amongst the white race of the Cape of Good Hope, is not so much owing to climate as to the peculiarity of race: the free white population of the Cape are, as near as may be, purely Saxon, descended from the old Dutch families, who originally settled there about two hundred and seventy years ago. They have preserved the purity of their blood with great care,

It appears that residence in town or country is not without its influence on the ratio of births of the two sexes, as we may judge from the Belgic documents:—

Years.	Births in the Towns.			Births in the Country.		
	Boys.	Girls.	Ratio.	Boys.	Girls.	Ratio.
1815 to 1824,	164,376	154,110	106·65	472,221	441,502	106·96
1825 to 1829,	87,516	83,122	105·29	256,751	241,969	106·10

The number of boys, compared with that of girls, has then been smaller in town than in the country: it is to be observed, that both ratios have sensibly diminished during the latter period.

This influence of town residence, tending to diminish the proportional number of births, is also observed in other countries. This is seen in the following table, in which M. Bickes has found another kind of influence, namely, legitimacy of birth:*—

States and Provinces.	Boys to 100 Girls. Legitimate.	Illegitimate.
France,	106·69	104·78
Austrian monarchy,	106·15	104·32
Prussian monarchy,	106·17	102·89
Sweden,	104·73	103·12
Wurtemburg,	105·97	103·54
Bohemia,	105·65	100·44
Province of Milan,	107·79	102·30
Eastern Prussia and Posen,	105·81	103·09
Brandenburg and Pomerania,	106·65	102·42
Silesia and Saxony,	106·30	103·27
Westphalia and the Dutchy of the Lower Rhine,	106·07	101·53
Cities.		
Paris,	103·82	103·42
Amsterdam,	105·00	103·83
Leghorn,	104·68	93·21
Frankfort-on-the-Maine,	102·03	107·04
Leipsic,	106·16	105·94

Thus all the documents relative to states agree in giving a larger proportional number of boys for legitimate than for illegitimate births. This difference is much less conspicuous for towns. M. Bickes has extended his researches concerning legitimate births to a great number of cities; and the average of the ratios, which I have calculated, gives 104·74, a value which is very sensibly inferior to that which all the European states give.

M. Poisson, some years ago, made researches into this singular circumstance, that the ratio of male to female births, for natural children, differs sensibly from the general ratio of France taken altogether; and he has obtained, from the documents of 1817 to 1826 inclusively, 21-20ths instead of 16-15ths. M. Mathieu also had arrived at a similar result.†

With the view of throwing more light on this interesting subject, Mr Babbage has also carefully collected the numbers of several different countries, and presented them, with all the desirable details, in a letter, which is inserted in Brewster's Journal of Sciences, new series, No. I. I have extracted the principal results.

	Legitimate Births.		Number of Births observed.	Illegitimate Births.		Number of Births observed.
	Female.	Male.		Female.	Male.	
France,	10,000	10,657	9,656,135	10,000	10,484	673,047
Naples,	10,000	10,452	1,059,055	10,000	10,367	51,309
Prussia,	10,000	10,609	3,672,251	10,000	10,278	212,804
Westphalia,	10,000	10,471	151,169	10,000	10,039	19,950
Montpellier,	10,000	10,707	25,064	10,000	10,081	2,735
Averages,	10,000	10,575		10,000	10,250	

In quoting these numbers, M. Prévost observes, that, independently of the physiological cause which gives a greater facility to male births, there exists an accessory cause in legitimate births especially, which still further increases this facility, and which he attributes to a sort of preference generally given to children of the male sex. "Is not the end of this preference," says he, "to prevent, after male births, the increase of the family, and consequently to increase the proportional ratio of the latter? Parents have one son: if different causes impede the increase of their family, they will perhaps be less uneasy at this privation, when their first wish is accomplished, than they would have been if they had not had male children. Would not this diminution of births, after one or two sons, tend to increase the ratio of male births?"* Without denying the influence which this moral restraint may exercise in certain cases, I think it altogether insufficent to explain the results which I shall soon advance.

M. Giron de Buzareignes has also communicated to the Parisian Academy of Sciences some researches made in France, on the births of children of both sexes.† He divides society into three classes: the first is composed of persons whose occupations tend to develop the physical qualities; the second, of persons whose occupations tend to weaken these powers; and, lastly, the third, of persons whose occupations are of a mixed kind. According to this observer, the proportional number of male births in the first class will be greater than that which France furnishes in general; in the second class, it will be the contrary; and in the third, both numbers will be equal. Thus, agricultural occupations are favourable to the development of male births, whilst commerce and manufactures produce an opposite effect. This observation agrees very well with the results which have been previously pointed out for town and country, but it does not sustain an equal examination when applied to the different states of Europe.

M. Bickes, who is much inclined to question the opinion advanced by M. Giron de Buzareignes, has presented a new explanation of the causes which occasion the ratio of the sexes to vary. According to him, "It is in the blood (the constitution, the race) of people or nations, who differ more or less from each other in this respect, that the powers or causes reside, whatever they may be, which determine the production of many boys. Political and civil institutions, customs, habitual occupations, mode of life, wealth, indigence, &c.—all these things have no influence on the respective ratio according to which the two sexes come into the world." We should have much difficulty to explain by this means how, in the same people, the ratio of births of the two sexes presents such sensible differences in town and country. As to the effect of legitimacy on the preponderance of female births, M. Bickes thinks that the first cause of it cannot be demonstrated.‡ We shall soon find other obstacles to his hypothesis. Professor Hofacker has made some researches in Germany, on the influence of the age of parents on male and female births, whence it results, that in general, when the mother is older than the father, fewer boys than girls are

intermingling as little as possible with the dark races, whether Caffre or Hottentot. Generally speaking, they hold the mulatto in great dislike and contempt; so that, amongst the pure Dutch of the Cape, a mulatto, however slightly tinged, has hitherto had little chance of acquiring a proper status in society. With respect to M. Quetelet's table of births, it seems probable that an excess of boys over girls is a law chiefly with the Celtic and Sarmatian races, and that in respect to the pure Saxon race, there exists either an opposite law, namely, the excess of females over males, or, perhaps, as near as may be, an equality; but the translator inclines to the opinion that the excess will be in the females with respect to the Saxon race.]

* Zeitung fur das Gesammte Medicinal wesen. Also, An. de Hygiène, Oct. 1832.

† Annuaire et le tome ix. des Mémoires de l'Academie des Sciences, p. 239.

* Bibliothèque Universelle de Genève. Oct. 1829, p. 140, *et seq.*

† Bulletin de M. Férussac, tome xii. p. 3.

‡ Annales de Hygiène, Oct. 1832, p. 459.

born; the same is the case when the parents are of equal ages; but the more the father's age exceeds that of the mother, so is the ratio of boys greater.

The different results of M. Hofacker are brought together in the following table:—

Ages of the Man and Woman.	Boys to 100 Girls.
The man being younger than the woman,	90·6
.. .. as old as the woman,	90·0
.. .. older from 3 to 6 years,	103·4
.. .. .. from 6 to 9 years,	124·7
.. .. .. from 9 to 18 years,	143·7
.. .. .. by 18 years and upwards,	200·0
The man from 24 to 36—the woman from 16 to 26 years,	116·6
.. .. 36 to 46 ..	95·4
.. .. 36 to 48 years, .. young,	176·9
.. .. middle-aged,	114·3
.. .. older,	109·2
.. .. 48 to 60 years, .. middle-aged,	190·0
.. .. older,	164·3

If these results were deduced from sufficiently numerous observations, and so accurate as to deserve entire confidence, and if they were verified in other countries, they would present a very powerful argument in favour of the hypothesis, that the births of one or the other sex can be made to predominate at will. We must regret that there are still so few proper documents to elucidate this delicate question; the only ones which I have succeeded in procuring are found in the work of Mr Sadler on the "Law of Population." I shall first present a table extracted from the registers of the peers of England, and let it be observed that it only includes first marriages:—

Difference of Ages: the Husband being—	Number of Marriages.	Births.		Ratio of Births.		Children by each Marriage.
		Male.	Female.	Male.	Female.	
Younger,	54	122	141	865	100	4·87
As old,	18	54	57	948	100	6·17
Older from 1 to 6 years,	126	366	333	1637	100	5·71
6 to 11,	107	327	258	1267	100	5·47
11 to 16,	43	143	97	1474	100	5·58
16 and upwards,	33	93	57	1632	100	4·55
Total,	381	1105	963			

These results agree perfectly with those of M. Hofacker. I have calculated in the latter column the fecundity of the marriages, which has likewise a value depending on the respective ages of the espoused.

In examining the influence of the age of the parents on births, Mr Sadler has been led to the following conclusions:—The ratio in which the sexes are born is regulated by the difference of age of the parents, in such a manner that the sex of the father or the mother will preponderate beyond the average of the total number of births, according to the party which has the excess of age. On the other hand, the sex which is in excess will have a mortality depending on the period which separates the age of the parents, so that the sexes will be balanced in numbers, towards the ordinary period of marriage.

It is thus that Mr Sadler explains how the proportional number of male births is not so great in the manufacturing towns of England as in the country, where men marry later, and present a greater difference of age to the women whom they espouse.* He also extends his explanation to the difference which is observed between legitimate and illegitimate births.

Mr Sadler, moreover, finds, that in considering the age of the father or the mother separately, we do not observe any difference of facility in producing infants of one sex rather than of another. This facility, according to him, only depends on the relative ages of the parents: this he deduces from the following numbers, extracted from registers of marriages:—

Age of the Couples at the time of Marriage.*	Number of Marriages.	Births.		Ratio of Births.		Fecundity.
		Male.	Female.	Male.	Female.	
Under 21,	54	143	124	1153	1000	4·94
21 to 26,	307	668	712	938	1000	4·50
26 to 31,	284	696	609	1143	1000	4·59
31 to 36,	137	296	263	1133	1000	4·10
36 to 41,	90	149	151	987	1000	3·33
41 to 46,	58	93	83	1120	1000	3·04
46 to 51,	51	79	83	952	1000	3·17
51 to 61,	30	27	17	1588	1000	1·47
61 and upwards,	16	5	8	625	1000	0·61
Total,	1027	2158	2050	1052	1000	4·10

Ages of the Wives of the Couples.	Number of Marriages.	Births.		Ratio of Births.		Fecundity.
		Male.	Female.	Male.	Female.	
Under 16,	13	37	33	1121	1000	5·38
16 to 21,	177	502	397	1299	1000	5·02
21 to 26,	191	512	485	1055	1000	5·22
26 to 31,	60	115	92	1250	1000	3·43
31 to 36,	21	40	36	1110	1000	3·62
36 and upwards,	9	13	13	1000	1000	2·89
Total,	471	1219	1046	1165	1000	4·61

Since these numbers are generally small, it would perhaps have been better had they been arranged under fewer heads. It appears to me that we might reduce them to the three following: under 26 years, from 26 to 36 years, and upwards of 36 years. We then obtain respectively 970, 1140, 1032 male births for 1000 female ones, when taking the couples; and 1161, 1211, 1000, when taking the wives. We see that the period between 26 and 36 years gives a few more male births.

Lastly, in extending his researches to widows and widowers, Mr Sadler further finds, from the registers of English couples, that the widowers tend to produce more female children.

Age of the Widowers or Widows at the time of Marriage.	Number of 2d & 3d Wedlocks.	Births.		Ratio of the Births.		Children by Marriage.
		Male.	Female.	Male.	Female.	
22 to 27,	5	21	33	91·3	100	8·00
27 to 32,	18	33	39	84·6	100	4·00
32 to 37,	24	51	66	77·3	100	4·87
37 to 42,	17	29	32	90·6	100	3·88
42 to 47,	16	30	38	79·0	100	4·25
47 to 52,	15	30	43	69·9	100	4·87
52 and upwards,	12	10	15	66·7	100	2·08
Total,	107	204	256	79·7	100	4·30

The ratio is so marked, that we find it almost corresponds to the different ages.

It results from the examination of the probable causes which may produce the inequality between the births of male and female children which has just been pointed out, that the most influential, if we may trust to the few documents which science at present possesses, is evidently that which the difference of age of the parents produces: we might even think that the other causes which have been pointed out, are in some manner the effects of it. Indeed, it ge-

* It is a fact which appears well established by several statisticians, and by Mr Milne in particular (Traité des Annuités, vol ii. p. 493), that precocious marriages generally produce a greater number of daughters.

* All the numbers of this and the following table have been taken from fruitful first marriages.

nerally happens throughout Europe, that men, when they marry, are five or six years older than women, so that the preponderance of male births will be almost the same, as is established by the researches of Hofacker and Sadler, who give, as the ratio of births of both sexes, the number 103·5 nearly, when the father is from 1 to 6 years older than the mother. Now, we think that this ratio will be larger or smaller, according as the difference of age of the parents is greater or less in the different nations, in town or country, among the persons whose connexions are legitimate or illegitimate; and, lastly, according to all the circumstances which may cause the ages to vary at which production takes place; so that the age of the parents will be the principal regulator which determines the magnitude of the ratio between the births of the two sexes. Hence we see how important it is to direct our researches to the age at which marriage takes place, especially since the greater or less mortality of children depends on these ages.*

2. Influence of Age on the Fecundity of Marriages.

We have just seen that the relative age of the parties exercises a sensible influence on the ratio of male births: it is natural to suppose, that it will have still more influence with regard to the number of births, or the fecundity. I am not acquainted with much on this subject besides the researches of Mr Sadler, which were undertaken with the design of showing that the age of parents, considered apart, has no influence on the ratio of male to female births. I have introduced them above, taking care to calculate the number expressing the fecundity in the last column. However, since the numbers of Mr Sadler are generally small, I have thought proper to receive fewer divisions of ages, which will give a greater probability to my particular results: we may sum up all these results in the following table:—

According to the Registers of English Couples.	Number of Children procreated by one Individual; being at the time of Marriage—		
	Under 26 years.	Between 26 and 36.	More than 36 years.
Husbands, - -	5·11	4·43	2·34
Wives, - -	5·13	3·49	2·80
Widowers & Widows,	3·99 †	4·50	3·03

We see that the fecundity of marriages, all things being equal, diminishes in proportion to the increasing age of the parties. To observe the influence of age itself on the fecundity of individuals, it would be necessary to compute the probability of life in marrying; for it is very evident that he who has yet twice as long to live as another person, may hope, all things being equal, to procreate more children. It is very true, on the other hand, that those who marry young have some fear lest they should have too numerous a family; which is not the case when persons marry at a more advanced age. In supposing, as a kind of limit, that, all things being equal, the fecundity depends on the probability of life, it would be necessary for each age to divide each of the ratios previously found by the corresponding number which expresses the length of the probable life. Now, in admitting approximatively 36, 32, and 21 years, as the probability of life of the individuals of the first class; afterwards, for the women, 40, 34, and 23 years; and, lastly, for the widows, 38, 33, and 22 years, we shall have, as the relative values of fecundity—

According to the Registers of English Couples.	Number of Children procreated by one Individual; being at the time of Marriage—		
	Under 26 years.	Between 26 and 36.	More than 36 years.
Husbands, - -	0·142	0·133	0·135
Wives, - -	0·128	0·163	0·125
Widowers & Widows,	0·131	0·136	0·166

These numbers, which only express the relative fecundity, serve, moreover, to show that the greatest aptitude for reproduction is evidently, among the individuals whom we are considering, before the age of 26 years; moreover, we see that it is not sensibly diminished in men until the 36th year. The data for females are too few to be relied on, since they only include nine women more than 36 years of age.

When we consider the respective ages of the husbands, we find, still availing ourselves of the numbers furnished by Mr Sadler, and which we have quoted above, that the fecundity of marriages reaches its greatest value when the ages of the married persons are the same, or when the man is from 1 to 6 years older than the woman: it does not sensibly diminish, if the difference of age does not exceed 16 years; but when it is greater, or when the man is younger than the woman, the fecundity seems to be at its *minimum*. These are results which it is in some measure easy to foresee. Moreover, I only proposed to point out these researches, without pretending to go deeply into them, since adequate data are still wanting.

Mr Sadler, in another part of his work, has ascertained the number of children produced by the wives of those couples in England whose ages at the time of marriage he has been able to determine: putting down all the marriages this time, whether they were fruitful or not, or were born during the first or second time of wedlock; and these are his results:—

Age at the time of Marriage.	Number of Marriages.	Number of Children.	Mortality of Children before the Marriageable Age.	Births by Marriage.	Deaths for one Birth.
12 to 15,	32	141	40	4·40	0·283
16 to 19,	172	797	166	4·63	0·208
20 to 23,	198	1033	195	5·21	0·188
24 to 27,	86	467	180	5·43	0·171

We see here that, from 12 to 27 years, the fecundity of women continues to increase. At first view, this result appears contrary to those which have been previously obtained; but it is proper to observe, that he is considering marriages in general, and not, as we have previously supposed, fruitful marriages in particular. We have seen that, on this latter hypothesis, the fecundity of women does not perceptibly vary under the age of 26 years. We can then only attri-

* [Assuming as a fact, an assertion which has been often made, that thoughtless and premature marriages, that is, when both sexes are very young, take place to a much greater extent in Ireland than in most other countries, records of such marriages would go far to solve the difficult question proposed above by M. Quetelet: such records, if they exist, might be compared with those of Holland, where it is presumed that a moral condition of the people exists, which is the antithesis to the Irish character. A comparison of these records with each other would go far to solve the question. Should it be found that the male sex still predominates in births in Ireland, it would then be clear that the theory of *age* proposed by M. Buzareignes, and supported by M. Quetelet, would be at fault, whilst that of Bickes, or the theory of *race*, which is the view supported by the translator, would be the true one.

It is quite possible, however, that both causes may have their influence; but a glance at the table, page 12, proves indisputably, as far as such records go, that, commencing in Eastern Europe with the Sclavonic race, amongst whom we find the disproportion of boys to girls greatest, and passing through the mixed Sclavonic and Saxon races of Prussia, and through the Celtic nations of France and the north of Italy, to Westphalia, Great Britain, and Sweden, where the Saxon race exists in its greatest purity, we find the disproportion between boys and girls constantly decreasing, and are entitled, therefore, to conclude, that whatever other causes may be in operation, blood or race comes in for at least a considerable share in the effects.]

† This number being founded on five marriages only, which produced 44 children, cannot be entitled to much confidence.

bute the difference to this, that many women, married late in life, continue barren. Moreover, it results from the calculations of Mr Sadler, that the children procreated by too premature marriages are more subject to mortality than others. It is, besides, very odd, that the statistician, who has calculated the preceding tables with a definite object, has not extended their application beyond the age of 27 years. It is also much to be desired that he had ascertained the ratio of fruitful to barren women, for the different ages at which marriages have taken place.

Not to choose the individuals whom he examines from a privileged class, Mr Sadler has also given a table from 2860 cases of child-birth, attended by Dr Granville in several of the principal benevolent establishments in London: we shall quote it here.

Age at the time of Marriage.	Number of Marriages.	Children at the full period.	Children living at the time of Birth.	Dead Children.	Deaths for one Birth.	Average No. of Births during one year of Marriage.	Children by Marriage.
13 to 16,	74	376	209	167	0·44	0·46	5·08
17 to 20,	354	1307	751	556	0·43	0·50	3,70
21 to 24,	283	823	474	349	0·42	0·52	2·91
25 to 28,	110	287	170	117	0·41	0·55	2·61
29 to 32,*	38	67	46	31	0·31	0·59	2·03

This table deserves to be carefully examined. We first observe that the mortality of children is somewhat less, in proportion as the marriages are less precocious; afterwards, the numbers of the seventh column, which Mr Sadler gives as having been calculated by Mr Finlayson from accounts taken of the ages of the delivered women, whom he does not know or of whom he takes no account, would tend to show that fecundity is greater as the woman is younger, and on this side of the term of 32 years. Nevertheless, from the last column, which I have added, and which I have made from the numbers of the table, it is easy to see that, if the annual fecundity be less, the *fruitful women* who have married early, all things being equal, have produced more children; which brings us back to the observation already made on the wives of peers. It is singular that Mr Sadler should not have examined the fecundity in both these cases: it seems to me, that he would have found less solid arguments in favour of the law of population which he endeavours to establish.

We certainly see, from the numbers of Mr Finlayson, that there is a somewhat greater annual fecundity for women married late; but it does not compensate for the excess of absolute fecundity of those who have married early. Generally, when a man marries a woman very young, he endeavours to take care of her, and her family may become numerous without his object being to make it so: on the contrary, if he marry a person grown up, he no longer thinks care so necessary; and, on the other hand, if he wishes to have a family, the time becomes more precious to him, as the age of his wife is advanced.†

It seems to me that the following consequences naturally follow from what has been said:—

1. Too premature marriages bring on sterility, and produce children who have less likelihood of living.

2. A marriage, if it be not barren, produces the same number of births, at whatever period it takes place, provided that the man's age does not exceed 33, or that of the woman 26 years. After these ages, the number of children produced diminishes.

3. From the preceding result, and from a consideration of the probability of life, we may infer that it is before the age of 33 years of the man, and 26 of the woman, that we observe the greatest fecundity.

4. If we may reckon the respective ages of married persons, we find that, all things being equal, the marriages most productive are those in which the man is at least as old as the woman, or older, yet not much exceeding her time of life.

After these observations, it becomes interesting to examine if man, in our climate, conforms to the laws which nature appears to have attached to fecundity, and if he reproduces at the most appropriate period of life. To establish this period, it would be necessary to know the age of parents at the time of the birth of their children. From the want of these documents, we may recur to the ages at which marriages take place, and admit, with sufficient probability, as an average term, that the birth of the first-born takes place within the first year which follows marriage.

In this hypothesis, it will be necessary to recur to tables of population; and some calculations, founded on the probability of life, will assist us in determining the marriage ages. The following table will explain the course which we have followed. The second and the fourth columns, from the Belgic population table, inform us of the number of men and women who are married, and who are of the age stated in the first column; moreover, also, whether they are yet married, or in the state of widowhood. The third and fifth columns point out what becomes of the same individuals in the period which follows, taking their mortality into account. The calculations have not been extended beyond 56 years, since the results after that period could only be very doubtful.

Age.	Married Men or Widowers.		Married Women or Widows.	
	Number of the Tables.	Number when Reduced.	Number of the Tables.	Number when Reduced.
From 14 to 16, -	0	0	4	4
.. 16 to 20, -	96	91	403	367
.. 20 to 25, -	3,278	3,029	5,981	5,594
.. 25 to 30, -	14,025	13,175	16,256	15,204
.. 30 to 35, -	20,879	19,638	21,928	20,552
.. 35 to 40, -	19,374	18,140	22,099	21,143
.. 40 to 45, -	18,951	17,512	22,188	20,506
.. 45 to 50, -	18,330	16,583	19,950	18,312
.. 50 to 53, -	11,708	10,864	12,453	11,697
.. 53 to 56, -	9,925	9,097	10,130	9,432

Now, to arrive at the number of marriages which have taken place between 20 and 25 years among the men, it will be sufficient to take from the number of married individuals of this age the number of those who were so before arriving at the age of 20 years: it will be necessary, moreover, to take into consideration the mortality of the latter; so that from 3278 we take away 91: the remainder, 3187, gives the number of marriages which have been made. In the same manner, the number of marriages which have been made between 25 and 30 years, will be calculated by taking 3029 from 14,025. We proceed in the same manner with the succeeding numbers; for the two classes which exceed fifty years, we must remember that they only include three years. To avoid any confusion in the calculation, we have, in the following results, employed the numbers of an average year of each period.

Age.	Marriages which have taken place. Men.	Women.
From 14 to 16 years, - - - -	0	2
.. 16 to 20 .. - - - -	24	80
.. 20 to 25 .. - - - -	637	1113
.. 25 to 30 .. - - - -	2199	2132
.. 30 to 35 .. - - - -	1541	1345
.. 35 to 40 .. - - - -	51	422
.. 40 to 45 .. - - - -	162	209
.. 45 to 50 .. - - - -	169	123
.. 50 to 53 .. - - - -	596	489
.. 53 to 56 .. - - - -	313	522

* It is evident that there are errors in this line, which we thought necessary to copy exactly.

† The table of Mr Finlayson, which is more extended than that of Mr Sadler, gives 0·78 as the annual fecundity of a woman from 33 to 36 years of age, and 1·12 for one from 37 to 39 years of age.

Some negative quantities are presented among these numbers, which may arise from a greater mortality than that which we have supposed; or from this circumstance, that at certain times there are *lacunæ*, or voids, in the population; or still more from the declarations of married persons having been made falsely, to conceal their age, or from other motives. We observe, indeed, that of the four negative numbers, three of them fall near the period of 50 years, which is overrated. Several persons, to give a round number, as is observed in other population-tables, will probably have declared themselves to be 50 years old, when they had not attained that term by some months, or even when they had already passed it by some years. As to the negative number between 35 and 40 years for the men, it corresponds to the direful period of the French wars, in which the Belgians took part: the men of this age entered on their 19th year some time between 1808 and 1813.

Considering what has just been said, we see that men in Belgium do not marry before 16, and probably not before 18 years of age: some women have married between 14 and 16 years of age. *The greatest number of marriages, both of men and women, take place between their 26th and 30th years:* women, however, reach the adult period earlier than men; the *maximum* would seem to fall about the 29th year for men, and after the 27th for women.

The number of marriages diminishes very sensibly after the 35th year; and it may be considered as almost nothing, for females at least, after the 40th year. Indeed, the total, between 40 and 56 years, is only 53. The number 53 is only relative to the numbers of the table, and not to what really takes place. Of the men, there is a certain number who marry at even more advanced ages: thus, the preceding table gives 162 from 40 to 45 years, 169 from 45 to 50, and 273 from 50 to 53 years.

From this research, it would result that a man's first child would be born to him when he was about 30 years of age, and the woman being about the age of 28: this would give the duration of a generation in Belgium; it is also the average duration of life nearly. We shall especially insist on this coincidence.

It is also very remarkable, that marriages only become frequent when men have passed the stormy period of the passions, and of the greatest tendency to crime, which happens about the 24th year: this is also the time when the development of the physical qualities has terminated, and the intellectual ones attain a greater energy.

According to M. Friedlander, to whom we are indebted for the article *Mortalité* in the *Dictionnaire des Sciences Medicales*, it would be about the 30th year that the greatest number of accouchements take place in Sweden and Finland. The following are the results which he has presented, from sixteen years' observation, made prior to 1795:—

Age of the Women Delivered.	Average Number of Women alive.	Annual Number of Births.	Number of Women to 10 Births.	Ratio of Women to 1000 Births.
15 to 20 years,	134,548	3,298	408	33·
20 to 25 ..	129,748	16,507	78	165·
25 to 30 ..	121,707	26,329	46	263·
30 to 35 ..	111,373	25,618	43	256·
35 to 40 ..	97,543	18,093	54	181·
40 to 45 ..	90,852	8,518	106	85·
45 to 50 ..	78,897	1,694	465	17·
Upwards of 50 years,	69,268	39	17,769	0·4
				1000·4

It is to be desired that such observations as these, which may be obtained with sufficient accuracy from the registers of the civil state, were more numerous; and that all which relates to the age of the parents, and to the period of the conception or birth of their children, might be stated more carefully for the future.

3. Influence of Places.

One of the first subjects of investigation presented to the mind, when studying the circumstances connected with births, is the determination of the influence of climate on fecundity. Unfortunately, the data which we possess on this important subject are so incomplete, and modified by so many accessory causes, that it is almost impossible to separate them from matter foreign to the question, and lay hold of results deserving of confidence. Opinions, also, vary much on this subject; and we are still ignorant whether, all things being equal, the north or the south is most favourable to fecundity.

If it be the fecundity of the population which we compare, we find, even in neighbouring countries, the most striking discordances; because, errors of numbers being taken away, the accessory causes are almost always more active than the influence of climate. To give an example of this, I shall quote the ratio of the births to the population of different countries, from the medical statistics of Mr Hawkins.*

States and Colonies.	Number of Inhabitants to one Birth.
Iceland, 1819,	37·0
England,	35·0
Cape of Good Hope, 1820,	33·7
France,	31·6
Sweden,	27·0
Isle of Bourbon,	24·5
The Two Sicilies,	24·0
Prussia,	23·3
Venice,	22·0
United States,	20·0

It would be impossible to find any agreement between these numbers and the degrees of latitude to which they refer, which might indicate the influence of climate. Even without going beyond France, we find very great discordances for some selected departments. Thus, the ratio for that kingdom is one birth to 32 inhabitants; whilst the ratio for the departments of Orne and Finisterre has been one to 44·83, and 25·97 respectively, for the five years 1826–30. On the other hand, taking the most southern departments of France indiscriminately, we do not find any sensible difference from those of the north. There is a province in America, called Guanaxuato, which in 1825 had one birth to 16·08 inhabitants:† this ratio, and that of the department of Orne, may almost be considered as forming the limit of the known ratios of different countries.

Since the examination of the influence of climate on the fecundity of the population is rendered perplexing by the existence of powerful influences of other kinds, we ought first to endeavour to ascertain the latter, in order to be able to judge what would be the fecundity of the *same* population, placed in two different climates. Moreover, the difficulty of obtaining an exact enumeration of the population, adds to the singular complexity of this research.

By taking the fecundity of marriages into account in considering the hypothesis of a homogeneous population, and only making use of the ascertained number of marriages and legitimate births, we may hope to arrive at more conclusive results on the influence of climate. M. Benoiston de Châteauneuf considered this interesting question in a notice "On the Intensity of the Fecundity of Europe at the Commencement of

* Elements of Medical Statistics, by E. Bisset Hawkins. London: 1829.

† Bibliothèque Universelle, 1833. On the Proportional Mortality of Norman Populations, by Sir F. D'Ivernois.

the Nineteenth Century."* We shall take this philosopher as our guide in our remarks on the fecundity of marriages.

"If we divide Europe into two climates only—one of which, commencing at Portugal and terminating at the Low Countries, will thus extend from the 40th to the 50th degree of north latitude, and represent the southern division; whilst the other, going from Brussels to Stockholm, or from the 50th to the 67th degree, will represent the northern division—we shall find that, in the former, 100 marriages give 457 births; and in the latter, the same number of unions only produces 430.

The difference becomes still greater, if we merely compare the two extreme temperatures with each other. In Portugal, 5·10 children are born to each marriage; in Sweden, 3·62 only

Finally, without going out of France, we may find new proofs of this observation. 'The fecundity,' says Moheau, 'increases from the north to the south of France. There, the average number of births by marriage is annually 5·03, and in the provinces of the north it is only 4·64.'

What was true in our case, fifty years ago, is also true now. The average of births, taken for five years (1821–25), is 4·34 by marriage in our provinces in the south (Dauphiny, Languedoc, Provence), and in Flanders and Picardy it is only 4·00.†

These facts suffice to show that we ought not to accuse those writers of inaccuracy who first affirmed that fecundity was greater in warm than in cold climates: they were in the right.

But if we extend these researches—and if, in extending them to many countries, we generalise still more—then the differences of climate, temperature, and position disappear, their influence ceases to be manifested, and nature obeys other laws."

According to M. Benoiston, there are born, each year, by marriage—

States and Provinces.	Children to one Marriage.
In Portugal,	5·14
.. the province of Bergamasco (Italy),	5·24
.. the government of Venice,	5·45
.. Savoy,	5·65
.. Roussillon (Eastern Pyrenees),	5·17
.. a part of Dauphiny,	5·39
.. .. Lyonnais,	5·68
.. .. Anjou,	5·09
.. .. Poitou,	5·46
.. .. Brittany,	5·52
.. .. Franche-Comté,	5·01
.. .. Alsace,	5·03
.. the canton of Fribourg,	5·35
.. a part of Scotland,	5·13
.. Bohemia,	5·27
.. Muscovy,	5·25
.. Eastern and Western Flanders,	5·27

"These different countries present a very great fecundity, and we may observe that eight of them are mountainous (Brittany, Franche-Comté, Roussillon, Comté de Nice, Savoy, Fribourg, Bohemia, Bergamasco): we also see that these are in general fertile countries, where the produce of the ground is adequate to the necessities of the people.

It appears that in maritime countries the births are also more numerous than in inland states; and the same is successively the case for wine, pasturage, corn, and forest countries."

The following table for Belgium presents some interesting details:—

Provinces.	Population in 1830.	Births: 1825-29.	Marriages: 1825-29.	Inhabitants: To one Birth.	Inhabitants: To one Mar.	Children to 100 Marriages.
Antwerp,	354,974	11,018	2,392	32	149	4·48*
Brabant,	556,146	18,893	4,035	29	137	4·68
Flanders, East	733,538	24,148	4,246	30	173	5·19
.. West,	601,678	20,315	4,145	30	169	4·90
Liege,	369,937	11,837	2,382	31	155	4·72
Hainau,	604,957	20,016	4,323	30	140	4·31
Limbourg,	337,703	10,589	2,422	32	139	4·37
Namur,	212,725	11,018	1,378	32	154	4·57
Luxembourg,†	292,151	10,477	2,278	28	128	4·67
Kingdom,	4,064,209	135,140	28,076	30	144	4·72

We see at first that the fecundity, estimated either in the ratio of the population or of the marriages, presents little difference, which is an evidence that the population is so far homogeneous; and we shall truly find this to be the case a little farther on. Luxembourg and Brabant, which have produced the greatest number of births in proportion to the population, are also the two provinces which, all things being equal, present the greatest number of marriages. The Flemings have fewer marriages, but the marriages are more fruitful there than in the rest of the kingdom, which explains why the ratio of births is exactly equal to that of the whole of Belgium. Moreover, it becomes difficult, from the small extent of this country, to recognise the effects of some of the influential causes which have been pointed out above, and especially difference of climate.

It is here necessary to make an essential remark, which is, that generally, in estimating the fecundity of marriages in Belgium, the total number of births has been compared with the total number of marriages, without making any deduction for illegitimate children; and I myself confess that, owing to the want of documents, I have not made this deduction in my works. I have reason to think, from some partial data, that the proportion of illegitimate to legitimate births would differ very little from that of France, where 100 marriages produce 408 births, taking them indiscriminately, and of these only 379 are legitimate births, that is to say, 29 less. In supposing, then, that legitimate and illegitimate children are in the same ratio to each other in Belgium as in France, the figure expressing the fecundity of marriages would not be more than about 4·4, which still gives it a very high value compared with other countries.

The distinction of first, second, and third times of wedlock, becomes equally important to enable us to work out the share of each of the influential causes with precision. In countries, indeed, where successive marriages are easily accomplished, the figure expressing the fecundity of marriages should be very small, for the fecundity of woman is not without limits; and the ratio of births to marriages should necessarily change, if the marriages become more numerous, while the number of births yet remains the same.

Among the causes influencing the number which expresses the fecundity, we ought to rank the circumstance of a town or country residence. During the decennial period of 1803 to 1813, the only one for which we may form calculations in Belgium, we find that 100 marriages have produced 484 births in the town, and 450 in the country;‡ but we might still reasonably object, that, legitimate not having been

* Annales des Sciences Naturelles, Dec. 1826.

† M. Benoiston de Châteauneuf informs us that he has deducted a certain number for natural children, but he does not say whether the same has been done for the rest of Europe.

* The fecundity of marriages has been calculated for the years between 1803 and 1829: the numbers of this province are not very accurate, since the population is not exactly known.

† The population of Luxembourg is that of 1825: the average of the marriages for this province and for Limbourg has only been taken for three instead of five years; the same also for the kingdom.

‡ Recherches sur la Reproduction et la Mortalité.

distinguished from illegitimate births, this difference can only be deceptive.

If we seek to establish the ratio of the energy of fecundation to the population, we generally find, taking only the figure of the fecundity of the great cities of Europe, that it has a superior value to that of the adjacent country districts. We may see, in the *Bulletin des Sciences Géographiques* for April 1831, a table of the changes of the population of the principal cities of Europe, which, if the elements of it are exact, gives one birth for 22·4 inhabitants, as the average of 78 cities there noted. The cities which present the extremes of the series are—Utrecht, 19·0; Liverpool, 18·0; Oporto, 19·6; London, 40·8; St Petersburg, 46·7.*

When we make the distinction between city and country for Belgium, we also find that the number of births, compared to the population, is greater in the cities: it has been 1 to 29·1 between the years 1825 and 1829. In the country, its value has been 1 to 30·4: and hence it would really appear, that there is a more active cause of fecundity in cities than in the country.

M. Villermé, in his work on Monthly Births,† has shown that unhealthy periods, principally those of epidemics produced by marsh miasmata, are unfavourable to fecundity. This philosopher has found a direct proof of it in the number of conceptions, which diminishes at those periods of the year when marshy emanations are most intense.

Mr Sadler, in his work on the Law of Population, has examined the relation which exists between the number of marriages, of births, and of deaths: in extending his comparisons to the numbers of different countries, and especially to those of England, France, and the old kingdom of the Low Countries, he has generally found, that *places which annually produce the greatest number of marriages are those where the fecundity of marriages is the smallest*, being, as it were, a sort of compensation which prevents the population of a country making too rapid an advance. The same author finds, *that the countries where marriages are very numerous, are also those which have a greater mortality.* We may form some idea of his results from the following table, which is a summary of the values obtained for France:—

Table showing that the Preventive Obstacle diminishes the Fecundity of Marriages, and that the Fecundity is regulated by the amount of Mortality.

Proportion of Marriages.	Number of Departments.	Legitimate Births to one Marriage.	Inhabitants to one Death.
1 to 110 to 120 Inhabitants, -	4	3·79	35·4
" 120 to 130 "	15	3·79	39·2
" 130 to 140 "	23	4·17	39·0
" 140 to 150 "	18	4·36	40·6
" 150 to 160 "	10	4·43	40·3
" 160 to 170 "	9	4·48	42·7
" 170 and more,	6	4·64	46·4

These facts, established by Mr Sadler, are verified by the numbers which the different parts of England furnish. Mr Sadler has also availed himself of the documents which I had given for the ancient kingdom of the Low Countries, and found a new confirmation of his results. I shall also present this table, which is instructive on many points.

In comparing countries with each other, after having compared the parts of which they are composed, and in making use of the data which would seem to deserve most confidence, we find:—

* The smallness of this ratio for St Petersburg, is owing to the peculiar state of the population, which contains a much greater number of men than of women.

† Annales de Hygiène, Janvier 1831.

Kingdoms.	Inhabitants			Fecundity.
	For one Marriage.	For one Birth.	For one Death.	
Prussia,* -	102·	23·1	36·2	4·23
England,† - -	128·	34·0	49·0	3·77
France,‡ -	131·4	32·2	39·7	3·79
Belgium,§ - -	144·	30·0	43·0	4·72

These results do not so well agree with the principles which Mr Sadler has deduced from his particular observations.

Provinces.	Inhabitants for one Marriage.	Births for one Marriage.	Average.	Inhabitants for one Death.	Average.
Limbourg, - -	90·3	3·09		4·75	
One marriage for less than 100 inhabitants,		3·09	3·09	4·75	4·75
Holland, Northern,	104·4	4·50		34·5	
" Southern,	113·3	4·74		35·5	
Zealand, - -	113·7	5·49		31·4	
Utrecht, - -	118·2	4·86		36·3	
One marriage for 100 to 120 inhabitants, -		19·39	4·89	137·2	34·3
Overyssel, - -	121·9	4·60		48·5	
Friesland, - - -	128·7	5·75		46·1	
Drent, - -	130·3	4·69		55·0	
Guelderland, - -	131·1	4·75		53·7	
Hainau, - -	136·5	4·98		51·1	
Flanders, Western,	137·7	5·01		40·7	
One marriage for 120 to 140 inhabitants,		29·78	4·96	290·1	48·3
Brabant, Southern,	142·2	5·45		38·2	
Antwerp, - -	142·9	4·65		48·8	
Groningen, -	149·3	5·17		49·3	
Luxembourg, - -	149·9	5·37		53·8	
Brabant, Northern,	150·0	5·14		51·4	
Liege, - -	154·1	5·33		46·2	
One marriage for 140 to 160 inhabitants,		31·11	5·18	287·7	47·9
Flanders, Eastern, -	165·3	5·62		44·8	
One marriage for 160 or more inhabitants,		5·62	5·62	44·8	44·8

After considering all the documents produced by Mr Sadler in support of his observation, it seems to me that we might truly admit as very probable, that a great mortality induces many marriages, and that marriages are less productive in proportion as they are more numerous. But I think that the author is too eager to draw arguments from them against the anti-populationist, whom he strives to defeat when attempting to make particular theories prevail. It seems to me that the facts which he cites, in order to acquire all the importance which he is desirous of giving them, should be supported by another statistical document, namely, the number of marriages of the first, second, and third wedlocks. It is said that deaths make way for marriages; this is what the researches of Mr Sadler prove: it is also said that mortality increases fecundity; and Mr Sadler opposes the results at which he has arrived to this assertion. It is here, I think, that the error

* Babbage in Brewster's Journal of Sciences, No. I., new series.

† Rickman—Preface to the Abstract of the Population, 1821.

‡ Annuaire du Bureau des Longitudes de Paris.

§ Annuaire de l'Observatoire de Bruxelles.

will be found. Firstly, it is necessary not to confound the fecundity of the marriages with the fecundity of the population: then, on the other hand, in a country where the mortality would be very great, especially among adult persons, the marriages of second and third wedlocks would be more numerous, and each marriage would thus produce, during its continuance, a fewer number of children; although, in point of fact, the fecundity of the population were very great. For example, in the provinces of France which have the least mortality, and, as Mr Sadler observes, the fewest marriages, we find the greatest number of children to each marriage. This latter observation appears to me to be a necessary consequence of the former: a woman, who has five children by one marriage, might, the mortality being greater, have these five children by two successive marriages, or even by a greater number. It would be very natural, then, that the fecundity of marriages should appear to have diminished. It is even evident, according to the mode of reasoning I have just employed, that it would be necessary to admit that, *all things being equal, in a country where mortality becomes greater, marriages should become more numerous, and the fecundity of marriages, on the contrary, decrease.* This result, which I deduce from purely rational considerations, is found to be supported by the facts brought forward by Mr Sadler; but it does not follow that the absolute fecundity of this country should decrease, or that the country should have a smaller annual number of births. I think the contrary, and believe that I can prove it a little farther on.

What so often renders statistical results difficult of interpretation is, that facts are assumed as simple which in their nature are complex. Thus, it appears to me impossible to determine any thing concerning the fecundity of the women of a country merely from the ratio of marriages to legitimate births: we necessarily ought to consider the mortality of the country we are examining, and take the marriages of second or third wedlocks into account. I regret that M. Benoiston de Châteauneuf, in his interesting work on the Fecundity of Europe, has not paid attention to this element: I think he might have overcome several difficulties which his subject presented to him, (which was extremely complex), and have explained some apparent anomalies.

It will also be necessary henceforth, in all researches on fecundity, to consider the age of marriage in the different localities. For example, it is evident, if persons do not marry at the same age in the country as in cities, that, all things being equal, we ought to expect to find different numbers for the fecundity of marriages. The same will be the case when we compare certain northern states, where marriage takes place very late, with southern countries, where it occurs very early. I repeat again, that the more we study the phenomena of population, the more complexity we find in them; but, at the same time, we have the hope of succeeding, by an analysis conducted with sagacity, and by using good materials, in ascertaining the causes on which they depend, and in estimating the degree of influence of each of these causes.

4. Influence of Years.

We possess different documents, which inform us of the fecundity of marriages of the same country at different periods, and which thus allow us to judge whether, all things being equal, this fecundity has undergone variations independent of the annual changes resulting from a more or less prosperous state of things, such as those which would arise from changes in the nature of the climate, or from the progressive advancement of civilisation. In making use of the Prussian documents furnished by Süssmilch, and retaining the periods of this philosopher, we find at first:

Periods.	Average Number of Marriages.	Average Number of Baptisms.	Average Number of Deaths.	Baptisms. to one Marriage.
1693 to 1697, -	5,747	19,715	14,862	3·43
1698 to 1702, - -	9,070	24,112	14,474	3·97
1703 to 1708, -	6,662	26,896	16,430	4·42
1709 to 1711, - -	5,835	18,833	85,955	3·23
1712 to 1716, -	4,965	21,603	11,948	4·35
1717 to 1721, - -	4,324	21,396	12,039	4·95
1722 to 1726, -	4,719	21,452	12,863	4·55
1727 to 1731, - -	4,808	20,559	12,825	4·28
1732 to 1735, -	5,424	22,692	15,475	4·18
1736 to 1737, - -	5,522	20,394	25,425	3·69
1738 to 1742, -	5,582	22,060	15,255	3·96
1743 to 1746, - -	5,469	25,275	15,117	4·62
1747 to 1751, -	6,423	28,235	17,272	4·40
1752 to 1756, - -	5,599	28,392	19,154	5·07
1816 to 1823, -	109,237	480,632	307,113	5·40*
1827, - -	106,270	524,062	368,578	4·93 †

The numbers belonging to the commencement of this century are births in general, whilst those of Süssmilch only include baptisms; which may cause a difference, the amount of which I do not know how to obtain. In order to arrive at the accidental causes, I have taken periods somewhat more extended than the preceding.

From 1693 to 1708, - -	3·94	baptisms to one marriage.
.. 1709 to 1721, - -	4·18	.. ..
.. 1722 to 1735, - -	4·36	.. ..
.. 1736 to 1746, - -	4·09	.. ..
.. 1747 to 1756, - -	4·73	.. ..
.. 1816 to 1823, - -	4·40	births to one marriage.
.. 1827, - -	4·93	.. ..
Average, -	4·37	

For England, we find, according to Messrs Rickman and Sadler, vol. ii. p. 478—

1760, - - -	3·66	baptisms to one marriage.
1770, - - -	3·61	.. ..
1780, - - -	3·56	.. ..
1785, - - -	3·66	.. ..
1790, - - -	3·59	.. ..
1795, - - -	3·53	.. ..
1800, - - -	3·49	.. ..
1805, - - -	3·50	.. ..
1810, - - -	3·60	.. ..
Average, -	3·57	

Mr Sadler gives, for the fecundity of the years 1680 to 1730, the numbers 4·65 and 4·25, which would seem to prove that the fecundity has diminished; but it might also happen that this apparent increase depended on the manner in which the numbers have been collected.‡

Sweden gives the following results:§—

From 1749 to 1758, -	4·20	births to one marriage.
.. 1759 to 1764, - -	4·05	.. ..
.. 1821 to 1826, -	4·03	.. ..
Average, -	4·09	

And I have found for the ancient kingdom of the Low Countries—

From 1803 to 1812, -	4·60	births to one marriage.
.. 1815 to 1824, - -	4·74	.. ..
.. 1825 to 1830, -	4·831	.. ..
Average, -	4·72	

It would result from the examples which have been presented, that the fecundity of marriages does not sensibly vary in the same country and in the course of a century, when we include periods of time suffi-

* Babbage, in Brewster's Journal of Sciences, No. I., new series.

† Bulletin des Sciences, Janvier 1830.

‡ We might also attribute it to greater prudence and circumspection. It has also been observed, that the proportional number of marriages, for the last half century, has progressively diminished in England. — (Say — *Cours d'Economie Politique*, p. 7, ch. 2.

§ Sadler, vol. ii. pp. 258, 263.

ciently great to remove the accidental causes attending years of greater or less prosperity.

It is remarkable that epidemics, periods of great scarcity, and all severe scourges, do not merely exercise a sensible influence on the number of deaths, but also on the amount of marriages and births. It does not certainly follow that, because provisions are rather dearer one year, that there should necessarily be fewer births and marriages, because the influence of this increase of price may be masked by some other cause; but when the dearness of provisions is very decided, and when there is truly a scarcity, we have the greatest likelihood of finding it manifested in the books of marriages and births. This is what we shall easily find on inspecting the following table for the kingdom of the Netherlands:—

Years.	Births.		Deaths.		Marriages.	Price of Wheat.	Half a Hectolitre of Rye.
	Town.	Country.	Town.	Country.			
						florins.	florins.
1815, -	59,737	135,625	49,007	88,592	48,854	4·90	3·50
1816, -	58,695	138,507	47,327	89,796	40,991	9·56	7·17
1817, -	55,207	122,349	55,240	97,368	33,881	6·79	4·28
1818, -	55,665	128,041	49,169	91,247	39,218	5·18	3·82
1819, -	61,788	143,504	49,739	90,659	42,401	3·72	2·52
1820, -	61,263	133,685	50,631	94,496	43,258	3·74	2·03
1821, -	65,356	145,003	49,706	89,414	44,796	3·71	1·67
1822, -	67,794	151,747	52,078	95,475	46,949	3·30	2·46
1823, -	65,318	148,299	48,815	91,877	45,424	2·95	1·96
1824, -	67,030	151,636	47,692	87,253	44,655	2·48	1·51
1825, -	68,078	153,813	50,689	95,449	47,097	3·12	2·03
1826, -	67,919	153,970	58,749	110,155	48,054	4·02	2·96
Total,	753,250	1,706,178	608,861	1,127,781	525,368		
Aver.,	62,770	142,182	50,739	93,981	43,783	4·48	3·03

The year 1817 presents a much greater number of deaths, for the cities and country, than the preceding years, whilst the births and marriages, on the contrary, have been much fewer: this year was really a year of scarcity, as was also the preceding one. We may observe that, during the period from 1709 to 1711, the same effect took place in Prussia, according to the numbers of Süssmilch, which have been quoted above, but from another cause—the pestilence which ravaged that country in 1710. The increase of mortality, also, has been accompanied by a falling off in the number of baptisms, and that of marriages has likewise fallen, but more particularly in the succeeding years, which has undoubtedly been owing to the vacuity which was formed in the class of adult persons. A singular mistake in figures, led one of the first economists of this century to conclude that the births were multiplied, as if to make up for the void left by the pestilence: indeed, after such scourges, it is not unusual to see the population regain its relation to the means of subsistence by an increase of births.

In general, privations are not only mortal to the human species, but even arrest its development: their influence is not always felt immediately—we often perceive that a long time after the cause has ceased to operate. In 1826, the price of bread rose again in Belgium, and we also see that the mortality became greater, and the number of marriages and births which the preceding year presented, underwent a sensible diminution.* However, these latter elements, especially the figure of births, are, from their nature, less subject to variation than the number of deaths.

On the contrary, in the years 1821 and 1824, the price of grain was at the lowest, and these are the years which, with respect to the increase of the population, have presented the least degree of mortality; they are also followed by years which present more marriages and births. The changes in the price of bread have also as marked an influence in the country as in town: it is perhaps less observable in the births.

* We have for the following years:—

Years.	Births in Town.	Births in Country.	Marriages.
1827, - -	64,100	143,288	45,632
1828, - -	63,674	153,166	47,409

5. Influence of Seasons.

The seasons have a marked influence on all the relations of man; they operate on his physical as well as his moral nature. Thus, the vehemence of his passions, and the intensity of his inclination to crime, are modified according to temperature and climate; and the same also holds in respect to his reproductive faculty and mortality. Physiologists have already observed the influence of the seasons on the births and deaths of mankind; but their results, in general, do not agree much with each other, because they are modified by the locality, the period, and the habits of the people to whom they applied. In 1824, I published some particular researches on this interesting subject, in the *Nouveaux Mémoires de l'Académie de Bruxelles.** The result of these researches was, that the number of births and deaths increases and decreases alternately; and that these numbers reach their maximum towards the month of January for deaths, and towards the month of February for births; and their minimum about six months after, in July.† These conclusions were afterwards confirmed by the principal cities of the Low Countries; and the general results of the kingdom were found to agree with the numbers first obtained for Brussels. These researches became the subject of several interesting letters from M. Villermé,‡ who, in the *Annales de Hygiène*, has since treated the same subject to its fullest extent, and has shown that the periods of maximum and minimum approach or recede according to the climate and habits of the people.

We shall commence by stating the number of births in the cities and country of the ancient kingdom of the Low Countries, during the twelve years from 1815 to 1826 inclusive. For the better understanding of these numbers, we have taken into account the unequal length of the months, and have taken quantities corresponding to months of 31 days: we have also assumed as unity, in the two last columns, the average of the total number of births, both for town and country.

Months— 1815 to 1826.	Births.		Births.	
	Town.	Country.	Town.	Country.
January, - - - -	63,255	159,787	1·067	1·102
February, - - -	71,820	170,690	1·122	1·177
March, - - - -	69,267	164,851	1·083	1·137
April, - - - -	66,225	147,118	1·035	1·014
May, - - - - -	62,102	134,446	0·971	0·927
June, - - - -	58,730	125,026	0·918	0·862
July, - - - - -	57,151	121,512	0·893	0·838
August, - - - -	59,620	131,657	0·932	0·908
September, - - - -	62,731	144,389	0·980	0·995
October, - - - -	62,500	146,362	0·977	1·009
November, - - - -	64,273	146,285	1·005	1·009
December, - - -	65,120	148,196	1·018	1·022

Let us first observe, that the influence of the seasons is much more apparent in the country than in town; which appears natural, since, in the latter case, there are fewer means of maintaining an equality of temperature. The maximum of births in February supposes the maximum of conceptions to happen in the month of May, when the vital powers regain all their activity, after the rigours of winter.

* *Sur les Lois des Naissances et de la Mortalité à Bruxelles*, tome iii. p. 501. See also the *Correspondance Mathematique et Physique*, tomes i. and ii.

† The thirty-fourth volume of the *Memoires de l'Academie Royale de Turin*, published in 1830, contains two letters of Professor Vanswinden on the same subject, which inform us that this philosopher had already arrived at the same result as early as 1796. It is to be regretted that we were not sooner acquainted with these, as also with the researches of M. Balbo, *Sur l'Influence des Saisons*. It would appear from these researches that deaths have not so regular a course as with us.

‡ See the letters addressed to me by M. Villermé in the *Correspondance Mathematique et Physique*, tome ii., and in the *Recherches sur la Population, les Naissances, &c., dans le Royaume des Pays Bas*, p. 15.

Should we not be correct in concluding, from the preceding results, that climates most favourable to fecundity are those which enjoy a mild temperature, and that excess of cold or heat should prove unfavourable to human procreation. This induction is in accordance with the results which have been made known above, on the influence of climates.

Now, if we wish to estimate the different causes which may modify the influence of seasons, we cannot follow a better guide than M. Villermé; and, not to modify the conclusions which he has deduced from his laborious researches concerning climates, we shall copy them verbatim, referring for them to the work of this savant, *De la Distribution par Mois des Conceptions et des Naissances de l'Homme.* (*Ann. de Hygiène.*)

"The direct or indirect influence of the annual revolution of the earth around the sun, of the great changes of temperature which this revolution causes, and of certain meteorological conditions, on conception, and consequently on the births of the human race, appears, then, very evident. But this induction, well founded as it may be, can only be really proved when, at the other side of the equatorial line, where the seasons succeed each other in the same order as on this side, but at contrary times, we see the periodic return of similar results occurring at similar seasons.

Well, in the republic of Buenos Ayres, the only country of the southern hemisphere of which I have been able to procure monthly results of births, the latter are so distributed that the greatest monthly numbers occur in July, August, and September, that is to say, in winter; and the fewest numbers in January and May, or in summer. The alternation of maximum and minimum follows that of the seasons precisely.

The influence of the different positions of the sun with respect to the earth, on the monthly distribution of conceptions, and consequently of births, is therefore very certain.

There is another consequence: the maximum and minimum periods of conception approach each other in hot countries, and recede from each other in cold ones, especially the period of minimum.

Finally, it results from all the facts which have been cited, that in our state of civilisation we are, at least in some measure, subjected to the different periodic influences of the kind we are considering, which are manifested by plants and animals."

6. Influence of the Hours of the Day.

Curiosity led me to investigate, if there existed any relation between the different hours of the day and the moments of births:* I have been assisted in this department by the data which M. Guiétte, then connected with the Lying-in Hospital, Brussels, communicated to me; these data are the result of eleven years' observations, from 1811 to 1822. I have since communicated them to M. Villermé, who has found them perfectly analogous to the results obtained at the Lying-in Hospital of Paris, but which are still unpublished, so far as I know.

With these observations, which, up to the present time, are very few, I present the indications of still-born children, at periods of six hours, according to the numbers observed by M. Guiétte in 1827–28.

Hours.	Births: 1811-1822.	Still-born: 1811-1822.	Births: 1827-1828.
After midnight, -	798	53	145
Before mid-day, -	614	51	119
After mid-day, -	574	59	119
Before midnight, -	604	55	148
Total, - -	2630	218	531

* Correspondance Mathématique et Physique, 1827, tome iii. p. 42; and Recherches sur la Population, p. 21.

We see, from these data, that births are more numerous during the night than in the day-time: the ratio for the years between 1811 and 1822 is 1492 to 1188, or 1·26 to 1; and for the two years of the observations of M. Guiétte, 293 to 238, or 1·23 to 1: therefore, about five children are born during the night to every four born during the day.

These observations have given rise to similar ones: Dr Buck of Hamburg, treating the same subject, has arrived at the following results:* the numbers are reduced to 1000:—

Births.	Winter.	Spring.	Summer.	Autumn.	Average.
After midnight,	325	320	291	312	312
Before mid-day,	270	252	256	216	249
After mid-day,	190	136	189	223	183
Before midnight,	215	292	264	247	256

These numbers give the ratio of night to day, as 1·31 to 1. It would appear from these particular data, that births are generally most numerous towards the hours of midnight and mid-day.

As to still-born children, the hourly difference is not appreciable, from the small number of observations which have been collected.

CHAPTER III.

OF THE INFLUENCE OF DISTURBING CAUSES ON THE NUMBER OF BIRTHS.

1. Influence of Professions, Food, &c.

If it be true that every thing which has a direct influence on the physical constitution of man, either weakening or strengthening it, has also an influence on his reproductive tendency, and causes the number and kind of births, and also the times at which they take place, to vary, we cannot doubt the influence of professions, trades, and modes of life, minor causes necessarily included in the preceding general ones.

It is to be regretted, however, that we have no particular researches on this interesting point. M. Benoiston, in his *Mémoire sur l'Intensité de la Fécondité en Europe*, has felt the importance of it, and has laboured to verify one particular fact, which seems to require further examination. We generally think that the fecundity of marriage is low among fishermen, and ascribe it to the phosphorus contained in the fish on which they live. But deeper researches have shown, that the alleged fact is at least doubtful; for it is found that the maritime departments of France, inhabited by fishermen, have almost exactly the same fecundity as the rest of the kingdom.

M. Villermé, in his work *Sur les Naissances par Mois*, has endeavoured to ascertain if the usual severe labour of the country diminishes fecundity, or changes the periods of conception; but he has not been able to obtain any conclusive results.

It appears that the influence of professions is generally masked by other modifying causes, which act so powerfully, that, considering the statistical elements which we possess, we cannot appreciate the influence of professions in a satisfactory manner. All that we can decide, from researches which have hitherto been made, is, that it is weak, and especially depends on the quantity and nature of the food, and the development of the physical powers. "There is no principle of political economy on which authors are more fully agreed," M. Benoiston† says, "than that the population of a state is always in proportion to the amount of its produce. It is by virtue of this law, which has

* Nachricht von dem Gesundheits—Zutande der Stadt Hamburg, von N. H. Julius. Hamburg: 1829.

† Sur l'Influence de la Fécondité en Europe.

few exceptions, that we do not see a great number of births among a poor and oppressed people, who have neither agriculture, industry, nor liberty. So far is such from being the case, that slave populations decline instead of increase. It is an acknowledged fact, that in St Domingo, in 1788, three marriages among the blacks only produced two children, whilst each marriage of the white people produced three." *

I do not know whether it is an unfounded prejudice, that in Protestant states, clergymen have generally a larger family than the other professions—at least, this opinion was generally believed in the ancient kingdom of the Low Countries. But the fact may be explained, not only from the nature of the profession, but also because the income of clergymen often increases with the number of their children.

2. The Influence of Morality.

When speaking of legitimate and illegitimate births, we showed that a state of concubinage tends to produce fewer male children: the same would be the effect of all habits which enervate the powers—they also diminish the number of conceptions. It also seems to be well established, that prostitutes either produce fewer children or are barren. The too early approximation of the sexes induces similar effects, and produces children which have a less probability of life.

Habits of order and foresight ought also to exercise a considerable influence on the number of marriages, and consequently of births. The man whose condition is unsettled, if he allow himself to be governed by reason, dreads to divide with a family the vicissitudes of fortune to which he is exposed; many economists have also maintained, and with reason, that the most efficacious mode of preventing an excess of population in a country, is to diffuse knowledge and sentiments of order and foresight. It is evident that the people of a country would not seek so much to contract alliances and load the future with trouble, if each individual found a difficulty in providing for his own subsistence. The great fecundity of Ireland has been cited as an example of the influence which depression and improvidence may exercise over productiveness.† When man no longer reasons, when he is demoralised by misery, and just lives from day to day, the cares of a family no more affect him then than the care of his own existence; and, impelled by momentary gratification, he begets children, careless of the future, and, if we may use the expression, resigns to that Providence who has supported him, all the care of the progeny to which he has given existence.

Foresight may also render marriages less fruitful, because a man is less eager in reproduction if he fears that his family, becoming too numerous, may one day feel the finger of distress, or be under the necessity of undergoing privations and renouncing a certain degree of ease to which they have been accustomed. I do not doubt but that particular researches, undertaken with the design of elucidating this interesting point, will some day confirm these conjectures: they would be of the greatest utility in pointing out the course to be pursued in the instruction which it is proper to give to the people.

One of the most striking examples of the effects of the indolence, poverty, and demoralisation of a people, is given by the province of Guanaxato in Mexico, where 100 births take place annually for every 1608 inhabitants, and 100 deaths for every 1970. "Some traveller," says M. D'Ivernois, "who has observed the sad concurrence of excessive mortality, fecundity, and poverty, in Mexico, attributes it to the banana, which almost ensures them an adequate quantity of food; others charge the raging heat of the climate, which begets an insurmountable aversion to labour, and leaves the inhabitants of this indolent region in a manner insensible to every other desire but that which impels the sexes towards each other. Hence the myriads of children, the greater part of whom do not live to be weaned, or only appear on the registers to give place immediately to others; and the surviving ones commence the inert and brief existence of their predecessors, like them the victims of the indolence, apathy, and perpetual misery to which they are habituated, without experiencing the necessity of extricating themselves, any more than their parents had done. To form an idea of what takes place in this republic, we must read the report of a Swiss who visited it in 1830. Nothing can equal the amount of physical, moral, and political evil, with which he has supplied his hideous account. Although he neglected to ascertain the number of births, he has guessed it, since he calls Mexico a *barbarous China*."

The criminal documents of France inform us of an equally curious circumstance, namely, that the period of the maximum of conceptions nearly coincides with that of the greatest number of rapes. M. Villermé rationally remarks, that this coincidence may lead us to think that those who are guilty, are sometimes obliged in an irresistible manner, not having the free command of the will. This conjecture acquires the greatest degree of probability from the researches which I shall explain farther on, when considering the tendency to crime: we shall there see how worthy this subject is of the attention of philosophers and legislators.

The production of illegitimate children deserves an attentive consideration for many reasons: in a political view, especially, it ought to become the subject of the most serious researches, since its tendency is to diffuse through society a continually increasing number of individuals deprived of the means of existence, and who become a burden to the state. On the other hand, these individuals, generally possessing a feeble organisation,* as we shall soon see, rarely arrive at maturity; so that they do not even afford the hope of compensating some day for the sacrifices which have been made for them. According to Mr Babbage (Letter to the Right Hon. T. P. Courtenay), we reckon—

	For 1000 Legitimate Children—	For 1 Illegitimate Child—
In France, - -	69·7 illegitimate.	14·3 legitimate.
Kingdom of Naples, -	48·4 ..	20·6 ..
Prussia, - - -	76·4 ..	13·1 ..
Westphalia, - -	88·1 ..	11·4 ..
Cities of Westphalia,	217·4 ..	4·6 ..
Montpellier, - -	91·6 ..	10·9 ..

We see that, in the cities of Westphalia, the number of illegitimate children is exceedingly great. About fifty years ago, at Stockholm, Gottingen, and Leipsic, one-sixth of the births were illegitimate; one-fourth at Cassel; and one-seventh at Jena.† From Berlin, we obtain the following results:—

From 1789 to 1793,	26,572 births,	of whom	2,824 illegitimate,	or 9 to 1
.. 1794 to 1798,	30,165	..	3,666	.. 9 to 1
.. 1799 to 1803,	31,638	..	3,930	.. 8 to 1
.. 1804 to 1808,	30,459	..	4,941	.. 6 to 1
.. 1819 to 1822,	26,971	..	4,319	.. 6 to 1
.. 1789 to 1822,	145,705	..	18,800	.. 7 to 1

The number of illegitimate births has therefore been increasing. The following are the numbers for Paris, for the last few years, according to the *Annuaires du Bureau des Longitudes*:—

* Traité du Commerce des Colonies, p. 213.

† See an article by M. D'Ivernois, inserted by the *Bibliothèque Universelle de Genève*, Mars 1830.

* [It is curious to observe how precisely opposite to the truth, as established by statistics, the generally received opinions of mankind have been on most points.—See Shakspeare's Historical Plays—*King Lear* and *King John*.]

† Casper, Beitrage, &c.

Years.	Births.		Legitimate Births to 1 Illegitimate.
	Legitimate.	Illegitimate.	
1823, - -	27,670	9,806	2·76
1824, -	28,812	10,221	2·82
1825, - -	29,253	10,039	2·91
1826, -	29,970	10,502	2·85
1827, -	29,896	10,392	2·86
1828, -	29,601	10,475	2·81
1829, - -	28,721	9,953	2·88
1830, -	28,567	10,007	2·85
1831,* - -	29,530	10,378	2·83
1832,* -	26,233	9,257	2·84
Average, -	287,633	101,010	2·84

Thus, for 28 births there have been almost exactly 10 illegitimate children: I think this ratio is the most unfavourable of any which has hitherto been made known.†

* In these numbers, 1099 and 1065 children, acknowledged and legitimatised subsequent to birth, are not included.

† [The views of M. Quetelet on this subject do not appear to embrace all the causes of illegitimacy. It may happen that in countries where the means of subsistence are of difficult attainment, parties, from prudential considerations, will not enter the married state. This is visibly the case in Scotland, where the illegitimate births are very numerous, but, from the want of national registers, cannot be stated. The ratio of illegitimates, we have reason to believe, is much greater in Scotland than in Ireland, where matrimony is entered upon with little regard for the future. Thus, extreme prudence may be said to lead to immorality. The possibility of effecting retrospective marriage (that is, dating it from before the birth of the illegitimate children), is another frequent cause of illegitimacy in Scotland; and it may be added, that the demand for wet-nurses by the higher class of mothers for their infants, forms another prevailing cause of illegitimacy, at least in large towns.

For the purpose of throwing light on this important subject in social statistics, we beg to subjoin the following passages from the Sixth Annual Report of the Poor-Law Commissioners of England, for 1840: they occur in the report handed in from Sir Edmund Head on the Law of Bastardy:—"Mr Laing, in his recent Tour in Sweden, gives most instructive evidence as to the number and causes of illegitimate births in that country. It appears that the proportion of illegitimate to legitimate births in all Sweden, from 1820 to 1830, is as 1 in 14·6, and in Stockholm as high as 1 to 2·3. Mr Laing goes on to remark—'There are two minor causes, both, however, showing a degraded moral feeling, which were stated to me as contributing much to this lax state of female morals. One is, that no woman in the middle or higher ranks, or who can afford to do otherwise, ever nurses her own child. A girl who has got a child is not therefore in a worse, but in a better situation, as she is pretty sure of getting a place for two years, which is the ordinary time of nursing. The illegitimacy of the child is in this community rather a recommendation of the mother, as the family is not troubled with the father or friends. As to the girl's own child, there is a foundling hospital, the second minor cause; in that it can be reared at a trifling expense, during the time the mother is out nursing. The unchaste are, therefore, in point of fact, better off than the chaste of the female sex in this town.'—*Laing's Sweden*, pp. 115, 117. It is well known that the results of the unrestricted reception of bastard children into the foundling hospitals in Belgium made it necessary for the government to take steps, in 1834, for discouraging the operation of, if not for repealing, the law under which it took place. I do not know what the present state of this question in that country is.—(See Senior, *Foreign Poor-Laws*, p. 137.) The legislation of the French Republic, by the laws of 27th Frimaire year 5, and 30th Ventôse year 5, explained by an edict of 19th January 1811, was most favourable to the mothers of bastards, and relieved them from all care of their own offspring. M. de Beaumont says—'On sait qu'une loi de la révolution récompensait les filles mères d'enfants naturels.'—(*L'Irlande*, ii. 122, note 2.)

Under the influence of these laws, which only carried out the principle involved in our former practice, the illegitimate children increased from 1-47th (which they were, on an average of seven years, in 1780) to 1-14th, in 1825. (See Senior, *Foreign Poor-Laws*, p. 120; M'Culloch, notes to Adam Smith, p. 162, n.)—Malthus (vol. i. p. 375) reckoned the illegitimate births in France, at the time he was writing, as 1-11th of the whole.

Since writing the above, I have received the *Annuaire du Bureau des Longitudes*, for 1840, which gives the most recent information on French statistics,

3. The Influence of Political and Religious Institutions.

Nothing appears more adapted to multiply the population of a state, without inducing injury, than multiplying the products of agriculture and industry, and, at the same time, ensuring a prudent degree of liberty, which may be a guarantee for the public confidence. The absence of liberal institutions, which excite the activity of man, and at the same time increase his energy and comfort, must produce the effects which are observed in the East, where population languishes and decreases. On the contrary, in the United States, population increases with a rapidity which has no parallel in Europe. M. Villermé* observes, that at the period of the French revolution, "when the tithes, duties on wine, salt, feudal tenures, &c., and corporations and wardenships, had just been abolished (that is to say, when petty workmen and cultivators, in a word, the persons of no property, by far the most numerous class in the nation, found themselves all at once in a state of unaccustomed ease and competency, which they celebrated through the greatest part of the territory by feasts, and rejoicings, and more abundant food), the number of births increased, to diminish gradually afterwards."

Years of war and peace have likewise a marked influence on the population: we shall only quote one example at present. From the date of the wars of the empire, it was insinuated that the French population, far from being reduced, only made greater increases. M. D'Ivernois, who has succeeded in procuring the number of births and deaths for this period, has endeavoured to verify this assertion, so often repeated, and he has found that it was essentially incorrect: he has, moreover, established two remarkable facts.† "Whoever investigates births, learns that,

It appears that in 1833 the number of births in Paris was

29,743 { 20,454 legitimate. / 9,289 illegitimate.

The illegitimate were therefore 31·2 per cent., or, to the legitimate, as 1 to 2·2—a proportion larger than that existing at Stockholm.

In the whole of France, in 1837,

The total number of births was 943,349 { 873,520 legitimate. / 69,829 illegitimate.

That is, 7·4 per cent., or as 1 to 12·5.

The 'mouvement moyen' of the population, calculated on the twenty-one years from 1817 to 1837, gives, as the annual number of births,

963,752 { 899,451 legitimate. / 69,301 illegitimate.

That is, the illegitimate to the legitimate as 1 to 12·979.

It thus appears that the proportion of illegitimate births is greater in France than in Sweden, the former being as 1 to 12·979, and the latter as 1 in 14·6, according to Mr Laing (p. 115), while the morality of France would seem to have deteriorated since the calculation of Peuchet. I fear that there are rural districts in this country in which the proportion of illegitimate to legitimate births is far more unfavourable than that existing in the French empire. The population of the county of Radnor, in 1831, was 24,961. According to Mr Rickman, the number of baptisms registered in 1830 was

649
26 add for uncentered births and baptisms.

675 total.

The number of illegitimate children born in 1830 is stated, on the same authority, to be 100; that is to say, 1 in 6·75, or more than twice as many in proportion as in France. This will not seem incredible, when we find from the table published in the appendix to the Second Annual Report of the Poor-Law Commissioners, that the average annual number of bastards chargeable to the parishes of the county of Radnor, in 1835 and 1836, was 417, or 1-59th of the whole population of the county, according to the census of 1831; and it is not to be wondered at that there are at present fifteen women with bastard children inmates of the workhouse of the Knighton Union, of which the population is only 6719—census 1831."]—*Note by the Publishers.*

* Sur la Distribution par Mois, &c.

† Bibliothèque Universelle de Genève.

since the return of peace, the inhabitants of Normandy have been attempting to repair as soon as possible the breaches caused by the war. We are likewise informed, that, as soon as the breaches were filled up, the births have so exactly regained what may be considered as their former ratio of increase, that in 1830, the last year of which the returns are known, the births do not exceed the deaths by 5000, which, in a population of 2,645,798 inhabitants, is the slowest rate of increase we know of. The slight variations of the Norman registers for the third of a century, and their stationary condition during the year 1819, authorise us in regarding this movement of the population as the law which had for a long time regulated, and probably will long continue to regulate, the renewal of generations. The second fact, relative to deaths, informs us also, that far from being diminished, they have undergone a slight increase during the peace. But not to exaggerate the latter, we should always remember that, during the time of Napoleon, the soldiers who died abroad, or in the hospitals at home, were never put on the state registers; whilst, from the period of the restoration, the bureau of the civil state has inserted all military deaths, except, perhaps, those who have perished in the short expeditions to Spain and Algiers."

Political and religious prejudices appear to have been at all times favourable to the multiplication of the species; and great productiveness was considered as an unequivocal proof of celestial benediction and a prosperous state, without considering whether the births were in proportion to the means of subsistence.* It is astonishing that learned economists have fallen into the same notion. Have they not, in many instances, confounded the effect with the cause? However this may be, when a nation, after having been in a languishing state, regains its prosperity, we generally see an increase of fruitfulness; but we should err if we were to conclude that this increased fertility, which is only an effect of the better condition of the people, is, on the contrary, the source of it.

We cannot doubt that the overthrow of powerful religious bodies in several countries, the suppression of a great number of festivals formerly held sacred by the church, such as a less rigorous observance of Lent, and other similar causes, may not in our time have modified the degree of fecundity. From the researches of M. Villermé, it appears that in almost all Catholic countries, Lent, observed as it now is, and especially as it used to be, seems evidently to diminish the number of conceptions, at least during its continuance.

We have already seen that the time of marriage influences both the number and kind of births which the marriage produces. M. Villermé has endeavoured to ascertain if the number of marriages which are contracted during the different months of the year, has a direct ratio to the number of conceptions, and he has come to the following conclusions:—1st, that this ratio is scarcely perceptible; 2d, that, nevertheless, marriages appear to be rather more fruitful during the early months than afterwards; and, 3d, that it is not proved, probable as it may seem, that a woman is more likely to become pregnant within the first week or two of her marriage, if she marry in April, May, June, or July, than if she wedded at any other time of the year.

CHAPTER IV.

OF STILL-BORN CHILDREN.

In concluding what we have to say concerning births, and before examining the subject of deaths, I thought it necessary to say something on still-births, whose equivocal existence seems to belong as much to the annals of life as of death.

To take a general idea of the subject at first, it will be proper to state the ratio of still to live births, in the different countries of Europe, according to the calculations of the principal statisticians.*

Places.	Births to 1 Still-Birth.	Authors.
Strasburg,	11	Friedlander.
Hamburg,	15	Casper.
Dresden,	17	Rambach.
Paris,	19	Baumann.
Berlin,	20	Casper.
Vienna,	24	..
London,	27	Black.
Brunswick,	33	Rambach.
Stockholm,	36	Wargentin.

The average of this table would give about 1 still-birth to 22 living ones: this ratio differs slightly from that of Berlin, which has continued almost the same for the last sixty years. The following are the values which have been obtained, taking periods of several years:—

Periods.	Births to 1 Still-Birth.
From 1738 to 1763,	23·5
.. 1764 to 1769,	20·2
.. 1770 to 1774,	17·7
.. 1785 to 1792,	18·6
.. 1793 to 1800,	20·0
.. 1801 to 1809,	18·6
.. 1812 to 1821,	19·7
Average,	19·8

Few statistical documents are more liable to be faulty than those which belong to still-births; however, when the same ratio is so nearly maintained throughout, and within periods so close to each other, and when the data have been collected under different administrations, we have strong reason to believe that it is not far from the truth.

Casper thinks that the number of still-births, compared with live-births, is greater in town than in country; but he does not quote any results in proof of this assertion, which, however, is quite justified by the numbers which I have found for Western Flanders (*Recherches sur la Reproduction et la Mortalité*). The following are the values obtained for the years from 1827 to 1830 inclusive:—

	Average Number of		Ratio.
	Live-Births.	Still-Births.	
Town,	5,424	266	20·4
Country,	14,637	383	38·2

The ratio of still-births to live-births in town, is almost exactly the same as at Berlin; but it differs very much from that of the country, indeed it is almost double. It is natural, then, to inquire, whence arises the great danger which in town threatens the life of the child before it is born? May we not attribute it, in some measure, to the use of corsets and the habit of tight-lacing?

What is still more remarkable is, that the mortality is greater among boys than girls: thus, of 2597 still-births which have been counted for Western Flanders, 1517 were male and 1080 female children, which gives a ratio of 14 to 10 nearly. This difference is considerable, and since it is nearly the same for the tables of each particular year, we must ascribe it to a special cause. At Berlin, from 1785 to 1794, the computation is 1518 still-births of the male and 1210 of the female sex: also, from 1819 to 1822, 771 boys

* When a seventh son was born, it was customary for the prince to hold it at the baptismal font. This practice has not become obsolete in Belgium, and we might quote several examples in which the magistrate or one of his officers has been the representative of the monarch in such cases.

* Dr Casper, in his Memoir on the Mortality of Children at Berlin, has presented some interesting researches on still-births, of the principal results of which I have availed myself.—*Über die Sterblickheit der Kinder in Berlin—Beitrage zur Medicinischen Statistick*, &c. 8vo. Berlin: 1825.

and 533 girls came into the world without life. M. Casper says the ratio appears to be 28 to 20; it is, then, exactly the same as for Western Flanders. This new identity of results is very remarkable; and it will be interesting to investigate the causes of a circumstance which is so unfavourable to the male sex. If we were desirous of guessing at this point, we might say, with those who suppose that a male conception requires a certain excess of energy in the woman, that this excess of energy was absent or wanting during the growth of the fœtus, and that energy failing, the child would suffer more from it, if a boy, than a girl. Hence the disproportion of dead births between the two sexes; hence, also, the greater mortality of boys immediately after birth, and during the period of suckling, at which time they are still in some measure connected with the mother. It is also evident that women in town, who are more delicate than those in the country, will be more liable to bring forth still children, and especially when they are pregnant of boys.

We possess statistical documents of still-births for the city of Amsterdam,* which it will be interesting to compare with the preceding. The following are the original numbers furnished for the years from 1821 to 1832:—

Number of Still-Births and of Births for Amsterdam.

Years.	Still-Births.			Births.		
	Boys.	Girls.	Total.	Boys.	Girls.	Total.
1821, -	238	246	534	3,742	3,600	7,342
1822, -	290	222	502	3,897	3,713	7,600
1823, -	268	198	466	3,734	3,448	7,182
1824, -	266	216	482	4,011	3,849	7,860
1825, -	207	128	335	3,802	3,550	7,352
1826, -	231	173	404	3,803	3,635	7,438
1827, -	..	..	..	3,524	3,366	6,890
1828, -	..	..	..	3,679	3,529	7,208
1829, -	..	..	..	3,785	3,618	7,403
1830, -	241	169	410	3,727	3,579	7,306
1831, -	208	168	376	3,843	3,499	7,342
1832, -	210	151	361	3,351	3,101	6,452
Average,	244	186	430	3,741	3,541	7,282

We therefore calculate 1 still-birth for 16·9 births, which is a very unfavourable proportion from what we have seen above. The number of still-births of the male sex likewise here exceeds that of still-births of the other sex; and this would appear to be a general law, since none of the papers which have been quoted are contrary to it, and in all cases the difference is very considerable, and nearly about the same. Here the average numbers are in the ratio of 244 to 186, or 13 to 10 nearly.

The *Annuaires du Bureau des Longitudes* give the following data for Paris:—

Years.	Still-Births.			Births.		
	Boys.	Girls.	Total.	Boys.	Girls.	Total.
1823, -	847	662	1,509	13,752	13,318	27,070
1824, -	810	677	1,487	14,647	14,165	28,812
1825, -	846	675	1,521	14,969	14,284	29,253
1826, -	810	737	1,547	15,187	14,783	29,970
1827, -	904	727	1,631	15,074	14,732	29,806
1828, -	893	743	1,636	15,117	14,484	29,601
1829, -	925	788	1,713	14,760	13,961	28,721
1830, -	943	784	1,727	14,488	14,099	28,587
1831, -	954	755	1,709	15,116	14,414	29,530†
1832, -	994	736	1,729	13,494	12,739	26,233
Average,	8,916	7,274	16,190	146,624	141,009	287,639

* Jaarboekje par Lobatto. See also a memoir by M. Engeltrum, a prize-essay at Utrecht, and printed in 1830. The author counts, for the hospital at Amsterdam, from 1821 to 1826—

Births—Legitimate, 483 Dead births, 28 Ratio, 17 to 1
.. Illegitimate, 1770 .. .. 151 .. 12 to 1

† In these numbers, 1099 and 1065 children, who were acknowledged and legitimatised after birth, are not included.

From this table, we calculate the still-births to births, in Paris, as 1 to 17·7—almost the same as for Amsterdam and Berlin. This ratio does not seem to differ much from that of large towns, which may be generally considered as 1 to 18. We see here, also, that the dead births of the male are more numerous than those of the female sex: the ratio is 12·2 to 10.

The official tables for the Prussian monarchy in 1827, and for Denmark in 1828, furnish the following results:*—

	Births.	Still-Births.	Ratio.
Prussian Monarchy, -	490,660	16,726	29 to 1
Denmark—Boys, - -	19,954	882	23 to 1
Denmark—Girls, -	18,840	690	27 to 1

These numbers, also, are similar to those which have been already given.

If we regard the influence of the seasons on still-births, the following are the data of Berlin, and for Western Flanders, during the five years from 1827 to 1831 inclusive:—

Months.	Still-Births at Berlin.	Still Births in Flanders.		
		Town.	Country.	Total.
January, -	117	140	225	365
February, -	123	141	197	338
March, - -	120	115	205	310
April, -	112	109	160	269
May, - -	110	102	162	264
June, -	98	104	162	266
July, - -	92	117	153	270
August, -	108	108	136	244
September, -	89	108	139	247
October, -	104	110	152	262
November, -	124	90	143	233
December, -	121	106	179	285
	1,305	1,341	2,013	3,354

These data tend to show that the number of still-births is greater during winter, and at the end of winter, than in summer.

M. Casper has examined some particular circumstances which may influence the number of still-births, such as illegitimate conceptions, venereal diseases, the abuse of strong drinks, &c. Thus, at Gottingen, in 100 births, there are 3 dead births of legitimate children, and 15 of illegitimate children. At Berlin, the dead births in 100 illegitimate births have been, for half the last century, three times as numerous as the dead births among 100 legitimate children: and this state of things has not improved; for, during the four years from 1819 to 1822, it is computed there were—

	Living Children.	Dead Children.	Ratio.
Legitimate births, -	22,643	937	25
Illegitimate births, -	4,002	317	12 †

Indeed, a woman generally takes less care to preserve the child which she carries in her bosom, when it is illegitimate. Moreover, it is necessary to add, that those children, who are almost always the fruit of misconduct, presuppose less vigour and soundness in the parents. M. Duges says, that at the Venereal Hospital in Paris, he has found two premature births to six or seven accouchements.‡ At Hamburg, during the year 1820, in one house which contained scarcely any but public women affected with the venereal disease, of 18 illegitimate births, 6 were dead births; and in another house in the same city, likewise partly occupied by public women, the still-births were 11 out of 93.

These different examples prove too well the great influence which the condition of mothers exercises over the children of which they are pregnant, and

* Bulletin de M. Ferussac, Janv. and Mai 1830.

† The official tables of the whole Prussian monarchy for 1827 gave (*Bulletin de M. Ferussac*, Janv. 1830, p. 118) 490,660 births, of which 16,726 were still-births, a ratio of 29 to 1.

‡ Recherches sur les Maladies des Nouveaux Nés. Paris: 1824.

convince us of the utility of researches into still-births, and the causes which may multiply the number of them.

While considering the mortality of new born children, it is proper also to examine the fate of the mothers. According to Willan, the mortality in the great Lying-in Hospital of London, into which about 5000 women were annually admitted, was—

	Of the Mothers.	Of the Children.
From 1749 to 1758,	1 in 42	1 in 15
.. 1759 to 1768,	1 in 50	1 in 20
.. 1769 to 1778,	1 in 55	1 in 42
.. 1779 to 1788,	1 in 60	1 in 44
.. 1789 to 1796,	1 in 233	1 in 77 *

Mr Hawkins observed the mortality in the London Hospital in 1826, to be 1 in 70. According to the same statistician, in the Lying-in Hospital of Dublin, from the time of its foundation in 1757 to 1825—

The loss of children has been,	1 in 19
.. still-births,	1 in 17
.. mothers,	1 in 89

At the same hospital, also, twin cases have occurred in the proportion of 1 to 60 accouchements; and three or more children in the proportion of 1 to 4000.

According to Tenon, at the end of the last century the mortality at the Hotel-Dieu of Paris, was 1 woman in 15, and 1 still-born child to 13 births; but in 1822, the mortality at La Maternité was not more than 1 woman in 30. At the same time, in the Maternité of Stockholm, the proportion was almost the same as at Paris, or 1 woman in 29.

At the Lying-in Hospital of Edinburgh, during the years 1826, 27, and 28, the loss was only 1 woman in 100.

According to Casper,† the mortality of confined women at Berlin, has been—

From 1758 to 1763,	1 in 95
.. 1764 to 1774,	1 in 82
.. 1785 to 1794,	1 in 141
.. 1819 to 1822,	1 in 152

Here, again, we see how much the mortality depends on the care taken of the woman and child at the time of confinement. The greatest mortality which has been noticed, was that of the Hotel-Dieu of Paris at the end of the last century: it was 1 woman in 15 for the mothers, whilst in London it was reduced to 1 in 238, or nineteen times less.

CHAPTER V.

ON THE INFLUENCE OF NATURAL CAUSES ON MORTALITY.

1. Influence of Locality.

We possess, in general, fewer documents respecting births than respecting deaths; for this reason, perhaps, that man takes less interest in what regards his entry into life than his exit from it. The laws regulating births he views more as an object of curiosity, whilst it is of the highest moment for him to know all his chances of life and death. Nevertheless, in inquiring into the mortality, it behoves us to proceed with the greatest caution, and not to hold, as many authors have done, all numerical statements to be of the same importance.

The mortality is generally estimated by the ratio of deaths to the population. Now, if it be in general difficult to ascertain, by the registers of a country, the precise number of deaths, it is still more difficult to determine exactly the total numbers of the population. A census is a very delicate operation, which can be executed only from time to time, and will be found productive of very different results, according to the care bestowed in its execution. In places, for example, where there may exist an interest for concealment of numbers, we should naturally expect to find a low estimate of the people, and in consequence too high an estimate of the mortality; hence the necessity for extreme caution in comparing one country with another, or the same country with itself at different periods.

The influence which climate exercises over the mortality of the human species, deserves to be first considered. But *climatology*, taking the word in its most extended sense, is a science still too little advanced to engage our attention here:* we absolutely want data, and particularly comparative data, with respect to countries out of Europe, and even some European countries themselves, where political sciences have not been sufficiently cultivated. It becomes thus impossible to appreciate at all correctly the effects of temperature, and its relations to moisture and dryness, the direction of the winds, of running streams, &c. We ought, therefore, in our first view, to leave out these latter circumstances, and busy ourselves only with the most general results.

If we, in the first place, consider only Europe, and if we divide this part of the globe into three principal regions, with a view of setting aside as far as possible accidental causes, we may arrive at means to solve the problem which now occupies us. It would be better, also, to adopt the results of late years, thus giving a more extended comparison.

Countries.	Periods.	1 Death in	Authorities.
North of Europe.			
Sweden & Norway,	1820	41·1	Marshall.
Denmark,	1819	45·0	Moreau de Jonnes.†
Russia,	about 1829	27·0	Sir F. D'Ivernois.‡
England,	1821 to 1831	51·0	Potter & Rickman.
Central Europe.			
Prussia,	1816 to 1823	36·2	Babbage.
Poland,	1829	44·0	Moreau de Jonnes.
Germany,	1825 to 1828	45·0	..
Belgium,	1825 to 1829	43·1	An. de l'Ob. de Brux.
France,	1817 to 1831	39·7	An. du B. de Long.
Holland,	1815 to 1825	38·0	Rech. Statistique sur les Pays Bas.
Austrian Empire,	1823	40·0	Moreau de Jonnes.
Switzerland,	1827 to 1829	40·0	..
South of Europe.			
Portugal,	1815 to 1819	40·0	..
Spain,	1801 to 1826	40·0	..
Italy,	1822 to 1826	30·0	..
Greece,	1828	30·0	..
Turkey in Europe,	1828	30·0	..
Naples and Sicily,	1822 to 1824	32·0	Bisset Hawkins.

As several of the authors just quoted have merely given ratios, without the numbers from which these were deduced, I have been forced to take the averages from the ratios themselves, and not from the numbers, which would have been more exact. Upon the whole, we shall probably approach the truth in stating the mortality in Europe to be as follows:—

In the North of Europe,	1 Death for 41·1 Inhabitants.
Central Europe,	.. 40·8 ..
Southern Europe,	.. 33·7 ..

Whatever distrust the numbers relating to mortality may excite in us, I believe it may be admitted, that upon the whole the mortality is greater in the

* From Elements of Medical Statistics, by Mr Hawkins.

† Beitrage, p. 100.

* See the Researches of Sir J. Clarke in England on the Influence of Climate on Chronic Diseases—(*Annales d'Hygiène*, Avril 1830.) See also *La Philosophie de la Statistique*, par Melchoir Gioja, 2 vols. 4to, 1826.

† The numbers of M. Moreau de Jonnes are taken from a notice on the Mortality of the Different Countries of Europe: it is to be regretted that the author has not stated the sources of his information.

‡ Bibliothèque Universelle, Oct. 1833, p. 154.

south of Europe than in the north or centre, without anticipating the cause of this difference, and whether it depends on the political institutions or on the nature of the climate itself. It is England which turns the balance in favour of the north of Europe; and were it left out, the centre of Europe would present the least mortality. If we now quit the limits of Europe to consider those localities nearer the equinoctial line, and more exposed to extreme temperature, we have, according to M. Moreau de Jonnes*—

Under the Latitude	Places.		
6° 10′	Batavia,	1 Death for 26	Inhabitants.
10° 10′	Trinidad,	.. 27	..
13° 54′	St Lucia,	.. 27	..
14° 44′	Martinique,	.. 28	..
15° 59′	Guadaloupe,	.. 27	..
18° 36′	Bombay,	.. 20	..
23° 11′	Havannah,	.. 33	..

This last table seems to prove that the mortality increases as we approach the equinoctial line. Still, these numbers must be received with distrust, because amongst the places referred to there are several cities, and the mortality in cities, as we shall shortly see, is generally greater than in the country. We must also regret that we have so few data in respect to places still nearer the equinoctial line. According to M. Thomas, the mortality of whites in the island of Bourbon is only 1 in 44·8; and from documents published in England in 1826, by order of the House of Commons, the mortality at the Cape of Good Hope is still less.†

Amongst the local causes which influence mortality, I have mentioned that of a town or country residence; this influence is sufficiently well marked. In Belgium, for example, the following have been the results of late years:—

	Population.	Average Number of Deaths.	1 Death to
Cities, -	998,118	27,026	36·9 Inhabitants.
Country,	3,096,091	65,265	46·9 ..

We see that the ratios of mortality are almost as 4 to 3. This difference will be particularly apparent, if we examine the mortality of the principal cities of Europe.

Cities.	Inhabitants to 1 Death, according to		Inhabitants to 1 Birth, according to	
	Czoerning.	B. Hawkins.	Czoerning.	B. Hawkins.
North of Europe.				
London, -	51·9	40·0	40·8	29·5 *
Glasgow, -		46·8		27·7
St Petersburg,	34·9	37·0	46·7	
Moscow, -	33·0		28·5	
Copenhagen, -	30·3		30·0	
Stockholm, -	24·3	24·9	27·0	24·8
Central Europe.				
Lyons, - -	32·3	32·0	27·5	
Amsterdam, -	31·0	24·0	26·0	
Paris, - -	30·6	32·5	27·0	
Bordeaux, -	29·0		24·0	
Hamburg, -	30·0		25·5	
Dresden, - -	27·7		23·0	
Brussels, -	25·5	26·0	21·0	
Berlin, - -	25·0	34·0	21·0	
Prague, -	24·5	24·4	23·3	
Vienna, - -	22·5	22·5	20·0	
Southern Europe.				
Madrid, -	36·0	35·0	26·0	
Leghorn, -	35·0	31·0	25·5	
Palermo, -	33·0		24·0	
Lisbon, -	31·1	28·2	28·3	52·5
Naples, -	29·0	52·0	24·0	25·0
Barcelona,	27·0	24·8	27·0	
Rome, -	24·1		31·0	23·6
Venice, -	19·4		26·5	
Bergamo, -	18·0		20·0	30·2

Comparing this table with the preceding one, it is easy to observe that the mortality of cities is generally much greater than that of those countries to which they belong. I think this fact established, notwithstanding the inaccuracies inherent in such calculations.

We venture to conclude, then, with a high degree of probability, that in the actual state of things the mortality is less in temperate climates than in the north or south, and that it is greater in cities than in the country.†

If we consider each country in particular, we shall afterwards find, according to the localities, very great differences. Thus in France, in the department of the Orme, there is 1 death for 52·4, and in that of Finisterre, there is 1 for 30·4 inhabitants—a remarkable difference for places so near each other. In the former kingdom of the Low Countries, and during the period from 1815 to 1834, in the province of Zealand, there was 1 death for 28·5 inhabitants, and in the province of Namur, 1 for 51·8 inhabitants. We must here remark, that a great mortality keeps pace with the great fecundity. In the localities just quoted, for example, there were—

Countries.	Inhabitants		
	for one Birth.	for one Marriage.	for one Death.
Department of Orme, -	44·8	147·5	52·4
... Finisterre,	26·0	113·9	30·4
Province of Namur, -	30·1	141·0	51·8
... Zealand, -	21·9	113·2	28·5

* In Iceland, from 1825 to 1831, it has been computed that there is 1 death for 30·0 inhabitants, which would tend to show that excess of cold is as injurious to man as excess of heat.—*Bibliothèque Universelle*, Oct. 1833, p. 177.

† Elements of Medical Statistics, p. 51.

[The reader will be pleased to observe, that the question of the influence of climate on mortality is a more intricate one than perhaps our distinguished author was fully aware of. Firstly, it involves the simple question as to the influence of climate over the mortality of any particular race of men, who have been known to inhabit that country from time immemorial, or at least beyond the usual historic periods; secondly, it involves the question of the influence of climate over the mortality of another race foreign to the country, or who have migrated to it within historic periods. The numbers, for example, in the above table, placed opposite Batavia, have nothing whatever to do with the effects of climate over the native Javanese, but express merely the fearful mortality which sweeps off the Saxon foreigners migrating to a climate which nature never intended they should inhabit. On the other hand, the climate at the Cape of Good Hope, the healthiest perhaps in the world, seems equally favourable to all the three races inhabiting the colony and its frontier, namely, the aboriginal Hottentot and the invading Caffre and Saxon. We shall afterwards endeavour to show, that by putting the above table in comparison with the preceding one, a great and important element of statistics has been left out, and Quetelet has given us the statistics of Java and Bombay, as if the native inhabitants had ceased to exist; whereas it is manifest that the effects of climate over the migratory part of the human race, the Celt and Saxon, should be stated apart, and not mingled up with, or rather substituted for, the natural statistics of countries which probably they can never retain possession of, whatever be the extent of their emigrations.]

* Topographisch-Historich Beschreibung von Reichenberg. See *Bulletin des Sciences Géographiques*, Avril 1833.

† M. Villermé informs me that he has arrived at the same conclusion, in an unpublished work, *On the Laws of Population, or the Relation of Medicine to Political Economy.*

[There is an inherent inexactness in these calculations which it is extremely difficult to get rid of. Norway, for example, and Sweden, and even the northern parts of Russia in Europe, are each of them inhabited by two races of men, of whom it is impossible to say, from a want of historic evidence, which formed the primitive race. The Fins, inhabiting the north of Sweden and Norway, and even of Russia, and perhaps also the Laplanders, are perfectly distinct races from their Scandinavian and Sarmatian masters, and of course their statistics ought to be considered apart.]

Thus Zealand and the department of Finisterre had more marriages, births, and deaths, than the department of Orme and the province of Namur. I declare that I have often been tempted to attribute these discrepancies to a faulty census of the population; but more attentive researches have induced me to believe that this state of things is dependent on local causes. In the province of Zealand, for example, continually buried in a humid atmosphere, there prevail fevers and other diseases causing this excess in the mortality; and this, reacting on the amount of subsistence, naturally increases the marriages and births.

What we have observed in these provinces may also be noticed in other countries, where we equally observe a great mortality and a great fecundity. Of this truth, England and the republic of Guanaxuato offer striking examples:—

States.	Inhabitants		
	to one Marriage.	to one Birth.	to one Death.
England,	134·00	35·00	53·00
Guanaxuato,*	69·76	16·68	19·70

These are, so to speak, the two extreme limits in the scale of population, and, we may also add, in the scale of civilisation.

It may be said, that a country proceeds onwards to a more prosperous condition, when fewer citizens are produced, and when those existing are better preserved. The increase then is entirely to its advantage; for, if the fecundity be less, the useful men are more numerous, and generations are not renewed with such rapidity, to the great detriment of the nation.

Man, during his early years, lives at the expense of society; he contracts a debt which ought one day to be paid; and if he dies before having been enabled to do so, his existence has rather been a loss, or cost, to his fellow-citizens than an advantage. Is it desired to know what he costs? Let us take the lowest price: from birth to the age of twelve or sixteen, the expenses attending the support of a child in the hospitals of this kingdom (the Low Countries) amounted to about 1110 francs, say 1000 only, and this rate is certainly not too high, even for France.† Every person, then, who escapes from infancy, has contracted a kind of debt, of which the minimum is 1000 francs, which society pays for the support of a child abandoned to its charity. Now, there are born in France annually more than 960,000 children, of whom 9-20ths are cut off previous to their having become of the smallest utility to the state; these 432,000 unfortunate persons may be viewed as so many friendless strangers, who, without fortune and without industry, have come to take part in the consumption of the general produce, and have then withdrawn themselves, leaving only, as traces of their existence, sorrowful adieus and eternal regrets. The expense they have caused, without reckoning the time devoted to them, amounts to the enormous sum of 432,000,000 of francs. And if we consider, on the other hand, the griefs caused by their departure, griefs which no human sacrifices can compensate, it is easy to see how worthy this subject is of the attention of the statesman and of the true philosopher. We cannot too often repeat, that the prosperity of states consists less in the multiplication than in the conservation of the individuals composing it.

The assertion that a great mortality unhappily coexists with a great fecundity, seems opposed to the observations of Mr Sadler; but, as I have already remarked, the fecundity of marriages must not be confounded with the fecundity of the population; I have even shown, that, all things being equal, a great mortality is rather productive of a less fecundity of marriages, because second and third marriages are more multiplied, and the duration of marriages becomes then less.

To examine the question which now occupies us, the absolute number of births and of deaths must be compared with that of the population.

The following table contains some results in respect to the different countries already quoted:—

States.	Inhabitants			
	For one Death.		For one Birth.	
England,	51·0	51·0	35·0	35·0
Sweden,	47·0	45·0	27·0	28·5
Belgium,	43·1		30·0	
France,	39·7	36·5	31·6	26·5
Holland,	38·0		27·0	
Prussia,	36·2		23·3	
Sicily and Naples,	32·0		24·0	
Guanaxuato,	19·7	19·7	16·1	16·1

I regret that the actual state of statistics does not allow me to present the observations of a greater number of countries. Still I think that these data prove an intimate ratio to exist between the mortality and the fecundity. And this ratio exists also between the different provinces of the same country.

In classing the cities according to their mortality, we find, according to the medium value of the numbers given above, leaving out St Petersburg, in respect to which there is evidently some error:—

Cities.	Inhabitants to one Death.		Inhabitants to one Birth.	
London,	46·0	46·4	40·8	35·2
Glasgow,	46·8		29·5	
Madrid,	36·0	32·3	26·0	27·0
Leghorn,	35·0		25·5	
Moscow,	33·0		28·5	
Lyons,	32·2		27·5	
Palermo,	32·0		24·5	
Paris,	31·4		27·0	
Lisbon,	31·1		28·3	
Copenhagen,	30·3		30·0	
Hamburg,	30·0		25·5	
Barcelona,	29·5	26·6	27·0	24·2
Berlin,	29·0		21·0	
Bordeaux,	29·0		24·0	
Naples,	28·6		23·8	
Dresden,	27·7		27·0	
Amsterdam,	27·5		26·0	
Brussels,	25·8		21·0	
Stockholm,	24·6		27·0	
Prague,	24·5		23·3	
Rome,	24·4		30·6	
Vienna,	22·5		20·0	
Venice,	19·4	18·7	26·5	23·2
Bergamo,	18·0		20·0	

The numbers thus cited tend, then, to show, that there exists a direct relation between the intensity of the mortality and that of the fecundity, or, in other terms, that the number of births is regulated by the number of deaths. This confirms fully the ideas of the economists who admit that the population tends always to a certain level, regulated by the quantity of the products. And in those localities where there exist particular causes of a greater mortality, it must happen that the generations are shorter, and succeed each other more rapidly.

We may remark, moreover, that in the countries we have just compared, the number of deaths is less than that of births; and this happens also in respect to the cities, with the exception of Stockholm, Rome, Venice, and Bergamo. It may, moreover, be observed, that these numbers have a greater tendency to become equal in proportion to the direct extent of

* According to M. D'Ivernois (*Bibliothèque Universelle de Genève*, 1833.)

† [In this country, the cost of bringing up a child to the age of twelve, on the lowest calculation, could scarcely be considered as lower than £144. We of course mean that he shall be brought up with due regard to his future health and strength.]

the mortality, with the exception of England and its cities; we have, in fact, for the

Localities.	Ratio of Births to Deaths.
England, - - - - - -	1·46
Sweden and Belgium, - - -	1·38
France, Holland, Prussia, Naples and Sicily,	1·37
The republic of Guanaxuato, - -	1·23
Cities having more than 40 inhabitants to 1 death,	1·15
" 30 to 40 " "	1·20
" 20 to 30 " "	1·10
" less than 20 " "	0·81

In studying the influence of localities on a less extensive scale, and in comparing the different parts of the same province, we frequently arrive at very dissimilar results: thus, as the country is level or mountainous, intersected with forests or marshes, the numbers which the mortality may offer will be found to differ very sensibly. M. Bossi, in the *Statistique du Département de l'Ain*, gives a striking example: with a view to study the influences of localities, he divided the department into four portions, and from documents collected during the years 1812, 1813, and 1814, he obtained the following results:—

	Inhabitants to one Death annually.	Inhabitants to one Marriage annually.	Inhabitants to one Birth annually.
In mountain parishes,	38·3	179	34·8
On the sea-side, -	26·6	145	28·8
In corn districts, -	24·6	135	27·5
In stagnant and marshy districts, - -	20·8	107	26·1

These remarkable results offer a new confirmation of the direct ratio which exists generally between deaths, marriages, and births. It may be seen, also, how the neighbourhood of marshes and stagnant waters may become fatal. M. Villermé cites a remarkable example of the influence of marshes.

"At Vareggio," observes M. Villermé,* "in the principality of Lucca, the inhabitants, few in number, barbarous, and miserable, were annually, from time immemorial, attacked about the same period with agues; but in 1741, floodgates were constructed, which permitted the escape into the sea of the waters from the marshes, preventing at the same time the ingress of the ocean to these marshes, both from tides and storms. This contrivance, which permanently suppressed the marsh, also expelled the fevers. In brief, the canton of Vareggio is at the present day one of the healthiest, most industrious, and richest on the coast of Tuscany; and a part of those families whose boorish ancestors sunk under the epidemics of the *aria cativa*, without knowledge to protect themselves, enjoy a health, a vigour, a longevity, and a moral character, unknown to their ancestors."

Similar epidemics prevail at fixed epochs on the borders of the Escaut, producing what are there called the fevers of the polders: these fevers follow great heat, and cause Zealand to approach the condition of Vareggio, and of the marshy countries quoted by M. Bossi.

M. Villermé pointed out to me a new example of the increase of mortality caused by the influence of marshes. In the Isle of Ely, from 1813 to 1830 inclusive, in 10,000 deaths, from birth to the most advanced age, there were 4732 before the age of 10, whilst in all the other agricultural districts of England together there were but 3505 deaths. In the Isle of Ely, also, there were 3712 deaths from 10 to 40 years in 10,000 deaths, which took place from 10 years to extreme old age; and only 3142 in the other agricultural districts which were not marshy.†

* Des Epidémics (An. d'Hygiène, Janv. 1833, p. 9.)

† See the letter of M. Villermé inserted in the *Bulletin de l'Academie de Bruxelles*, No. 23, for June 1834.

We owe, also, to M. Villermé a very curious memoir on the mortality of Paris and other large cities,* showing that wealth, independent circumstances, and misery, constitute, in the actual state of things, in respect to the inhabitants of the different quarters of Paris, the principal causes to which must be attributed the striking differences observed in the rate of mortality. The distance or proximity of the Seine, the nature of the soil, its depression to the east or west, the elevated grounds shutting in Paris to the north or south, the peculiar exposure of certain quarters, the different kinds of water made use of—are all circumstances modifying in some measure the general climate of the city; yet they do not seem to produce sensible differences in respect to the mortality. To make this more apparent, I have collected in a single table the principal results arrived at by M. Villermé: the numbers refer to the periods from 1822 to 1826.

Arrondissement.†	Inhabitants to one Death in Private Dwellings.	Surface occupied by the Buildings.	Surface occupied by one Individual in the Houses.	Localities not Taxed.‡	Average Value of one Locality.	Taxed Localities.	
						Personal Contribution.	By a patent of more than 30 francs.
		metres.			francs.		
2	71	0·75	26	0·11	605	0·40	0·47
3	67	0·55	15	0·07	426	0·38	0·44
1	66	0·57	65	0·11	498	0·49	0·35
5	64	0·46	19	0·22	226	0·28	0·36
4	62	0·39	7	0·15	328	0·23	0·49
11	61	0·55	22	0·19	258	0·30	0·32
7	59	0·82	11	0·22	217	0·29	0·35
6	58	0·62	13	0·21	242	0·20	0·45
9	50	0·60	16	0·31	172	0·26	0·30
10	49	0·53	46	0·23	235	0·46	0·24
8	46	0·46	47	0·32	173	0·25	0·31
12	44	0·64	37	0·38	148	0·19	0·29

2. Influence of Sexes.

The influence of the sexes is extremely evident in every thing which pertains to death; it has already been shown to be so before the birth of the child. During the four years from 1827 to 1830, there have been in Western Flanders 2597 still-born children, 1517 of which were males and 1080 females, which gives a ratio of about 3 to 2. This difference is considerable, and as we find it appear annually, it must have a special cause.

Again, this mortality affects male children not only before their birth, but pretty nearly during the ten or twelve months which follow that event; that is to say, pretty nearly during the period of lactation, as may be seen from the following documents respecting Western Flanders:—

* An. d'Hygiène, July 1830.

† The 2d arrondissement comprises the following quarters:—Chaussée d'Antin, Palais-Royal, Feydeau, and Faubourg Montmartre; the 3d, Montmartre, Faubourg Poissonnière, St Eustache, and Mail; the 1st, Roule, Champs-Elysées, Place-Vendôme, and Tuileries; the 4th, St Honoré, Louvre, Marchés, and Banque; the 5th, Faubourg St Denis, Porte St Martin, Bonne-Nouvelle, and Mont-Orgueil; the 11th, Luxembourg, Ecole de Medicine, Sorbonne, and Palais-de-Justice; the 7th, St Avoie, Mont-de-Piété, Marché St Jean, and Arcis; the 6th, Porte St Denis, St Martin-des-Champs, Lombard, and Temple; the 9th, Ile St Louis, Hotel-de-Ville, Cité, and Arsenal; the 10th, Monnaie, St Thomas d'Aquin, Invalides, and Faubourg St Germain; the 8th, St Antoine, Quinze-Vingts, Marais, and Popincourt; the 12th, Jardin du Roi, St Marcel, St Jaques, and L'Observatoire.

‡ All the locations of each quarter have been reduced to 100, so as to show how many of that number there are who pay no tax, how many are taxed by personal contribution, and how many by patent. The untaxed localities represent the poor.

Ages.	Cities.		Ratio.	Country.		Ratio.
	Boys.	Girls.		Boys.	Girls.	
0 to 1 month,	3,717	2,796	1·33	8,180	5,709	1·42
1 to 2 ..	930	692	1·36	2,012	1,609	1·25
2 to 3 ..	607	500	1·21	1,480	1,161	1·27
3 to 4 ..	532	382	1·39	1,192	964	1·22
4 to 5 ..	403	322	1·25	963	774	1·25
5 to 6 ..	346	329	1·05	831	707	1·18
6 to 8 ..	569	508	1·12	1,331	1,117	1·20
8 to 12 ..	1,148	1,030	1·11	2,505	2,453	1·02
1 to 2 years,	2,563	2,409	1·06	4,594	4,920	1·02
2 to 3 ..	1,393	1,337	1·03	2,927	2,879	1·02
3 to 4 ..	908	908	1·00	1,606	1,748	0·92
4 to 5 ..	556	583	1·96	1,200	1,184	0·99

It appears, then, beyond doubt, *that there is a particular cause of mortality which attacks male children, by preference, before and immediately after their birth.* The effects are such, that the ratio of deaths before birth is as 3 to 2; during the two first months after birth the ratio is 4 to 3; during the third, fourth, and fifth months, 5 to 4; and after the eighth or the tenth month, a difference scarcely exists.

The inequality in the number of deaths for children of both sexes, towards the period of birth, is a remarkable fact in the natural history of man, and merits the attention of physiologists. It cannot be attributed to the excess of male births over female births, seeing that the ratio of these last numbers is scarcely from 20 to 19; this ratio could, at the most, explain the difference of mortality in ages beyond the first year.

The influence of sex shows itself at different ages in a manner more or less curious: an idea may be formed of this by an inspection of the following table, constructed from numbers collected in the different provinces of Belgium:—

Age.	Male Deaths to one Female Death. City.	Country.
Still-born,	1·33	1·70
From 0 to 1 month,	1·33	1·37
.. 1 to 2 ..	1·37	1·20
.. 2 to 3 ..	1·22	1·21
.. 3 to 6 ..	1·24	1·16
.. 6 to 12 ..	1·06	1·03
.. 1 to 2 years,	1·06	0·97
.. 2 to 5 ..	1·00	0·94
.. 5 to 14 ..	0·99	0·93
.. 14 to 18 ..	0·82	0·75
.. 18 to 21 ..	0·98	0·92
.. 21 to 26 ..	1·24	1·11
.. 26 to 30 ..	1·00	0·96
.. 30 to 40 ..	0·88	0·63
.. 40 to 50 ..	1·02	0·83
.. 50 to 60 ..	1·07	1·18
.. 60 to 70 ..	0·96	1·05
.. 70 to 80 ..	0·77	1·00
.. 80 to 100 ..	0·68	0·92

This table gives the ratio between the deaths of the two sexes for each year, without regard to population. The numbers for the country may, moreover, be considered as representing faithfully the amount of the relative mortality, because at each age the individuals of both sexes are nearly equal in number, which is not the case in cities, at least with respect to aged men. The ratio of cities in respect to the population is in general very great for those of advanced years; there exist, nevertheless, the same alternations of increase and of decrease as in the ratio calculated for the country.

Thus, about the period of birth, there die more males than females; about the age of two years, the mortality of both sexes becomes pretty nearly equal; that of women thereafter increases, and becomes sensibly greater between the ages of 14 and 18 years, that is to say, after puberty; between 21 and 26, the most active epoch of the passions, the mortality of the male exceeds that of the female; from 26 to 30, epoch of marriage, the mortality is once more equalised, but becomes sensibly greater for women during the whole period of fecundity: when that period ceases, the mortality diminishes, and this condition or ratio continues until the final period of existence for both.

The great mortality of the female peasantry (*femmes de la campagne*) during the period of child-bearing, may be owing to the laborious duties of their station, which they are thus called on to perform at a period requiring the greatest care.* These laborious agricultural employments are, on the contrary, from their regularity, very far from being equally prejudicial to man. The male inhabitants of towns suffer much at this period of life from irregular conduct, and the facilities offered for following the dictates of passion.

3. Influence of Age.

Of all the causes which modify the mortality of man, none exercises a greater influence than age. This influence is universally acknowledged, and its appreciation is one of the first objects to which the doctrine of the calculation of probabilities was directed. The first table of mortality appears to be dated in 1693; it was composed by the astronomer Halley, who constructed it from documents of the city of Breslaw. Similar tables have been constructed since that time for the principal European countries; yet there are few in which the distinction of the sexes has been observed. Even France does not possess a general mortality table keeping in view this distinction; and all the assurance societies continue to base their calculations on the hypothesis that the mortality is the same for both sexes. Nevertheless, the English have observed the necessity for modifying their rates of insurance; and Mr Finlayson, secretary for the national debt, has perfectly shown that the greater mortality of men ought to be kept in view.

The tables which I give here for Belgium, keep in view not only the distinction of the sexes, but notice, for the first time, the differences caused by a town or country residence. I have taken care, also, to indicate the mortality during the early months following birth. The data employed in the construction of these tables have been collected with care for a period of three years, from the registries of the civil state in Belgium. To enable the reader to compare these results, I have taken the same basis, and calculated the mortality, assuming 10,000 births for each of the sexes in town and country. A fifth table shows the mortality of the kingdom, without regard to the differences just alluded to.

Age.	Table of Mortality of Belgium.				General Table: Town and Country; Men and Women.
	Town.		Country.		
	Men.	Women.	Men.	Women.	
Birth,	10,000	10,000	10,000	10,000	100,000
1 month,	8340	9129	8926	9209	90,306
2 ..	8550	8916	8964	9088	87,936
3 ..	8361	8760	8470	8929	86,175
4 ..	8195	8641	8314	8694	84,720
5 ..	8069	8540	8187	8567	83,571
6 ..	7961	8437	8078	8490	82,526
1 year,	7426	7932	7575	8001	77,528
18 months,	6954	7500	7173	7603	73,367
2 years,	6626	7179	6929	7326	70,536
3 ..	6194	6761	6537	6931	66,531
4 ..	5911	6477	6326	6691	64,102
5 ..	5738	6295	6169	6528	62,448
6 ..	5621	6176	6038	6395	61,166
7 ..	5547	6095	5939	6299	60,249
8 ..	5481	6026	5862	6215	59,487
9 ..	5424	5966	5792	6147	58,829
10 ..	5384	5916	5734	6082	58,258
11 ..	5332	5873	5683	6018	57,749
12 ..	5323	5838	5634	5969	57,289
13 ..	5296	5807	5589	5908	56,871
14 ..	5271	5771	5546	5862	56,467
15 ..	5241	5732	5502	5795	56,028

* [The reader will be pleased to observe that M. Quetelet alludes here to the whole period of child-bearing in the female peasantry, as contrasted with the habits of towns; on the other hand, it is a fact generally admitted, although we know not the precise data on which the opinion is founded, that the individual accouchements are not only safer but much easier in the country than in towns.]

Age.	Table of Mortality of Belgium—(*Continued.*)				General Table: Town and Country; Men and Women.
	Town.		Country.		
	Men.	Women.	Men.	Women.	
16 years,	5209	5639	5456	5725	55,570
17 ..	5171	5645	5408	5668	55,067
18 ..	5131	5660	5357	5593	54,575
19 ..	5087	5551	5302	5546	54,030
20 ..	5038	5500	5242	5484	53,450
21 ..	4978	5445	5178	5421	52,810
22 ..	4908	5387	5109	5356	52,172
23 ..	4827	5326	5036	5289	51,465
24 ..	4740	5264	4958	5222	50,732
25 ..	4652	5201	4881	5153	49,993
26 ..	4560	5138	4805	5085	49,298
27 ..	4523	5074	4734	5016	48,602
28 ..	4459	5010	4673	4948	47,965
29 ..	4397	4946	4620	4880	47,350
30 ..	4335	4881	4572	4812	46,758
31 ..	4275	4816	4525	4744	46,170
32 ..	4214	4751	4478	4677	45,584
33 ..	4154	4686	4431	4609	44,996
34 ..	4094	4622	4384	4542	44,409
35 ..	4034	4558	4337	4474	43,823
36 ..	3976	4490	4296	4401	43,236
37 ..	3918	4418	4255	4329	42,650
38 ..	3860	4347	4215	4257	42,064
39 ..	3802	4277	4174	4185	41,476
40 ..	3744	4208	4134	4112	40,889
41 ..	3678	4148	4090	4041	40,300
42 ..	3611	4088	4044	3971	39,697
43 ..	3544	4027	3995	3901	39,106
44 ..	3477	3967	3943	3831	38,504
45 ..	3411	3907	3887	3761	37,900
46 ..	3352	3846	3827	3701	37,295
47 ..	3293	3783	3767	3640	36,690
48 ..	3233	3720	3707	3579	36,084
49 ..	3174	3656	3647	3519	35,477
50 ..	3115	3592	3588	3458	34,789
51 ..	3040	3520	3512	3392	34,153
52 ..	2962	3448	3435	3323	33,418
53 ..	2881	3375	3358	3256	32,676
54 ..	2810	3300	3276	3187	31,930
55 ..	2739	3225	3194	3118	31,179
56 ..	2667	3150	3111	3049	30,424
57 ..	2593	3080	3026	2982	29,656
58 ..	2499	3010	2939	2912	28,875
59 ..	2415	2939	2851	2840	28,081
60 ..	2329	2862	2767	2762	27,242
61 ..	2239	2779	2677	2677	26,356
62 ..	2146	2689	2587	2586	25,423
63 ..	2051	2595	2495	2495	24,465
64 ..	1956	2498	2387	2405	23,478
65 ..	1859	2397	2277	2310	22,462
66 ..	1754	2292	2163	2200	21,392
67 ..	1649	2187	2049	2086	20,263
68 ..	1556	2065	1942	1983	19,219
69 ..	1466	1963	1835	1875	18,175
70 ..	1372	1864	1713	1758	17,017
71 ..	1279	1741	1587	1642	15,890
72 ..	1184	1627	1474	1530	14,749
73 ..	1087	1514	1358	1420	13,638
74 ..	989	1389	1236	1300	12,461
75 ..	891	1261	1114	1182	11,273
76 ..	806	1134	996	1061	10,120
77 ..	721	1011	882	940	9014
78 ..	631	900	770	832	7910
79 ..	541	789	664	723	6853
80 ..	463	682	566	619	5867
81 ..	384	585	482	535	5031
82 ..	332	495	414	460	4299
83 ..	273	411	353	390	3627
84 ..	225	346	294	323	3016
85 ..	184	289	239	262	2464
86 ..	150	239	191	211	1989
87 ..	120	192	152	168	1585
88 ..	93	150	117	132	1233
89 ..	69	116	88	97	924
90 ..	49	86	67	71	682
91 ..	37	65	48	54	510
92 ..	29	47	33	40	387
93 ..	18	33	27	32	292
94 ..	11	24	20	24	207
95 ..	9	18	14	18	153
96 ..	5	12	10	12	105
97 ..	4	8	7	7	67
98 ..	2	4	4	4	39
99 ..	1	2	2	2	20
100 ..		1	1	1	10
101 ..					5
102 ..					2
103 ..					1
104 ..					0

An inspection of this table shows that the probable value or duration of life after birth is in general about 25 years, that is to say, that at the age of 25, the number of children born at the same time is reduced to one-half. Keeping in view the distinction of the sexes, we find that the probable life of girls (*filles*, unmarried females) is longer than that of boys (unmarried males); in fact, it is 27 years in the country, and more than 28 in cities, whilst for unmarried males it is less than 24 years in the country, and less than 21 in cities.

Towards the age of five years, the chances of prolonged life are the greatest, whatever be the sex or place of abode; at this epoch, the probable duration of life of women in city, and men in the country, is 50 years, and of 48 years for women in the country, and men in the city.

This age of five years, when the more urgent dangers of infancy have ceased, is very remarkable in the natural history of man: in proportion as we recede from it, the probable duration of life becomes shorter and shorter; thus, at the age of 40, it is only 27 years for the inhabitants of the country, and for women inhabiting towns, and of 25 years only for men inhabiting towns; for those who have reached 60 years, the probable duration of life is from 12 to 13 years; and with the octogenarian it is reduced to four years.

In general, the mortality is greater for man inhabiting towns, owing, without doubt, to the irregularities and excesses to which he is exposed.

The value, then, of the average life in Belgium is 32·15 years; for men inhabiting cities, 29·24, and for the male agricultural population, 31·97; for women inhabiting cities, 33·28, and 32·95 in the country. According to Mr Rickman's last work, the average life in England would be 33 years, 32 for the men and 34 for the women.* In France, it is estimated at 32·2, calculated from the numbers of births.† Finally, these calculations presume the population to be stationary, and we shall afterwards have occasion to see that they lead to serious errors.

I shall next make a more attentive examination of the different critical periods of man and woman, as well as of the degrees of duration of life (*viability, existibility*) at different ages.

What first occupies our attention, is the great mortality of children after birth: to have an accurate idea of this, it is sufficient to consider that, in town as well as country, four times as many children die within the first month after birth as in the second; and almost as many as during the second and third years, although the mortality then is very great. Indeed, the table of mortality shows, that one-tenth die within the first month after birth. This number is equal to the aggregate number of deaths of the survivors between 7 and 24 years of age, or between 24 and 40 years; or, still further, it is equal to the number of survivors who reach the age of 76 years. MM. Milne Edwards and Villermé have made some interesting researches on the mortality of new-born children; Toaldo, in Italy, attributes it chiefly to the custom of taking the infants to church immediately after birth, where they often endure the severest cold, and are exposed naked to the waters of baptism.

The mortality is so great, especially for male children, that, from the first year after birth, the number is already reduced one-fourth. The loss of boys in towns is such, that at the fifth year, out of 10,000, there are only 5738 remaining.

The age of five years is very remarkable, because the mortality, which until that time is very great, is suddenly reduced, and becomes extremely small until the age of puberty. At the age of five years, the probability of life attains its maximum, that is to say, man may reckon upon a longer existence.

The epoch which precedes puberty, and which

* Preface to the Abstract, &c., p. 46.

† Annuaire du Bureau des Longitudes for 1834, p. 102.

commences at 13 in town and 14 in the country, is equally deserving of attention: it also presents a maximum of a peculiar kind—it might be called the maximum of *viability*; it is the period when man can most depend upon his actual existence, and when he can wager with most probability that he will not die the moment after.

After the age of puberty, the mortality becomes greater, especially among women: this increase is even perceptible among women in the country.

Towards the age of 24, there is a peculiar circumstance connected with men; namely, a maximum which is not observed in the curve of the mortality of women. (See the table of curves at the end of the volume). The period of this maximum coincides with that when man shows the greatest inclination to crime;* it is the stormy age of passion, which occupies a most conspicuous place in the moral life of man. The mortality afterwards diminishes insensibly, and reaches for men in town and country a new minimum about the age of 30.

The reason why these periods of maximum and minimum are not observed in the curve of female mortality, proceeds undoubtedly from the circumstance, that the effect which the development of the passions in woman might have over the deaths is combined with the effect resulting from the dangers of childbearing; for, after the age of 24 years, the deaths of women continue to increase, and, taken from 28 to 45 years, exceed the number of deaths of men. The difference is very apparent between 30 and 40 years.†

From 60 to 65 years, also a remarkable period, viability loses much of its energy, that is to say, the probability of life becomes very small.

Lastly, the length of one century appears to be the limit of man's existence. Very few exceed this bound. On the 1st of January 1831, of sixteen centenarians found in Belgium, fourteen of them lived in the three provinces of Hainault, Namur, and Luxembourg. Limbourg and Eastern Flanders had each one, and none were found in the provinces of Brabant, Anvers, Western Flanders, and Liege. The three oldest individuals were 104, 110, and 111 years—they belonged to the province of Luxembourg; the others did not exceed 102 years.

Of the sixteen centenarians, nine belonged to the male sex; none of them had been soldiers: it is remarkable that all these persons had been, or still were married, and generally were living in very ordinary circumstances. It is generally thought that the greater number of centenarians are males, although the average life of females is longer.

A German physiologist, M. Burdach, has published some very singular approximative comparisons of human mortality and the periods of human life.‡ This philosopher divides life into 10 periods of 400 weeks each; and thus makes an age of the first dentition, of adolescence, of youth, &c.; in the first period is found a secondary one of 40 weeks, the age of lactation.

To complete the documents relative to mortality at different ages, it would be necessary to consider the dangers to which man is exposed every moment. Indeed, when we say that the infant at birth has a probable life of 25 years, we know nothing of the dangers to which he may be exposed during this period. It is for the purpose of considering these dangers that I have constructed the following table, which points out the actual degree of mortality of each age, that is to say, the probability of dying within a very limited period. This table is calculated from the one on mortality: the inverse ratio of each number, placed opposite, may be considered as the relative degree of the duration of the life of man at different ages, or the relative probability of living:—

Age.	Degrees.		Age.	Degrees.	
	of Mortality.	of Viability.		of Mortality.	of Viability.
1 month,	960	1	23	12	85
2 ..	273	4	24	12	82
3 ..	200	5	25	12	83
4 ..	168	6	30	11	95
5 ..	135	7	35	11	90
6 ..	127	8	40	12	83
1 year,	115	9	45	13	77
2 ..	77	13	50	15	67
3 ..	60	17	55	20	50
4 ..	27	37	60	27	37
5 ..	21	48	65	39	26
6 ..	15	67	70	57	18
7 ..	12	83	75	137	11
8 ..	10	100	80	29	8
10 ..	8	131	85	174	6
14 ..	6	161	90	250	4
15 ..	7	155	95	333	3
20 ..	10	100	100	4217	2

I have endeavoured to render these numbers sensible to the eye by the construction of a curve *a b c d e*. (See Plate 2, placed at the end of the volume). The greater or less divergence from the axis A B, indicates the greater or less degree of viability. Thus we see that, about the age of 14, viability is greatest: it afterwards presents an anomaly between the 15th and 30th years. This curve has been constructed for men and women indiscriminately: the dotted line serves for females. Its form is more regular than that of males alone: it descends in a continuous manner from the point *m*, which corresponds to the 13th year, to the point *n*, corresponding to the 50th, where it is confounded with the other curve. We see that viability after puberty diminishes more rapidly in females than males; it is also less during the time of childbearing, from the 27th to the 45th year, but greatest at the age of the passions, about the 24th year. The curve of viability has a striking similarity to that of the propensity to crime, and a still greater similarity to that showing the development of the physical powers.

The age of shortest viability would be then immediately after birth, and the age of longest viability immediately before puberty: the viability of the child after the first month of life is greater than that of the man near 100 years old.

Towards the 75th year, it is scarcely greater than for the infant about the sixth month after birth.

We shall add to what has already been said, the law of the duration of diseases, expressed in weeks and fractions of a week, as M. Villermé has given it in the *Annales d'Hygiène* for January 1830, according to the documents of the philanthropic Highland Society of Scotland.

Age.	Weeks of sickness for one Person.	Age.	Weeks of sickness for one Person.
21st year,	0·575	55th year,	1·821
25th ..	0·585	57th ..	2·018
30th ..	0·621	60th ..	2·246
35th ..	0·675	63d ..	3·100
40th ..	0·758	65th ..	4·400
45th ..	0·962	67th ..	6·000
50th ..	1·361	70th ..	10·701

The committee of the Scotch Society which has collected these data, thinks that below the age of 20 the average annual duration of diseases ought to be estimated at three days, or nearly; and above 70

* Recherches sur le Penchant au Crime aux differens Ages. See also the third book of this work.

† It has long been thought that the time of cessation of the monthly period was more fatal to women than the other periods of life. M. Benoiston de Châteauneuf has shown that this opinion is groundless, in a *Memoire sur la Mortalité des Femmes de l'Age de 40 à 50 Ans*. Paris: 1822.

‡ Die Zeitrechnung des Menschlichen-lebens. Liepsic: 1829.

years, also, for the working class, about 4 months, or 16½ weeks. These researches coincide very well with the measures of viability given above.

M. Villermé has also been investigating the law of mortality of each age during epidemics,* and he has been led to conclude that it *seems* to agree with the general law of mortality according to age, that is to say, that those who, all things being equal, have the least probability of life, are those who fall most readily, when attacked by epidemics:† thus, one epidemic attacks more particularly children, another old persons. Well, of an equal number of diseases at each age, the mortality of children is greater the younger they are, and when old persons are attacked, the older they are.

This observation is confirmed by the researches of Duvillard on death caused by the small-pox; by those which have been collected after the sweating miliary fever, which was epidemic in 1821 in the department of Oise; and by several others quoted by M. Villermé.

"According to the unanimous accounts from different parts of Germany," says this philosopher, "accounts which fully confirm the official report on the ravages of cholera-morbus in the city of Paris and department of the Seine, the children under four or five years, and the old persons of advanced age, attacked by this malady, almost always die, whilst young people less frequently fall under it.

Indeed, some researches which I have made on the influence of marshes, show that the same circumstance attends the fevers or epidemic maladies resulting from them (marshes); for of an equal number of sick persons, more young children died than of all the others, and after these the old persons.

The influenza, or catarrhal fever, which prevailed through a great part of France during the spring and summer of 1831, and which especially attacked adults and old persons, at least in Paris, has principally been fatal to the latter when very old.

All these facts concerning diseases so different, render it extremely probable that the mortality occasioned by epidemics commonly follows, as has been already stated, for the sick persons who are attacked by them, the general law of the mortality according to age.

Hence the inference, that epidemics which attack the two extremes of life, are, every thing considered, the most fatal and deadly."

4. Influence of Years.

It has been observed that the annual number of deaths may, in certain circumstances, be considerably modified by scarcity, wars, and other scourges.

The influence of famine had been confirmed long ago; nevertheless, an English statistician, Mr Sadler, recently thought he perceived in the relative numbers of England almost the opposite of what his predecessors found. Similar discordances between the results of observers have often been quoted by superficial persons to establish the small importance of statistical inquiries, instead of seeking for the true cause of them.

Now, to explain the difficulty which here presents itself, it is necessary to observe, in the first place, that mortality does not increase just at the moment when bread becomes dearer—the excess of mortality is only induced by the diseases and privations which poor people are obliged to endure at periods of distress; so that, during the greater part of the time, the influence of the scourge on the registers of mortality only becomes visible several months, and sometimes a year, after its commencement. The consequences, moreover, do not stop suddenly: the price of bread may have resumed its ordinary course, or even become lower, and yet the excess of deaths may be still very sensible.

We should be wrong in admitting, also, that the smallest fluctuations in the prices of bread ought proportionally to show themselves in the number of deaths: in the midst of so many causes modifying mortality, a single one, in order to leave manifest traces, must be strongly marked. We must not, then, ascribe, as Mr Sadler has done, the same importance to every year from the time that the price of grain had somewhat exceeded the average—we must keep to those years in which there was a positive scarcity; and, above all, we must not suppose the mortality to proceed equally with the price of provisions. An examination of the tables showing the movement of the population in Belgium from 1815 to 1826 inclusive, will point this out. We may there observe, that the price of wheat and rye reached their maximum in 1816; but the effects of the scarcity over the deaths and births became apparent only the year following. Were we to follow Mr Sadler's plan, the calamitous year of 1816 would be arranged among the happy ones, since, comparatively to the other years, there were fewer deaths. To proceed as Mr Sadler has done, we ought to compare the deaths of the four years from 1815 to 1818, during which the prices of grain exceeded the average, with those of the four following years, and we have as a medium of each period—

	Average of Deaths— In Town.	In Country.
Years of famine, - - -	50,186	91,501
.. plenty, - - -	51,015	95,222

Observe how this conclusive table would lead to results entirely opposed to those we have obtained.

We cannot be too much on our guard against conclusions drawn from statistical documents, and especially against the methods of reasoning which may be employed. The greatest sagacity is necessary to distinguish the degree of importance to be attached to each influencing element; and we have frequent proofs that even clever men have been led into absurdities by ascribing to certain causes influences produced by other causes which they had neglected to take into consideration.

The fatal influence of the years 1816 and 1817 shows itself not only in the general results of deaths for all Belgium, but also, as has been remarked,* in the particular results in the foundling hospitals, and in houses of refuge. This may be judged of by the following numbers:—

Years.	Foundling Hospitals.		Mendicity Houses: Inhabitants to one Death.
	Population.	Deaths.	
1815, - - -	10,739	1,597	8·25
1816, - - -	11,176	1,459	10·15
1817, - - -	11,829	1,793	5·49
1818, - - -	12,813	1,290	6·79
1819, - - -	13,248	1,346	9·29

We ought to attribute this greater mortality to the individuals admitted into the hospitals and mendicity houses having been already sufferers from the famine, and not to the privations which they had to undergo in these establishments. The number of admissions of foundlings, which, one year with another, never exceeded 3000, reached to 3945 in 1817: it is this which has rendered the mortality greater, because the in-

* An. d'Hygiène, Janv. 1833, p. 31.

† [Typhus fever, which occasionally spreads epidemically, seems to form an exception to this law.]

* Page 35 of Recherches sur la Population, les Naissances, &c., dans le Royaume des Pays Bas. See also, on the Mortality of 1817, the Statistique Nationale of M. Ed. Smits.

fants exposed at this critical time had within them the germs of death already.*

Another observation which may be made on the preceding numbers, is the dreadful mortality of mendicity houses, which was about 4 or 5 times as great as in the least healthy provinces of Belgium: we may say the same for the houses for foundlings. This confirms the very judicious remarks which have been made by MM. Villermé and Benoiston de Châteauneuf, in the *Annales d'Hygiène*, on the unequal mortality of the rich and poor. The deaths in the prisons of Belgium were incomparably less numerous than in the houses of mendicity. At Vilvorde, in 1824, 1825, and 1826, there was 1 to 28 inhabitants; at Saint-Bernard, 1 to 22 in the year 1826; and at Ghent, about the same period, 1 to 44 only: this ratio is somewhat less than that for the whole kingdom. We ought to make a distinction between the prisons and houses of mendicity, because the individuals who enter these latter establishments rarely make a stay of 7 or 8 months, and generally arrive there, as has been already stated, with a constitution undermined by privation and disease; on the contrary, those who enter prison after having undergone sentence, are generally in a less unfavourable state of health, and the average duration of their confinement is not less than 5 years.†

In investigating the influence of years of peace or war, it seems to me that in general the same degree of confusion has been made. A country in time of war suffers, indeed, because its male population falls, on the one hand, either in engagements, or in consequence of fatigue and privation; and, on the other hand, the chances of reproduction become fewer; the country, moreover, suffers, because its industry and activity are impeded, or because importations of all kinds, especially of grain, are diminished: but a nation might be engaged in war without any of these causes undergoing a very sensible alteration. It would be then deceptive to look for the effects of it in the tables of mortality. It is in this manner that Mr Sadler* also denies the influence of years of war, when making use of English data; and without inquiring whether the means of subsistence, the imports, and the exports, had undergone any change, or whether the nation had been deprived of a part of the male population more than at another time. I think that we might more accurately appreciate this influence in such a country as Holland or Belgium, several provinces of which have a great maritime trade, and the ports of which have long been closed. Thus I shall collect the numbers given during the two decennial periods which have preceded and followed 1814: the one includes the years from 1804 to 1813 inclusive, and we shall take it as a period of war; the other extends from 1815 to 1824, and forms a time of peace:†—

Provinces.	Deaths.		Births.		Marriages.	
	1st Period.	2d Period.	1st Period.	2d Period.	1st Period.	2d Period.
Brabant, Northern,	75,771	69,507	89,488	100,853	21,210	20,390
.. Southern,	118,396	119,109	145,256	169,181	30,892	36,423
Limbourg,	75,679	70,549	91,397	101,781	20,453	22,900
Gueldres,	53,764	59,818	67,308	90,892	15,627	19,337
Liege,	74,683	82,696	102,949	113,623	22,671	24,387
Flanders, East,	169,986	162,834	207,334	218,839	42,549	43,120
.. West,	144,726	141,310	179,099	191,139	37,693	37,882
Hainault,	110,344	118,239	158,762	183,198	37,093	39,591
Holland, Northern,	143,103	121,725	122,275	145,744	33,533	34,789
.. Southern,	135,457	123,959	135,703	165,741	32,498	34,942
Zealand,	46,237	42,436	45,895	55,331	10,731	10,645
Namur,	30,519	34,134	48,557	58,690	11,466	12,502
Antwerp,	67,126	70,623	96,658	101,471	21,579	23,675
Utrecht,	31,150	29,928	36,055	41,639	8,674	8,562
Friesland,	45,387	38,219	49,354	65,505	14,185	15,327
Overyssel,	31,483	37,479	43,114	51,951	9,969	11,629
Groningen,	37,026	30,539	41,592	51,673	11,940	11,492
Drenthe,	9,418	9,639	13,254	16,723	3,691	3,954
Luxembourg,	66,406	53,695	91,989	92,242	20,412	18,740
Total,	1,487,606	1,421,600	1,765,179	2,015,646	406,743	430,247

This table shows us at first that in all the provinces, without exception, the number of births has been greater during the decennial period of peace than during that of war; the number of deaths, on the contrary, has been smaller, except in some provinces in the interior, such as Gueldres, Overyssel, Drenthe, Brabant (Southern), Hainault, Liege, and Namur; yet the difference in several of them may be owing to the increase of population, and it must be observed that these provinces are chiefly agricultural, and that Hainault, Namur, and Liege, were actively engaged in the clearing of lands and toil of arms. The number of marriages has varied very little during the two periods.

The provinces which have very sensibly suffered by mortality were those especially which are maritime, and whose ports were closed for a considerable time. Thus the two Hollands and Zealand had more deaths than births. This state of things ceased at the peace. It seems to me that the results contained in this table

* Gioja, in his *Filasofia della Statistica*, has taken the same years, 1815, 1816, and 1817, as examples of the influence of famine on mortality. The following are the results at which he has arrived; they do not require any comment:—

Number of Children exposed at the *Luogo pio* de Sainte-Catherine, at Milan, and of the sick persons in the large hospital of that city.

Years.	Children Exposed.	Annual Average Number.	Sick Persons.	Annual Average Number.	Price of one muid of Wheat.	Annual Average Price.
1815,	2290	1750	17,974	14,010	59 liv.	25 liv.
1816,	2625	(from 1818	20,963	(from 1818	75 ..	(from 1818
1817,	3062	to 1825).	23,350	to 1825).	63 ..	to 1825).

Mortality in the private houses and hospitals of Milan.

Years.	In Private Houses.	Annual Average Number.	Deaths in the Hospitals.	Annual Average Number.	Total of the Deaths.	Annual Average Number.
1815,	3324	3305	2690	2928	6504	5333
1816,	3096	(from 1818	3065	(from 1818	7051	(from 1818
1817,	3806	to 1825).	4020	to 1825).	8426	to 1825).

† Annales d'Hygiène.

* [Mr Sadler seems to have been anxious to maintain the accuracy of the old saw, "few die of want, thousands of surfeit." Like most ancient adages, the truth will be found by as near as may be reversing it.]

† See, on the influence of the wars of the French Empire, the observations of M. F. D'Ivernois, the results of which have been given at page 23.

are as conclusive as can be desired, and show to what extent wars influence mortality, by impeding the activity of the people and injuring their industry.

We may here find an apparent contradiction to what has been stated elsewhere. I have observed that the deaths generally, in becoming more numerous, likewise increase the number of marriages and births; but the obstacle to the multiplication of marriages was that very state of war, the influence of which I have just been showing—a state which removed the major part of the young men from society. Nevertheless, we observe that the number of marriages has been almost the same during the two periods; and I find a new confirmation of my conjectures. The great mortality ought to have shortened the duration of marriages, and brought on more marriages of second and third unions, which have, by that cause, been less fruitful, and produced fewer births. I particularly insist on this fact, which appears to me very remarkable, namely, that the fecundity of marriages has been incomparably less during the first period.

Remarks somewhat similar should be made for the influence of years of famine. Here the contradiction appears greater. A great number of deaths has frequently been accompanied by fewer marriages; this was owing to the want which momentarily induced the death exciting a fear to undertake new establishments, so that persons did not pass rapidly from the state of widowhood. What has been observed concerning the deaths, which, by multiplying, multiply the marriages and births, ought only then to be generally understood for those countries which are not under the influence of accidental causes, such as wars, epidemics, famines, &c.

5. Influence of Seasons.*

The number of deaths, like that of births, undergoes very sensible variations according to the different months of the year. Numerous researches have already been presented on this subject, and it has been acknowledged that, in our climate, the rigours of winter are in general mortal to the human species.† The following table, prepared from the documents of Belgium, and according to the same principles as that which has been given for births, will present a first example of the influence of seasons on mortality:—

Months: 1815 to 1826.	Deaths.		Ratio.	
	Town.	Country.	Town.	Country.
January, -	59,892	116,129	1·153	1·212
February, -	56,967	114,758	1·088	1·198
March, -	54,277	114,244	1·050	1·192
April, - -	51,818	107,254	1·002	1·120
May, - -	48,911	93,714	0·946	0·978
June, - -	46,607	84,464	0·901	0·882
July, - -	45,212	77,555	0·874	0·809
August, - -	47,032	78,902	0·910	0·822
September,	50,191	85,131	0·971	0·888
October, -	51,649	89,514	0·999	0·934
November, -	52,908	89,585	1·024	0·935
December, -	55,631	98,705	1·076	1·030
Average, -	51,700	95,822	1·000	1·000

* The greater part of what follows has been extracted from a memoir *Sur l'Influence des Saisons et des Ages sur la Mortalité*, which I presented to the Royal Academy of Sciences of the Institute in 1833. I had already published some observations on this subject in the first volumes of my *Correspondance Mathematique et Physique*.

† [Another old saw, and as like the preceding as possible in its almost inconceivable want of any foundation in truth, was, that "an open winter, or a green Christmas, make a fat churchyard:" like the former saw supported by Mr Sadler, it may readily be shown that a precisely reverse statement will approach the truth as near as possible: this had been long suspected by Dr Heberden. In the climate and locality of Edinburgh, for example, the first setting-in of frost is annually accompanied by a great increase of mortality; it also aggravates both the number of cases of typhus fever and the deaths therefrom, occasionally to an alarming extent.]

Let us here again remark that the influence of the seasons is more evident in the country than in town, where there is a greater combination of means to withstand the inequality of temperatures.

The terms of maximum and minimum do not take place at the same time in all climates; in some, they even appear to have been shifted by civilisation, which has caused local causes of epidemics to disappear. These epidemics were especially caused by high temperatures in marshy places or the interior of cities. M. Villermé has pointed out a very striking example for the city of Paris (*An. d'Hygiène*), in the following table of the months, arranged in the order of the decreasing number of deaths of an average day:—

13 Years at the end of the 17th Century.	20 Years up to 1722, including the 13th of the preceding Column.	20 Years from 1723 to 1742.	20 Years from 1743 to 1762.	20 Years from 1763 to 1782.	The 10 Years which terminated in 1817.—(1814 is taken away.)	The 10 Years from 1817 to 1826.
Sept.	Feb.	April.	April.	April.	April.	April.
Dec.	Sept.	March.	March.	March.	March.	March.
Jan.	April.	May.	Feb.	Feb.	Feb.	May.
Nov.	Jan.	Feb.	May.	Jan.	Jan.	Jan.
March.	March.	Jan.	Jan.	May.	May.	Feb.
May.	May.	Dec.	June.	Dec.	Dec.	June.
Aug.	Oct.	June.	Dec.	June.	June.	Sept.
Feb.	Nov.	Sept.	Nov.	Oct.	Sept.	Dec.
Oct.	Dec.	Aug.	Oct.	Sept.	Nov.	Aug.
April.	Aug.	Oct.	Sept.	Nov.	Oct.	Oct.
June.	June.	Nov.	July.	July.	Aug.	Nov.
July.	July.	July.	Aug.	Aug.	July.	July.

This table is founded on two millions of deaths: it results from this (says M. Villermé), that from the progressive diminution of the epidemics which so often desolated Paris formerly, at the end of summer, the annual period of the maximum of mortality in this city has been shifted. During the years of the 17th century of which we have accounts, this maximum took place in autumn, but now it is in spring. Formerly the minimum was observed at the beginning of summer, but in the present age it is a little later. This proof of the ameliorations which have been made in Paris, since the end of the reign of Louis XIV. (continues M. Villermé), either in the healthy state of the city itself, or in the lot and condition of the inhabitants, is decisive; for we may affirm that the changes which we have just confirmed, belong, not to an increase of mortality during the season which at present gives the maximum, but to a diminution during the season which formerly contained the greatest number of deaths.

M. Villermé makes the observation, that the epidemics which result from famine always exercise their ravages at annual periods, when food is most scarce, difficult to obtain, or the diseases which induce painful conditions of life, for a great number of men, are more numerous or much more aggravated; and they cease after harvest, which brings back abundance. For example, in the ancient kingdom of Holland and the Netherlands, at the end of the bad harvest of 1816, the excess of deaths became very sensible during the following year, and particularly during the months which preceded the new harvest.

With respect to epidemics, independent of famine, they seem to be generally combined with summer or hot weather, and the first months of autumn, at least in our climate. This seems to be especially the case from the researches of M. Friedlander for London, Dantzic, Malta, Lavalette, and Aleppo.*

According to Wargentin, the maximum of mortality for Stockholm would take place in the month of August; and according to M. Mourgue, it is the same for Montpellier. The displacement of the maximum in these cities may be owing to local causes. It ap-

* Des Epidemics, &c., An. d'Hygiène, p. 27.

pears, at least in most European countries, that the maximum of deaths generally takes place at the end of winter, and the minimum about the middle of summer.

But this observation was so complex that we sought to analyse the particular facts which it sums up. It was interesting to see if the rigours of winter were equally fatal at all ages, and if the maxima and minima of deaths invariably took place in the same months, at different periods of life, or whether they varied according to these periods.

I have examined this thorny question with care, notwithstanding the long and irksome calculations which I was obliged to undertake. To perfect my researches as much as possible, I have taken into account town or country residence, and the distinction of sexes, so that the tables which I have formed are at the same time tables of mortality for the different months, for men and women, for town and country.* I do not think that this subject has ever been considered in a sufficiently comprehensive manner; there were, however, some special works, particularly on the mortality of new-born children. MM. Villermé and Milne Edwards had observed that the mortality of new-born children increases during the heat of summer, and still more during the cold of winter;† but their numbers, belonging to the three months which follow birth, do not establish distinctions for each particular month, nor for the more advanced months.

According to the researches made in Belgium, the maximum of deaths in summer was not sensible during the first month after birth: but, setting out from this period, it takes place in August, and is most conspicuous towards the middle of the first year; the two minima, which were confounded during the first month, afterwards diverge more and more until the fifth and sixth months, and are placed the one in April the other in November: they afterwards approximate again, to be again confounded, after the first year, and to form a single minimum in September. This singular result is found again when we consider the tables for the mortality of the sexes separately; it is found again, in making the distinction of town and country; but the maximum of summer is manifest in town from the first month after birth.

When we consider the number of deaths which take place soon after birth, it becomes necessary to take into account the excess of births which takes place after the winter: now, in taking an account of this excess, we find that it does not sensibly influence the results previously announced. It is always correct, then, to say, that the greatest mortality, in the first year which succeeds birth, is observed during winter, that it diminishes in spring, increases a little during the heat of summer, and afterwards undergoes a new diminution on the near approach of winter; so that a mild temperature is most fitly adapted to tender infancy, while excess of heat and excess of cold are prejudicial to it, either because these excesses directly influence an organisation which is still very delicate, or because they act through the intermedium of the mother who supports it.

After the first year, the mortality of children is entirely altered; we only observe one maximum and one minimum; the maximum appears after winter, and the minimum in summer. From the age of eight to twelve, these terms are slightly altered, and advance in the order of the months, until near the epoch of puberty, in such a manner that the maximum of deaths is observed in May and the minimum in October. Near puberty, the maximum recedes until the 25th year, and is invariably placed in the month of February, until the most remote age. As to the minimum, it does not again leave the month of October, but it establishes a second in the month of July, which remains there till the end of the mortal career; so that between these two minima, placed three months distant from each other, we observe a secondary maximum, scarcely apparent indeed, during the month of September.

Thus, when man and woman have attained their physical development (about the age of 25 years), they are like children during the first year, most subject to mortality after the heat of summer and the rigours of winter.

The table which follows will assist the reader to understand these results, and their numerical appreciation. It is well to be aware, that in the calculations I have taken account of the unequal lengths of the months. On the other hand, that we may perceive at one glance the law of mortality with respect to seasons and ages, I have constructed a series of lines, which, by their greater or less divergence from the horizontal line, indicate the greater or less divergence from the average mortality. (See the figured table, plate 1).

Table Showing the Influence of Seasons and Age on Mortality.

Ages.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
From 0 to 1 month,	1·39	1·23	1·21	1·02	0·93	0·82	0·78	0·79	0·86	0·91	0·93	1·07
" 1 to 3 "	1·39	1·18	1·15	0·95	0·89	0·83	0·83	0·94	0·83	0·92	0·97	1·13
" 3 to 6 "	1·24	1·06	1·02	0·90	0·95	0·95	0·99	1·06	0·99	0·94	0·96	1·02
" 6 to 12 "	1·28	1·21	1·27	1·18	1·06	0·84	0·76	0·67	0·81	0·82	0·86	1·03
" 12 to 18 "	1·10	1·11	1·24	1·39	1·25	1·03	0·83	0·81	0·74	0·77	0·78	0·98
" 18 to 24 "	1·23	1·18	1·21	1·18	1·03	0·84	0·89	0·76	0·75	0·81	1·01	1·18
" 2 to 3 years,	1·22	1·13	1·30	1·27	1·12	0·94	0·82	0·73	0·76	0·78	0·91	1·01
" 3 to 5 "	1·23	1·16	1·26	1·29	1·13	0·94	0·78	0·74	0·73	0·79	0·89	1·05
" 5 to 8 "	1·20	1·17	1·32	1·24	1·20	0·96	0·78	0·74	0·76	0·75	0·85	1·02
" 8 to 12 "	1·08	1·06	1·27	1·34	1·21	0·99	0·88	0·82	0·81	0·76	0·80	0·96
" 12 to 16 "	0·95	0·95	1·14	1·14	1·19	1·04	0·97	0·95	0·96	0·81	0·86	1·04
" 16 to 20 "	0·93	0·94	1·07	1·18	1·15	1·03	1·00	0·99	0·89	0·87	0·95	1·01
" 20 to 25 "	0·97	1·00	1·09	1·02	1·09	0·96	0·90	0·92	0·96	0·95	1·03	1·11
" 25 to 30 "	1·05	1·04	1·11	1·06	1·02	1·02	0·91	0·96	0·95	0·93	0·97	0·97
" 30 to 40 "	1·11	1·13	1·11	1·04	0·99	0·92	0·85	0·94	0·99	0·95	0·94	1·03
" 40 to 50 "	1·17	1·15	1·13	1·05	0·99	0·86	0·85	0·94	0·93	0·87	0·95	1·11
" 50 to 65 "	1·30	1·22	1·11	1·02	0·93	0·85	0·77	0·85	0·89	0·90	1·00	1·15
" 65 to 75 "	1·43	1·32	1·18	0·99	0·91	0·77	0·71	0·80	0·83	0·86	0·98	1·17
" 75 to 90 "	1·47	1·39	1·16	1·01	0·87	0·77	0·67	0·75	0·84	0·84	1·00	1·21
" 90 & upwards,	1·58	1·43	1·25	0·96	0·84	0·75	0·64	0·66	0·76	0·74	1·03	1·29
Average, - -	1·26	1·20	1·17	1·03	1·00	0·88	0·80	0·84	0·86	0·86	0·94	1·09

We may see, from the preceding table, that at no period of life is the influence of the seasons on mortality more perceptible than in old age; and at no age less than between 20 and 25, when the physical man, fully developed, enjoys the plenitude of his power.

The absolute maxima and minima are very evident between 1 and 12 years, and after the age of 50, since

* These researches are founded on the official documents intrusted to me by the *Bureau de Statistique* established by the minister of the interior. They comprise about 400,000 of different ages, and apply to all Belgium for the years 1827 to 1831. However, the occupation of Maestricht and Luxembourg, has left some vacancies in the tables prepared for the eastern part of the kingdom.

† An. d'Hygiène, 1829.

they afford numbers which, especially in the latter period, are as 1 to 2 and 2½. It is not so with the secondary maxima of summer: the numbers which they present differ so little from those of the minima between which they fall, that we may, for some periods, attribute the difference to the almost inevitable errors in this species of observations, if they did not manifest themselves in the same manner for several successive years, and even in the partial tables, making a distinction of sexes.

Now, if we establish this latter distinction, we shall find that, for the different epochs of life taken separately, the numbers minima and maxima, both absolute and secondary, fall almost exactly on the same months, and that their ratios have almost the same values; but it is not so with the absolute number of deaths for each sex. Thus, as we have already seen, during the first year after birth, more boys die than girls, and the ratio of deaths for the two sexes is almost the same for each month. Besides, we may judge better by comparing the deaths which have taken place at the same epochs and in the same localities. I am contented to compare the principal ages with each other, and I have assumed as unity the number of male deaths.

Months.	1st Month.	1 to 2 Years.	12 to 16 Years.	16 to 20 Years.	20 to 25 Years.	40 to 50 Years.	90 and upwards.
January,	0·75	0·95	1·32	1·04	0·83	1·21	1·18
February,	0·70	0·91	1·42	1·08	0·83	1·22	1·30
March, -	0·79	0·90	1·11	1·17	0·78	1·18	1·50
April, -	0·73	0·94	1·23	1·18	0·80	1·21	1·44
May, -	0·75	0·96	1·45	0·97	0·80	1·30	1·40
June, -	0·67	0·97	1·28	1·16	0·73	1·18	1·20
July, -	0·70	1·00	1·32	1·08	0·78	1·17	1·42
August,	0·79	0·92	1·20	0·98	0·77	1·08	1·08
September,	0·79	0·98	1·31	1·01	0·73	1·06	1·47
October,	0·67	0·99	1·22	1·01	0·68	1·11	1·50
November,	0·76	1·05	1·20	0·99	0·64	1·11	1·08
December,	0·76	1·05	1·20	0·96	0·64	1·18	1·48

In making the distinction of town and country, I have not found any essential difference in the results concerning the influence of seasons on mortality. I was also equally occupied in investigating the influence which the seasons might have on the number of still-born infants; but the results which I have obtained have already been quoted at page 25.

Since my first researches on the relations which exist at different ages, between the seasons and the mortality, a similar work, by M. Lombard of Geneva,* has appeared. I have had the satisfaction to see that the conclusions of this philosopher almost exactly coincide with my own; although they only include 17,623 deaths, it is easy to perceive that they establish nearly the same facts as those observed in Belgium. Some displacements of the maxima may proceed from the combined influence of different causes, which must naturally vary with the localities. Thus the tables of Geneva give for the first month after birth results conformable to those of Belgium, and we do not perceive any secondary maximum in summer, except for infants between one month and two years old — though this secondary maximum is evidently later than in Belgium, and appears in the months of September and October. It is to be regretted that the numbers for Geneva do not make the distinction of children of early age, since their mortality differs so much, according to my observations. M. Lombard does not admit that this secondary maximum of deaths, which he finds in September and October, for children of one or two years old, may be caused by the continuance of heat, to which cause MM. Villermé and Edwards attribute it: he thinks that it might be attributed "to the difference of temperature between day and night, which is never greater than at this time of the year." This difference, according to him, principally affects the digestive tube, an organ which, in the child, is very liable to contract serious disease. The secondary maximum of September, for the most advanced years, which I also find in his numbers, still remains to be explained; moreover, the two causes assumed are both probable.

* De l'Influence des Saisons sur la Mortalité à differens Ages.

6. Influence of the Hours or Time of Day.

The different parts of the day (day and night) seem to exercise an influence over the number of deaths similar to that by the same cause over births; but to arrive at satisfactory conclusions respecting this point, more numerous observations are required. The only data I have been able to obtain are drawn from the records of the Hospital Saint-Pierre at Brussels for a period of 30 years:*—

Hours.	Deaths.
After midnight, 12 to 6 o'clock, - - - -	1367
Before mid-day, 6 to 12 noon, - - - - -	1321
After mid-day, 12 to 6 P. M., - - - - -	1453
Before midnight, 6 to 12, - - - - - -	1074
	5250

The difference of day and night is not so well marked for the births; and, contrary to what we observed in regard to the births, most deaths take place in the day time. The two first parts of the day present nearly the same number of deaths, the difference affecting chiefly the 6 hours following mid-day and the 6 hours preceding midnight.

The inquiries of Dr Buek of Hamburg do not agree so well with ours on this point as they did in regard to the births. The following table contains the results, as he has given them, the seasons having been taken into consideration, and their sum reduced to 1000.

Deaths.†	Winter.	Spring.	Summer.	Autumn.	Medium or Average.
After midnight,	315	321	292	281	306
Before noon, -	243	260	236	220	242
After noon, - -	194	211	220	227	211
Before midnight,	248	207	252	272	241

These numbers agree with the preceding only in this respect, that the number for the first part of the day exceeds that for the second. The ratio in respect to Hamburg is 548 to 452, and for Brussels 2718 to 2532; and this is also what we observe with respect to births. But I repeat, in order to entitle them to confidence, these researches ought to be very considerably extended.

CHAPTER VI.

ON THE INFLUENCE OF DISTURBING CAUSES ON THE NUMBER OF DEATHS.

1. Influence of Professions, Degree of Affluence, &c.

It is scarcely possible, in the actual state of science, to determine precisely the different chances of mortality to which man is exposed in different social conditions: the elements which we have been able to collect, to determine this point, are at present too scanty; however, they enable us to prove that the influence of professions, for instance, may cause a considerable variation in the degree of mortality. It is the same with the affluence and mode of subsistence of a people. To obtain conclusive ideas on these important points, I am going to bring forward the principal results which have been arrived at.

Statisticians at the present day appear to acknow-

* For the details, see *Correspondance Mathematique*, 1827, vol. iii. page 42, and the *Recherches sur la Reproduction*, &c.

† [Although the word *Naissance* is found here in the original work, it is quite evident that the author means *Decès*, or Deaths.]

ledge that the chances of mortality are much more numerous in manufacturing than in agricultural countries, and in the interior of cities than in the middle of the country. We have already had several proofs in what has gone before, and we can produce some fresh ones—I do not say for town and country, for we have seen that the difference of mortality is too apparent to require us to return to it again—but for manufacturing provinces.

If we first look at England, we shall there find very evident differences between the manufacturing and agricultural provinces. The following are some results which have been communicated to me by M. Villermé, who has deduced them from the new documents published in England by Mr Rickman, for the years 1813 to 1830 inclusive:—

Localities.	Of 10,000 Deaths which have taken place	
	From Birth to the most advanced Age, before the Age of 10 Years had been completed, there were—	From the Age of 10 Years to the greatest degree of longevity, from the 10th to the 40th, there were—
In the whole of the agricultural districts, - - -	3,505	3,142
In the whole of the districts partly agricultural and partly manufacturing, - -	3,828	3,318
In the whole of the manufacturing districts, - -	4,355	3,727

We here see very evidently that all the advantages are on the side of the agricultural districts.

In the Netherlands, the most agricultural province is Gueldres: the mortality there is only 1 in 53·7 individuals, whilst in the commercial provinces of Holland it is 1 in 35.

In Belgium, the provinces generally displaying the fewest deaths are those of Luxembourg, Namur, and Hainault; these are also essentially agricultural provinces, although the two latter have some manufacturing towns.

France presents similar results, but which will appear less conclusive, because the departments most exposed to mortality are certainly the manufacturing departments in general; but since these are also those which include the greatest cities in the kingdom, we cannot exactly discern whether it is really the professions of the inhabitants or their dense crowding which causes the excess of mortality.

It would appear evident that the most favourable state for man is a regular life, which produces a sufficiency for his wants, and which is not agitated by the passions or irregularities of town life. In the agricultural state, man generally attains a state of comparative affluence: he does not undergo, as in the manufacturing districts, the alternate changes of superfluity and want—he is less acquainted with these two extremes which subject him to privations or drive him to excesses.

Misery, with the privations which it brings in its train, is one of the most powerful causes of mortality. Several statisticians have endeavoured to demonstrate this observation; and again, very recently, M. Benoiston de Châteauneuf has given a new confirmation of it in a paper entitled "On the Duration of Life in the Rich and in the Poor."* The author, to whom we are indebted for a valuable collection of researches on the mortality of man in his different social conditions, has made, on the one hand, an abstract of the deaths of 1600 persons of the highest rank, among which are 157 sovereigns or princes; on the other hand, he has taken from the civil registers of the state the deaths of 2000 persons in the 12th arrondissement of Paris, which contains a population of workmen of all kinds, ragmen, sweepers, delvers, day-labourers, &c., a class subjected to pain, anxiety, and hard labour, who live in want, and die in hospitals. These researches, which bring together the extremes of wealth and poverty, have given the following results:—

Age.	Mortality		
	of the Common rank.*	of the Rich.	of the Poor.
25 to 30 years,	1·41	0·00	2·22
30 to 35 "	1·56	0·35	1·43
35 to 40 "	1·71	1·20	1·85
40 to 45 "	1·91	0·85	1·87
45 to 50 "	2·21	1·59	2·39
50 to 55 "	2·63	1·81	2·58
55 to 60 "	3·39	1·68	4·60
60 to 65 "	4·41	3·06	5·76
65 to 70 "	5·85	4·31	9·25
70 to 75 "	7·80	6·90	14·14
75 to 80 "	10·32	8·09	14·59
80 to 85 "	13·15	11·58	..
85 to 90 "	13·55	16·29	..
90 to 95 "	14·05	..	..

The registers of insurance societies likewise tend to point out the greater mortality of the poor. The Equitable Society had always employed the tables of mortality of Northampton; but the secretary, Mr Morgan, showed, in 1810, that the deaths of 83,000 insured persons, which had taken place in the space of 30 years, were in the ratio of 2 to 3 compared with those given in the tables. Among these *select* persons, the mortality of females is still lower than that of males, because, in the middle class, women are more exempt from anxiety and fatigue, as well as the fatal effects of passion and irregularities of conduct. In general, among the persons insured by the Equitable Society, the average death annually was only 1 in 81·5 from the year 1800 to 1820.†

On the other hand, to take an extreme limit also, if we consider man in the state of greatest misery and deepest degradation, it is calculated that one negro slave dies annually out of 5 or 6, whilst the free Africans who served in the English troops only lost 1 man in 33·3.‡

It is likewise proper that we should duly understand the word *riches*, when speaking of population: a great abundance of goods is often only a ready means of gratifying the passions and giving way to excesses of every kind. The most favourable state of a people is that in which they have the means of providing for every real want, without exceeding the bounds of temperance, and without creating artificial wants. It is to be observed, as M. de Tracey very judiciously remarks, that the people are almost always richer in nations called *poor* than in those called *rich*. Thus, there is no nation possessed of more wealth than England, yet a great part of the population subsist on public money.§ The rich province of Flanders certainly contains more poor than Luxembourg, where great fortunes are rare; but here the population live in a state of general affluence, and find the means of procuring moderate incomes, and which never vary from day to day, as in the manufacturing districts. The same may be said of Switzerland, and agricultural countries generally.

According to Mr Hawkins, the mortality of the whole marine of England, in the different parts of the world, without excepting the population in hospitals, was in 1813 1 in 42. The same author thinks that

* See the *Moniteur* for May 11, 1829.

* According to the table of M. Duvillard.

† M. D'Ivernois has quoted several striking examples of longevity among insured and select persons in the affluent classes of Geneva.—(*Bib. Universelle*).

‡ Elements of Medical Statistics, p. 266, *et seq.*

§ [M. Quetelet here refers to the exorbitant sums levied in England in the form of poor-rates, and which amounted to £4,123,604 in the year 1833. No alteration of consequence has since taken place in the annual expenditure on this score.]

the troops on land have a still smaller mortality than the seamen.

M. Benoiston de Châteauneuf has also been occupied with investigations on the mortality of the French army compared with that of the rest of the population, and he has been led to several curious results, which I shall endeavour to state succinctly.*

M. de Châteauneuf here likewise finds that the privileged class is that which is the best fed, and undergoes the least fatigue: thus, according to the documents of France, the mortality of the soldier was a little greater than that of the mass of the people; the guard has fewer deaths than the army; and the sub-officer dies more rarely than the soldier, both in the guard and army.

If we investigate the influence of seasons on the mortality of soldiers, the following are the results which we obtain for the deaths of the infantry from 1820 to 1826:—

Seasons.	Months.	Deaths.
Winter.	January, February, March, - -	4·168
Spring.	April, May, June, - - - -	4·182
Summer.	July, August, September, - - -	4·463
Autumn.	October, November, December, -	4·279
		17·092

The maximum of deaths falls in summer. But without taking notice of the astronomic calculation which fixes the period of the seasons, if we determine the seasons by their influence on the atmosphere alone, after the manner of several German and Italian physicians, we have a new division as follows:—

Seasons.	Months.	Deaths.
Winter.	December, January, February, -	3·966
Spring.	March, April, May, - - - -	4·357
Summer.	June, July, August, - - -	4·143
Autumn.	September, October, November, - -	4·536
		17·092

The maximum of deaths is no longer in summer, but takes place in autumn. Thus, in whatever way we divide the year, whether into half-years, quarters, or seasons, the intensity of mortality reaches its minimum in winter. Taking the numbers of each month, we find two minima and two maxima: these results differ less from those of civil life than M. de Châteauneuf thinks, who, moreover, when he composed his memoir, was not acquainted with the influence of seasons on different ages. We may form an opinion of it by bringing together the numbers of France, and those which I have found for Belgium.

Months.	Deaths in France from 1820 to 1826.	Deaths in Belgium	
		From 16 to 20 Years.	From 20 to 25 Years.
January, -	1·402	0·93	0·97
February,	1·334	0·94	1·00
March, -	1·432	1·07	1·09
April, - -	1·475	1·18	1·02
May, - -	1·450	1·15	1·09
June, - -	1·257	1·03	0·96
July, - -	1·279	1·00	0·90
August, -	1·007	0·99	0·92
September,	1·577	0·89	0·96
October, -	1·638	0·87	0·95
November,	1·381	0·95	1·03
December,	1·260	1·01	1·11
Total, -	17·092	12·00	12·00

We see, however, that after the great heats of summer, the soldier is exposed to a degree of mortality which is not observed in civil life.

If we consider the different regions of France, we shall find that the inhabitants of the provinces in the north are more capable of bearing the fatigues of service than those of the south; but none appear less fitted for service than those of the centre.

M. de Châteauneuf has also endeavoured to investigate what causes the increase of mortality of the soldier, and he has examined the influence of several causes, such as duels, venereal diseases, suicides, nostalgia, phthisis, &c. This able statistician had already examined in another work the influence of certain professions on the development of pulmonary phthisis,* and he had arrived at several interesting conclusions. M. Lombard of Geneva has since been occupied with the same subject of research,† and has collected a great number of facts, of the principal results of which we ought not to be ignorant.

After having discussed the data afforded him by five different lists, formed for Paris, Hamburg, Vienna, and Geneva, M. Lombard has put them together, and divided the professions into three classes, according as they are favourable, indifferent, or unfavourable to the development of phthisis, or, in other terms, according as they have a greater, equal, or smaller number, than the general average.

The following is the general list:—

I.—PROFESSIONS PLACED ABOVE THE AVERAGE.

A.—Among Men.

1. *In all the lists.*—Sculptors, printers, hatters, polishers, gendarmes, brushmakers, soldiers, jewellers, tailors, millers, mattress-makers, lacemen or embroiderers, lemonade-makers, domestics, and hairdressers.

2. *In the majority of the lists.*—Copy-writers, cooks, turners, joiners, barbers, shoemakers, and coopers.

3. *In one list only.*—Ironmongers, vinedressers,‡ commissioners, old-clothesmen, tinmen, *porteurs de lessive*, paviers, engravers, mechanics, calico-printers, doorkeepers, showmen, springmakers, enamellers, design-painters, street-sweepers, pastry-cooks, showmakers, instructors, carters, brokers, sundial-makers, showpillar-makers, upholsterers, Protestant ministers,§ iron-merchants, lime-makers, basket-makers, shepherds, teachers of arithmetic, police-officers, servants in place, feather-sellers, crystal-cutters, gauze-weavers, sportsmen, and ribbon-makers.

B.—Among Women.

1. *In all the lists.*—Seamstresses, shoemakers, glovers, and embroiderers.

2. *In the majority of the lists.*—Polishers.

3. *In one list only.*—Makers of watch-needles, clockmakers, milliners, teachers, laundresses, old-clothes-women, toilet and mercer-women, hatters, bookbinders, knitters, jewel-makers or dealers, feather-makers or dealers, florists, brushmakers, and lacemakers.

II.—PROFESSIONS WITHIN THE LISTS, SOMETIMES ABOVE THE AVERAGE, SOMETIMES BELOW IT.

A.—Among Men.

Students, plasterers, stone-cutters, saddlers, delvers, clockmakers, waggoners, cellarmen,‖ goldsmiths, stocking-makers, charcoal-makers, gilders, musicians, sawyers, and glaziers.¶

* Essai sur la Mortalité de l'Infanterie Française (*An. d'Hygiène*, tome x. 2d part.) See also a memoir by M. le Comte Morozo, Sur la Mortalité des Troupes Piémontaises, in the *Memoires de l'Academie de Turin*.

* An. d'Hygiène, tome vi. partie 1, July 1831.

† Idem, tome xi. partie 1, Jan. 1834.

‡ This result is founded solely on six deaths, and requires confirmation.—*Note by M. Lombard.*

§ The number of consumptive persons is increased by the deaths of several English ecclesiastics, who arrived out of health at Geneva.—*M. Lombard.*

‖ The first eight may be considered as belonging to the first class, that is to say, to those among whom the number of phthisical persons is above the average; in fact, they are so placed in the Geneva list, which may be considered more exact than the other.—*M. Lombard.*

¶ The remark made in the preceding note will apply to the last seven professions, which, in the Geneva list, are placed below the average.—*M. Lombard.*

B.—Among Women.

Housekeepers, day-labourers, spinners, weavers, gauzemakers, gilders, stocking-menders, and mantua-makers.

III.—PROFESSIONS BELOW THE AVERAGE.

A.—Among Men.

1. *In all the lists.*—Coachmen, quarrymen, carpenters, tavern-keepers, butchers, porters at the market and message-boys, porters, tanners, bleachers, bargemen, confectioners, slaters, foundry-men, and orderlies.

2. *In the majority of the lists.*—Bakers, smiths, farriers, locksmiths, masons, and weavers.

3. *In one list only.*—Surgeons, braziers, cutlers, different merchants, woodcutters, advocates, sedan-carriers, chamois-leather-dressers, agriculturists, men of letters, negotiators, grocers, persons employed under government, bookbinders, governors of colleges, commissioners, loaders, clogmakers, merchant-drapers, druggists, annuitants, veteran officers, grooms, messengers, bankers, magistrates, dyers, physicians, coal-measurers, notaries, carvers, lawyers, money-changers, breeches-makers, candle-makers, tobacco-merchants, librarians, harness-makers, blanket-weavers, furbishers, plumbers, wood-merchants, professors, chocolate-makers, funeral assistants, landlords, cheesemongers, skin-dealers, furriers, chimney-sweepers, agents, architects, gunsmiths, packers, pinmakers, assizers of wood, vermicelli-makers, teachers of foreign languages, needle-makers, spinners, cotton-weavers, marble-cutters, starch-manufacturers, ragmen, water-carriers, toymen, stuff-manufacturers, shop-boys, miners, merchant-mercers, and combmakers.

B.—Among Women.

1. *In all the lists.*—Carders of mattresses, sicknurses, retailers, bleachers, gardeners.

2. *In the majority of the lists.*—Women employed in doing tailor-work.

3. *In one list only.*—Fringe-makers, embroiderers, winders, gauzemakers, ragwomen, cotton-spinners, watch-chainmakers, calico-printers, cooks, domestics, annuitants, washerwomen, merchant-grocers, counterpane-makers, butchers, midwives, bakers, female porters, and leech-appliers.

Next, passing to the causes which may influence the frequency of phthisis in the different professions, M. Lombard arrives at the following conclusions:—

1. The circumstances which multiply phthisis, are misery, sedentary life and absence of muscular exercise, shocks sustained in workshops, a curved posture, the impure air of shops, the inhalation of certain mineral or vegetable vapours, and, lastly, air loaded with thick or impalpable dust, or light, elastic, filamentous bodies.

2. The circumstances which exercise a preservative influence, are riches, active life, and fresh air, regular exercise of all parts of the body, inhalation of watery vapour,* or animal and vegetable emanations.

If we want to ascertain the degree of influence of each of these causes, in the production of phthisis, among the workmen who are found exposed to them, it may be considered as being as follows:—

Average number of phthisical persons, 114 in 1000.

I.—Noxious Influences.

1. Mineral and vegetable emanations,	0·176
2. Dust of different kinds,	0·145
3. Sedentary life,	0·140
4. Life passed in workshops,	0·133
5. Dry hot air,	0·127
6. Bent posture,	0·122
7. Movement of the arm, striking the chest,	0·116

II.—Preservative Influences.

1. Active life, muscular exercise,	0·089
2. Exercise of the voice,	0·075
3. Life passed in the open air,	0·073
4. Animal emanations,	0·069
5. Watery vapours,	0·063

There are, then, many other researches which have for their object the determination of the influence of professions on mortality:* it would be difficult to present a summary here, since the facts at present collected are very few; however, I cannot pass over in total silence the researches of Casper of Berlin, who, by his labours in medical statistics, has taken a distinguished rank in science.† Casper finds that the profession of medicine is perhaps more exposed to mortality than any other, contrary to the prejudices so generally received; and he has observed that theologians occupy the other extreme in the scale of mortality. Undoubtedly, we must here include under the name of theologians, the clergymen and not the learned men who descend into theological studies; which may make a great difference, for the activity of mind, carried to a certain degree, may become as prejudicial, as a regular and quiet life is advantageous to the preservation of man. The following table, presented by Casper, points this out clearly:—

Of 100 theologians, there have attained the age of 70 and upwards,	42
Agriculturists and foresters,	40
Superintendants,	38
Commercial and industrious men,	35
Military men,	32
Subalterns,	32
Advocates,	29
Artists,	28
Teachers, professors,	27
Physicians,	24

It would seem to follow from this table, that mental labour is more injurious to man than bodily, but that the most injurious state is that where fatigue of body is joined to that of the mind. A sedentary life, which is not exposed to any kind of excess, appears, on the contrary, to be most favourable. The summary which follows will suffice to point out the extremes.

Of 1000 deaths, there were as follows:—

Age.	Physicians.	Theologians.	Ratio
From 23 to 32 years,	82	43	1·91
·· 33 to 42 ··	149	53	2·81
·· 43 to 52 ··	160	64	2·50
·· 53 to 62 ··	210	180	1·17
·· 63 to 72 ··	228	328	0·70
·· 73 to 82 ··	141	257	0·55
·· 83 to 92 ··	30	70	0·43
	1000	1000	

I do not know whether we have any precise researches on the influence which study in general has on the constitution of children and young persons. This subject deserves a serious examination at the present day, especially since many parents, by improper attention, and sometimes from motives of self-love or very censurable cupidity, bring up their children as we should grow plants in a hot-house, to enjoy their flowers and fruits the sooner. Numerous examples have shown how short these fruits endure, and how subject those are who produce them to premature decay: we have seen few of these prodigies preserve their reputation beyond the period of infancy, or withstand the excessive efforts of an organisation too feeble for the labours imposed upon it. We shall also have occasion to examine, when speaking of mental alienation, to what extent excessive studies, especially in the exact sciences, may predispose to this dreadful malady, or even entirely ruin the most happy organisation.

* [The theory evidently alluded to in the text, that the inhabitants of marshy countries were less liable to pulmonary phthisis than others, was supported for a while by a few medical men, but afterwards entirely abandoned.]

* See especially, in the *Annales d'Hygiène*, different memoirs by MM. Parent Duchatelet, D'Arcet, Leuret, Marc, Villermé, Benoiston de Châteauneuf, &c.

† Gazette Medicale Hebdomadaire de Berlin, 3d January 1834, and An. d'Hygiène, April 1834.

There are diseases, of more or less danger, inherent in the habits of individuals, and the quality of the food and drink which they use. Of this number appears to be stone in the bladder, which especially afflicts certain localities. I am under obligations to M. Civiale, for different data on this cruel scourge, which is now combated with so much success; and I thought that those respecting age were not without interest in a work the object of which is the study of the development of man. Although the observations are at present scanty, it appears certain that the disposition to this disease is the greatest in childhood: we may judge from the following table:—

Ages.	Patients affected with Stone.			
	Lunéville.	Bristol.	Norwich and Norfolk.	Leeds.
From 0 to 10 years,	943	46	255	83
" 10 to 20 "	377	65	99	21
" 20 to 30 "	106	41	47	21
" 30 to 40 "	38	34	46	12
" 40 to 50 "	23	37	41	28
" 50 to 60 "	18	28	92	21
" 60 to 70 "	16	18	63	9
" 70 & upwards,	5	2	6	2
Total, - -	1526	371	649	197

It is about the age of five years especially, that the number of calculous patients appears to be the greatest. Indeed, at Lunéville, the following numbers have been observed from year to year, commencing at infancy and reaching to the 10th year:—0, 17, 79, 131, 145, 143, 116, 119, 84, and 75.

It would appear that after puberty age had no great influence on the predisposition to this disease, especially taking into account the number of individuals of each age which a population contains.

The difference of the sexes has a marked influence: it is generally supposed that about 21 men are affected with the disease to one woman; this would be inferred from the following table:—

Places.	Stone Cases.		
	Men.	Women.	Men to 1 Woman.
Lunéville, - - - -	1463	63	23
Bristol, - - - -	348	7	49
Paris, - - - - -	423	16	26
Ulm, - - - - -	123	4	31
Leeds, - - - - -	183	9	21
Norwich and Norfolk, -	618	31	20
Lombardy, - - -	758	36	41
Diction. de Medicine, -	312	44	7
Practice of M. Civiale, -	419	10	42
Total, - - -	4652	220	21·14

Women, like men, have a greater disposition to stone in infancy than at a more advanced age; as to the danger of death from it, we may calculate on about 1 death to 5·3 cases nearly, in different countries, when lithotomy is had recourse to. The danger of operation is least during infancy.

2. Influence of Morals.

Up to the present time, we possess few researches on the influence which morals may have on the number of deaths in a nation, excepting in the case of violent deaths. This is a vast field open to the investigations of statisticians, who might arrive at results no less interesting for the preservation of society than for moral and political philosophy.

We have already seen, from the preceding researches, what advantage an industrious and prudent people has, with respect to mortality, over a depraved and indolent one. In establishing a parallel between England and the unfortunate republic of Guanaxuato, I have shown that, proportion still being kept in view, the deaths were almost three times as numerous in the latter as in the former country. We have likewise seen that the mortality was much less in the higher classes of society than in the lower; and this state of things is not merely owing to abundance on the one hand and privations on the other, but also to rational and temperate habits,* more regulated passions, and less rapid transitions in their mode of living.

The violence of the passions seems to have considerable influence in shortening the duration of human life. Thus, when the physical man is fully developed, about the age of twenty, it would be supposed that he ought to resist all the destructive tendencies of his nature; but the contrary is the case. This excess of mortality, which is not observed in females, continues in man until very near the age of thirty, a period at which the fire of the passions is somewhat deadened. We shall be better enabled to understand this critical period in the life of the male, when we have examined the development of his moral nature.

It is particularly in epidemics that we are enabled to recognise the influence of morals on the number of deaths. We have been enabled to judge, especially during the ravages of cholera in Europe, how much intemperance has been fatal to those who gave themselves up to it. Opinions have been greatly at variance on the nature and curative means of this scourge, but all agree in establishing the fact which I have stated.*

From numerous observations, it appears that the fear of a disease may singularly predispose to an attack of it: the moral influences here exercise a remarkable action over the physical, and one which deserves the greatest attention from philosophers. This interesting subject has already been made the object of many researches; but it has scarcely been examined by that rigorous method of analysis which has for some time been applied to science. Persons have been seen to fall down dead, through the violent excitement of a passion; others have been seen, labouring under a presentiment of death, really to die, when their excited imagination had made them dread death. It would be extremely interesting to determine what are the passions most dangerous to excite inordinately, and at what point fear may cause death. These researches would induce essential modifications in our habits and institutions. Thus, the custom of attending with religious forms on the patient whose condition is hopeless, may cause death in many cases; and we cannot but applaud the precautions taken in certain countries, of discharging these forms from the commencement of the disease, when it only presents symptoms of slight danger. Religious ceremonies then appear less like the signal of a passage to another state of existence.

I shall also class among the disturbing causes which increase mortality, man's tendency to self-destruction, or to destroy his species, although he shares it in common with animals, who are obedient only to the laws of nature. But here the tendency is manifested under entirely different forms; thus, destruction of man by man is a crime or a virtue, according to the manner in which it takes place: and it would be very difficult to assign the limits of two such opposite conditions, especially if we regard the difference of times and places. An historical account of the displacement of this limit in different nations, would of itself be a work of the highest interest, and would show us under what phases humanity has been fated to appear.

* [The translator's experience in respect to cholera has a tendency to modify M. Quetelet's opinion. So far as he observed, the temperate and the intemperate fell equally under this terrible scourge; in fact, its origin, progress, and disappearance, are quite a mystery. It can scarcely now be said that a single well-established fact respecting this disease was made out by the medical profession in Europe.]

An examination of such questions as these, however, will more naturally find a place when I consider the development of the moral qualities of man, and have to speak of duelling and homicide. This will also be the place to treat of the destruction of man by his fellow-man, when on a larger scale, and in modes consecrated by our manners and institutions; for our ideas of war belong also to moral statistics.

I have just shown, by different examples, how much mortality is influenced by morals: another no less striking example of this influence is that which still-births afford, when we have made the distinction between legitimate and illegitimate ones. The fatal heritage of vice does not affect the child before its birth only, it pursues it still, for a long time after it has escaped this first danger, and misery often aggravates the evil. Thus, it follows from the researches of Baumann and Süssmilch, that the mortality presents the following ratio, all things being equal:—

	1 legitimate,	2·0 illegitimate.
Still-births,		
1st month after birth,	1 ..	2·4 ..
2d and 3d month,	1 ..	2·0 ..
4th, 5th, and 6th month,	1 ..	1·7 ..
Remainder of the year,	1 ..	1·5 ..
2d year,	1 ..	1·4 ..
3d and 4th year,	1 ..	1·3 ..

The difference continues very evident until the seventh year; so that, according to Baumann, only one-tenth of illegitimate children will arrive at maturity. This result just explains what is observed in the republic of Guanaxuato, "where nothing can equal the mass of physical, moral, and political pollution."*

Casper gives a table of the mortality of children at Berlin,† from which it appears that of 28,705 children who died before the age of 15 years, during the decennial period from 1813 to 1822, there were 5598 illegitimate, which gave annually 2311 deaths of illegitimate, and 160 of legitimate children, before the age of 15. But according to this savant, about the same period, 5663 legitimate children were born, and 1080 illegitimate ones. The ratio of deaths, therefore, was 1 to 2·5 for the first, and 1 to 1·9 for the second.

What especially tends to increase the mortality of illegitimate children is, that the greater number of them are abandoned to public charity. The absence of the cares of a mother, at a time when they are most needed, and the other privations of every kind, which are the necessary consequences of such an abandonment, sufficiently explain the great mortality which generally exists in foundling hospitals.

To understand this mortality, M. Benoiston de Châteauneuf, in his *Considerations sur les Enfans Trouvés*,‡ thus estimates the mortality of infancy in Europe during the century which has just elapsed:—

	Minimum.	Maximum.
From 0 to 1 year,	19 in the hundred.	45½ in the hundred.
.. 0 to 3 years,	26½ ..	50 ..
.. 0 to 4 ..	30 ..	53 ..
.. 0 to 10 ..	35 ..	55 6-7ths ..

According to this savant, the mortality of foundlings in several cities of Europe was, from birth to the end of the first year—

At Petersburg, in 1788,	40 per cent.
.. Florence, ditto,	40 ..
.. Barcelona, in 1789,	60 ..
.. Paris, in 1789,	80 ..
.. Dublin, in 1791,	91 ..

"From birth to four years old, at Rome, Madrid, Dublin, and Paris, we find 50, 62, 76, and 98 in the hundred.§

Lastly, at the end of 20 years, of 19,420 children received into the house at Dublin, only 2000 remained alive, and 7000 at Moscow out of 37,600. What an awful destruction! War and epidemics are less terrible to the human race. And let no one suppose that modern times have produced more happy results, or that this dismal catalogue, which we might still extend, at the present day presents fewer numbers. According to the authentic accounts which we have before us, at Madrid, in 1817, there died, either in hospital or country, 67 children out of 100; at Vienna, in 1811, 92; at Brussels, from 1812 to 1817, 79. At this period, the hospital, which was small, unhealthy, and badly ventilated, was removed to another quarter of the city, and from that time there has been a considerable decrease of the average number of deaths, which is not more than 56 in the 100."*

What has preceded, sufficiently shows what influence well-directed conduct may exercise over the life and death of foundlings. This is not the place to examine how far these institutions should be approved of, where unfortunates are collected together; but it may be interesting to know how much the number of foundlings and deserted children has increased since these institutions arose. At Paris, for example, the ratio of their number to that of births, in one century, makes the following progress:—

Years.	Ratio in 100.	Years.	Ratio in 100.
From 1710 to 1720,	9·73	From 1770 to 1780,	33·66
.. 1720 to 1730,	11·37	.. 1780 to 1790,	23·79
.. 1730 to 1740,	14·48	.. 1790 to 1800,	17·48
.. 1740 to 1750,	18·21	.. 1800 to 1810,	20·96
.. 1750 to 1760,	23·71	.. 1810 to 1820,	22·68
.. 1760 to 1770,	30·75		

We see that the proportion rises rapidly during the latter years of the reign of Louis XV.; it diminishes more than two-thirds under the Convention; it increases again under the imperial government; and has been stationary since the revolution.

M. de Châteauneuf, from whom I borrow the greater number of the preceding data, gives the following ratios for some of the principal cities of Europe:—

		Foundlings.
Lisbon, from 1815 to 1819,		26·26 in 100 births.
Madrid, ...		25·38 ..
Rome, .. 1801 to 1807,		27·90 ..
Paris, .. 1815 to 1821,		20·91 ..
Brussels, .. 1816 to 1821,		14·63 ..
Vienna, .. 1815 to 1821,		23·43 ..
Petersburg, 1820,		45·00 ..
Moscow,		27·94 ..
County of Nice,		6·06 ..
Savoy,		5·83 ..

Thus, in the greater number of the cities quoted previously, nearly one-fourth of the children are exposed. This state of things is very apt to give rise to reflections on the misery and immorality of great cities. Paris annually produces about 21 foundlings to 100 births, whilst the rest of France only produces 3·52. It is true that this disproportion would be much less, if throughout France there were the same facility as at Paris of sending children to the hospitals; and it is also just to remark, that many children are sent to Paris, who do not belong to the city. In Belgium the following values have been obtained, according to the results of the ten years preceding 1833:†—

* Sir F. D'Ivernois, *Sur la Mortalité Proportionnelle.*

† Beitrage, p. 173.

‡ Paris, 1824, 1 vol. 8vo.

§ M. de Gérando, in his excellent work *Le Visiteur du Pauvre*, makes the mortality 1 in 7 of the children which the civil hospitals in Paris send out to be supported (p. 295); but we must observe, that these children vary from 1 day to 12 years of age; and in this the numbers agree with those of M. Benoiston, at p. 76 of his *Considerations*, &c.

* I have found, from the average results of the eight years from 1815 to 1822, that the mortality of the hospital at Brussels was 69·38 in the 100: at this period, it had a greater mortality than any of the nineteen hospitals in the kingdom; the average mortality has been 45·07 in 100.—See *Recherches sur les Naissances, &c.*

† See Correspondance Mathematique et Physique, tome vii. livraison 2, p. 135.

Provinces.	Births: Annual Average.	Foundlings and Deserted.	Foundlings to 100 Births.
Antwerp,	11,018	2156·5	19·6
Brabant,	18,893	2307·4	12·2
Flanders, West	20,315	480·5	2·3
" East,	24,148	693·8	2·9
Hainault,	20,016	1830·2	9·1
Liege,	11,337	212·2	1·9
Namur,	6,399	844·9	13·2
The kingdom,*	112,626	8525·5	7·6

It is very difficult to explain the differences which are presented by the several provinces of such a country as Belgium, unless as regards the facility which mothers find, in certain localities, of exposing their children. On this subject, we ought to read the observations of M. Gouroff, one of the persons who has paid most attention to all that concerns foundlings.† "The city of London, the population of which is 1,250,000, in the space of five years from 1819 to 1823, has only had 151 children exposed; and the number of illegitimate children received into eighty-four workhouses, during the same period, only reaches to 4668; and, moreover, about one-fifth of these children are supported at the expense of the father. What a striking contrast is Paris, which, having only two-thirds the population of London, has had, within the same years, 25,277 children, all maintained at the expense of the state!

Do we still ask for a more certain proof of the influence which foundling hospitals have in multiplying the abandonments of infants? Mayence had no establishment of this kind; and from 1799 to 1811, there were 30 children exposed. Napoleon ordered a '*tour*' to be established in this city. It was opened on the 7th November 1811, and existed until the month of March 1815, when the Grand-Duke of Hesse-Darmstadt caused it to be suppressed. During these three years and four months, the house received 516 foundlings. When it was once suppressed, as the habit of exposing the children had not taken root in the people, all things returned to their former order: in the course of the nine following years, only seven children were exposed."

When proposing the reform of foundling hospitals, M. de Gouroff does not desire it to be done precipitately. "On the contrary, it requires reflection, time, and patience, to prepare and gradually execute the measures which ought to precede it, and to avoid the error committed in some of the cities of Belgium, which, in 1823, that they might not be burdened with the expense of the children left out of doors, suppressed the '*tours*.' Immediately the lives of several new-born infants were sacrificed, and public opinion obliged the government to order their re-establishment."

The principal conclusions of the work of M. de Gouroff are:—

1. That in Catholic countries, or rather in those where asylums have been opened to all children indiscriminately who are abandoned at the time of birth, these little unfortunates are much more common, much more numerous, than elsewhere.

2. That in these asylums there is a frightful mortality, and quite beyond the proportion of the greatest mortality which cuts off other children, even in the most indigent classes.

3. That infanticide is scarcely prevented by foundling hospitals; or rather, that, in order to prevent a few infanticides, whether direct or indirect, through the effect of unrelieved exposure, these houses do themselves destroy an incomparably greater number of children.‡

* Except the provinces of Liege and Luxembourg.

† Essai sur l'Histoire des Enfans Trouvés. 8vo. Paris: 1829.

‡ [Perhaps the question is not very fairly stated by M. de Gouroff. Infanticide, when direct, is a horrible crime, in fact, murder; but the exposure of a child is a misdemeanour; so that foundling hospitals were established in Catholic countries without doubt with a view to prevent crime, and it is astonishing and almost incredible that they have not succeeded in effecting even this: in other respects, they themselves are an evil of the first magnitude.]

3. Influence of Knowledge and of Political and Religious Institutions.

Civilisation, which sweetens the existence of man, has also prolonged it: the progress of knowledge has contributed to the health of the individual houses and interior of cities, and has gradually caused marshy lands and the other sources of the epidemics which habitually harassed our ancestors, to disappear. Knowledge, by multiplying the commercial relations of nations, has also rendered famines less frequent and formidable; the chances of which, on the one hand, have been diminished by bettering the culture of the earth, and varying the means of subsistence: medical science and public hygiène have likewise found out valuable means for resisting mortality; whilst the development of industry, and the securities which society received from more liberal institutions, have contributed to diffuse affluence and the most active means of preservation.

At the present day, it appears clearly established, that in countries where civilisation makes the greatest progress, we may also observe the greatest diminution of mortality. However, we must not exaggerate these advantages, as has been done in respect to some countries: the greater accuracy statistical documents acquire, the more numerous appear the prejudices which have been entertained on this subject. England is placed in an advantageous position, which has always fixed the attention of savants when studying the theory of population; but it is perhaps to this kingdom that my remark is most applicable. If we examine what has been the mortality from the commencement of the eighteenth century, we shall find, according to two of her most eminent statisticians:*—

Years.	Inhabitants to one Death.
1700,	43
1750,	42
1776 to 1800 inclusive,	48
1806 to 1810 "	49
1816 to 1820 "	55
1826 to 1830 "	51

According to these numbers, there would be a very sensible decrease of mortality; but we know that very numerous omissions have taken place in the figures of mortality. Mr Rickman himself thinks that, in consequence of these omissions, we ought to reckon 1 death in 49 inhabitants, instead of 1 in 51, for the five last years; whilst, according to Mr Hawkins, the mortality for 1822 would have been 1 in 60.† On the other hand, the census may likewise have been faulty. Moreover, it might be objected, that these inaccuracies, if they could be corrected, would probably only place in a clearer light a still greater difference of mortality, since the figure of mortality is generally smaller in proportion as there is more negligence in collecting it. That would suppose always that the census of the population is correct.

The changes which have taken place in great towns should especially receive our attention. For example, in 1697, the total number of deaths in London rose to 21,000; however, a century after, in 1797, the number was only 17,000, notwithstanding the increase of the population.‡ These advantages have been

* Mr Marshall gives 5,475,000 and 6,467,000 as the population of England and Wales in 1700 and 1750; and the deaths 132,728 and 154,686. The other ratios are drawn from the last work of Mr Rickman.

† Elements of Medical Statistics, by F. Bisset Hawkins.

‡ Ibid., p. 18.

obtained especially between 50 to 60 years ago, since which time the city has increased with great rapidity in extent and population. In the middle of the last century, the annual mortality was still 1 in 20; at present, it is only 1 in 40, according to the census of 1821; so that it has exactly diminished one-half. It is then correct to say, that the mortality, towards the end of the last century, had undergone an increase, which may be attributed to the excessive abuse of spirituous liquors which then prevailed.

The towns of Manchester, Liverpool, and Birmingham, have presented almost the same decrease of mortality as London. It is very difficult to believe that some error may not have crept into such estimates.

France, like England, has experienced a diminution of mortality, if we may refer to ancient documents.* According to M. Villermé, it was computed in 1781, that 1 death took place to 29 inhabitants; in 1802, 1 in 30; and now, 1 in 40.†

In Sweden, from 1755 to 1775, 1 death took place to 35 inhabitants; in 1775 to 1795, 1 to 37; and in 1823, 1 to 48.

Likewise, at Berlin, from 1747 to 1755, the annual mortality was 1 to 28; and from 1816 to 1822, the ratio was less than 1 to 34.

M. Moreau de Jonnes, in a notice on the mortality of Europe, has presented the following table, which likewise tends to prove the influence of civilisation on the number of deaths, in periods of which the intervals have been marked by social ameliorations.‡

Countries.	Years.	One Death to	Years.	One Death to
Sweden,	1734 to 1768	34·0	1821 to 1825	45·0
Denmark,	1751 to 1754	32·0	1819	45·0
Germany,	1783	32·0	1825	45·0
Prussia,	1717	30·0	1821 to 1824	39·0
Wurtemburg,	1749 to 1754	31·0	1825	45·0
Austria,	1822	40·0	1825 to 1830	43·0
Holland,	1800	26·0	1824	40·0
England,	1620	33·0	1821	58·0
Great Britain,	1785 to 1789	43·0	1800 to 1804	47·0
France,	1776	25·5	1825 to 1827	39·5
Canton de Vaud,	1756 to 1766	35·0	1824	47·0
Lombardy,	1767 to 1774	27·5	1827 to 1828	31·0
States of the Church,	1767	21·5	1829	28·0
Scotland,	1801	44·0	1821	50·0

I repeat, that I am far from giving my belief to the prosperous state which these figures seem to point out. However, we cannot but be inclined to admit that deaths have diminished with the development of civilisation and affluence. Some countries have afterwards lost their population, or at least it has remained stationary, when those advantages were lost which they previously enjoyed. Thus, the opulent city of Amsterdam, which, by its activity, has for some time been unrivalled in Europe, is affected by the diminution of its commerce. In 1727, the mortality there was 1 to 27, and it still preserved the same value, according to the average results of the 12 years which preceded 1832. The deaths really rose to the number of 7336; and on the 1st of January 1830, of 202,175 persons, 90,292 were males, and 111,883 females. The following table will show the number of deaths, year by year:*—

Deaths in the City of Amsterdam.†

Years.	Deaths.			Births.
	Male.	Female.	Total.	Total.
1821,	3,618	3,507	7,125	7,342
1822,	4,041	3,957	7,998	7,670
1823,	3,279	3,355	6,634	7,182
1824,	3,082	2,994	6,076	7,899
1825,	3,184	3,118	6,302	7,332
1826,‡	4,351	4,457	8,808	7,438
1827,	4,133	4,107	8,240	6,899
1828,	3,562	3,516	7,078	7,208
1829,	4,056	3,942	7,998	7,403
1830,	3,387	3,427	6,814	7,306
1831,	3,479	3,659	7,138	7,342
1832,§	4,057	3,765	7,822	6,452
Average,	3,686	3,650	7,336	7,282

In comparing the births with the deaths which have taken place during the years pointed out in the table above, we see that they have been in average value numerically inferior to the number of deaths; in fact, there have been annually 7282 births, and 7336 deaths. It is true that Amsterdam has been troubled by several scourges; nevertheless, it constantly appears that its population is not on the increase, which is an almost infallible index of the loss of prosperity when the average life does not attain a high value.

If we consider the ages on which the mortality falls, we shall have a new proof of the influence which our institutions and habits have in modifying it. In speaking of still-births, we have shown how much the number may be increased in the interior of cities, and especially in the midst of excesses of every kind, which give rise to demoralisation; we have, moreover, seen that the children who are born under these unfortunate circumstances, have fewer chances of living, especially if the parents are in misery. Different dangers gather round their early years, and weigh upon the whole course of their career: thus, without speaking of those to which, by our nature, we are exposed, some belong to our manners, others to our religious institutions, and lastly, others to our political institutions. As to those which belong to our manners, I have already attempted to point them out. I have also shown the influence which certain religious institutions may have—baptism, for example—on tender infancy; the Lent and fasts on our reproductive powers, and probably on our vitality; and religious ceremonies and the preparatives for death on the minds of the sick. Moreover, we may join to these active causes, which modify the amount of population, the state of celibacy which is imposed on a class of persons, whose number, during the sway of Catholicism, was much greater than it is in our own day.

Amongst political institutions, the levying of soldiers, and wars, are likewise, notwithstanding all that has been said on the point, ever recurring causes of mortality, and causes so much the more afflicting because they fall on the healthiest and most valuable part of the population—on the man who has just attained his full physical development, and is prepared to repay to society the debt which the infinite cares

* Mr Finlayson has succeeded in obtaining the registers of tontine-holders, both in France under Louis XIV. and in England under William III., and he is convinced that the life of the French tontine-holder at that time was longer than the English one.—See on the question the observations of M. D'Ivernois, *Bibliothèque Universelle*, Oct. 1833, p. 146.

† It is well to premise, that the mortality calculated for the beginning of the present century is extremely uncertain.—See the judicious remarks of Sir F. D'Ivernois in the *Bibliothèque Universelle de Genève*, 1833.

‡ It is to be regretted that the author has not pointed out the sources of his information: his results would have had much more value. Several numbers of this table must certainly appear very doubtful.

* Jaarbockje, by Lobatto, different years.

† The five years from 1816 to 1820 have given—

1816,	6,233	6,615
1817,	8,416 (a)	7,040
1818,	6,300	6,988
1819,	6,557	7,154
1820,	7,006	6,850
Average,	6,914	6,909

(a) This was a year of scarcity.

‡ Period of the epidemic of Groningen.

§ Year of the cholera.

his infancy have contracted. In some countries even, by too extensive an enlistment into the army of men before they had time to become fully developed, they are exposed to new chances of death; or, by the fatigues of war, the vigour of the new generation is prematurely undermined.

Governments dispose, in some sort, of the lives of the men whom they have constantly under their influence, from the moment of birth to the day of their death. I shall not here speak of the kind of governments: we know too well that those which are favourable to despotism arrest the development of the species; and, on the other hand, how much a prudent degree of liberty, by seconding every individual industry and exertion, gives to man the means of providing for his preservation. I shall not speak of the immense distance which exists between the degree of mortality of the slave and his master, notwithstanding all the excesses to which the latter class give themselves up;* but I cannot omit taking a rapid view of the mortality in institutions created by man for the protection of society, and giving a glance at the influences of vaccination, hospitals, asylums, prisons, &c. My design is not so much to treat this subject deeply, as to show to what extent the numbers may vary, according to the locality.

In most civilised countries, there are enactments on vaccination, of greater or less severity, which are enforced with proportionate rigour. According to Casper, and several other savants who have written on the ravages caused by small-pox, it would appear that formerly generations were decimated by this scourge, that is to say, one-tenth of the human race died from it. Duvillard† has found—1st, that in the natural state, of 100 individuals of 30 years of age, scarcely four individuals have escaped an attack of small-pox; 2d, that two-thirds of all infants are attacked by it sooner or later; 3d, that small-pox, in the early years after birth, destroys, on the greatest average, one out of every three who are affected with it; 4th, and one dies out of every seven or eight affected, at whatever age it may be. Such was the state of things before the discovery of vaccination; it has since been much ameliorated. However, in 1817, 745 persons died in Paris of small-pox; in 1818, 993; and in 1822, the number was as many as 1084. Also, at St Petersburg, in 1821, 408 deaths took place from it; and at Vienna, 238 in 1822; whilst in London, during that year, there were 712. Prussia has been much better dealt with than other countries; during the two years 1820 and 1821, taken together, only 1 in 7204 persons died from it, whilst France lost 1 in 4218 the last two years. The following are the data of Berlin, for almost half a century:—

From 1782 to 1791 inclusive,	- -	4,453 deaths.
" 1792 to 1801	" - - -	4,929 "
" 1802 to 1811	" - - - -	2,955 "
" 1812 to 1822	" - - - -	555 "

The number of deaths for the last period, which is extremely small in comparison with the preceding years, would be still less if the deaths for 1814 and 1815 were subtracted, during which time vaccination was neglected. Indeed, these two years had 411 deaths from it, so that during the remaining there was only 114. Moreover, we should fall into a serious error, as M. Villermé* has said, if we counted as gain to the population all those individuals who had been vaccinated, and not carried off by the small-pox. "An epidemic, or any other malady against which we endeavour to secure ourselves," says M. Villermé, "indeed suppresses one cause of death, but from that circumstance the probability of dying from other diseases becomes greater. In other words, by closing one of the gates of death, we open the others wider, so that more persons pass through these latter, which is not saying that mortality should be equally rapid. Consequently, vaccination, and every preservative against epidemic disease, or any disease whatever, does not increase the population of old Europe *directly*; but, what is still better, it alleviates the lot of those whom it snatches from the chances of small-pox, it diminishes the number of the blind, it preserves the native beauty of the person, and increases the average duration of life."

We may, then, regard the valuable discovery of Jenner as a real conquest of knowledge. We especially recognise the progress of civilisation, in all that which was hideous and miserable being removed from society: perhaps a feebly enlightened philanthropy has been too zealous, and in seeking to avoid certain evils, given rise to others. Nothing can more excite our compassion, than the feeble infant which a mother in her distress abandons to public charity; notwithstanding, an excess of pity may become an encouragement to vice, and a real burden always increasing on society.†

It appears that it is this dread which has prevented the formation of a foundling hospital in Edinburgh.‡ Moreover, it has been shown how dreadful the mortality is in the greater number of these establishments, notwithstanding all the efforts of art, which has combated them with some success. Mr Hawkins, in his *Elements of Medical Statistics*,§ says that the mortality in the foundling hospital in Dublin was so great, that it became the object of parliamentary inquiry: of 10,272 sick children sent to the infirmary attached to the hospital, during 21 years ending in 1796, only

* The mortality of Europeans at Batavia appears to be as great as that of the slave population; but it would seem that the chances of mortality are increased for the adult man who is transported to a climate very different to that in which he was developed. This is confirmed by the following table, given by M. Moreau de Jonnes, unfortunately without mentioning his sources:—

Batavia, 1805, - -	Europeans,	1 death to	11·0 persons.
" " -	Slaves,	"	13·0 "
" " - -	Chinese,	"	29·0 "
" " -	Javanese,	"	40·0 "
Bombay, 1815, - -	Europeans,	"	18·5 "
" " -	Mussulmans,	"	17·5 "
" " - -	Parsees,	"	24·0 "
Guadaloupe, 1811 to 1824,	Whites,	"	23·5 "
" "	Free Blacks,	"	35·0 "
Martinico, 1815, - -	Whites,	"	24·0 "
" " -	Free Blacks,	"	33·0 "
Grenada, - - -	Slaves,	"	22·0 "
St Lucia, - - -	Slaves,	"	20·0 "

† Analyse et Tableaux de l'Influence de la Petite-Vérole.

* Des Epidemics, Jan. 1833.

† [No one now disputes that the poor ought to be the objects of national and legislative care; but great differences exist as to the amount of provision which ought to be made for them. One party contend, that not only the infirm and aged poor, but the able-bodied also, when out of work, are entitled to an ample support. Another, in which Dr Chalmers takes the lead, would only extend a limited public provision, in very necessitous cases, and that only after aid from relations and neighbours of the parties had been found to fail. The principle of the modern English poor-law appears a fair medium between the two extremes: it affords out-of-door relief to the infirm, the aged, and the helplessly young, and to the able-bodied in necessity holds out accommodation in work-houses, where the provision is a little inferior to that usually enjoyed by the independent labourer, so that it may act as a test of real necessity, and not be an attraction to sloth. It has long been a favourite doctrine with the second of the extreme parties, that provision of every kind vitiates a population, by taking away motives for self-dependence; but it has been shown more satisfactorily, on the other hand, that when a population is allowed to sink below a certain point of comfort, it tends to become excessive, in consequence of the recklessness which attends a state of great misery. Unquestionably, the interest, as well as humanity, of every civilised nation, is concerned in making provisions to prevent any portion of the population sinking into very abject circumstances.—*Publishers' Note.*]

‡ In Edinburgh, an attempt has occasionally been made to form a foundling hospital, but has failed, from the opinion of its injury to morality.—*Hawkins, Elements of Med. Stat.*, p. 132.

§ Page 130.

45 were preserved!—10,201 of these unfortunate children were affected with syphilitic symptoms, whilst of late there has only been 1 in 30. We have also shown how much art and good management have diminished the mortality of lying-in institutions. My object in speaking of these establishments was not, of course, to present a complete table; but to show how political institutions and philanthropic establishments may cause the degree of mortality to vary, whatever other causes of variation there may be. It is with the same object that I think I ought to take a view of the mortality of hospitals in different countries. This difficult subject may give rise to serious errors, because all hospitals do not receive patients affected with disease of equal severity or advancement. It is requisite, therefore, to use much reserve, and especially only to compare those hospitals with each other which admit the same kind of patients. In this I shall follow Mr F. B. Hawkins as my guide, and borrow the numbers which he gives in his Elements.

In 1685, in the Hospitals of St Bartholomew and St Thomas, the Mortality was	1 in 7
" 1689—St Thomas,	1 in 10
" 1741 "	1 in 10
From 1773 to 1783,	1 in 14
" 1783 to 1793,	1 in 15
" 1803 to 1813,	1 in 16

According to the first report of St George's Hospital, for 1734, the mortality was 1 in 8; from 1825 to 1827, it was 1 in 9.

The mortality in the Royal Infirmary of Edinburgh, for the decennial period which terminated 1818, was 1 in 16, or the same as St Thomas's.*

M. Casper, in his researches on the state of the poor in Paris,† has presented a table, including the proportion of deaths and duration of stay in the hospitals and asylums of Paris. Since these data deserve confidence, from the sources from which they have been drawn, and from the care which the author has taken to test them, I have thought proper to extract the following numbers:—

Hospitals of Paris—1822.	Mortality.	Average duration of Stay.
Hotel-Dieu,	1 in 6·6	25·2 days.
Pitié,	" 8·2	28·0 "
Charité,	" 5·5	30·6 "
St Antoine,	" 6·7	31·6 "
Necker,	" 5·6	33·6 "
Cochin,	" 8.3	25·8 "
Beaujon,	" 6·2	30·8 "
St Louis,	" 14·4	60·3 "
Veneriens,	" 33·2	60·4 "
Enfans Malades,	" 4·4	51·3 "
Maison d'Accouchemens,	" 28·0	21·1 "
Foundling Hospital—indoor patients,	" 4·3	12·2 "
" " outdoor patients,	" 6·2	
Maison Royale de Santé,	" 5·8	24·7 "
Maison de Santé (Veneriens),	" 113·0	41·0 "
Asylums of Paris—1822.		
Salpétrière,	" 8·4	
Institute de St Perine,	" 9·1	302·0 "
Bicêtre,	" 7·6	
Incurables—men,	" 6·7	
" women,	" 11·1	64·0 "
Hospice des Ménages,	" 11·8	31·5 "
" des Orphelins,	" 75·3	
" de la Rochefoucauld,	" 8·4	

It appears that the mortality of hospitals, in the remainder of France, is not so great as at Paris. Thus, at the Hotel-Dieu of Lyons, it is only 1 in 11; at Montpellier 1 in 10, for the average of all the hospitals. The following is a summary of the mortality in the principal hospitals of Europe,* which may be compared with the preceding data:—

	Mortality.
Berlin—La Charité, from 1796 to 1817,	1 in 6 nearly.
Vienna—Large Hospital,	" 6 "
Pesth in Hungary—Civil Hospital, 1826,	" 6 "
Dresden—City Hospital, 1816,	" 7 "
Munich—New Hospital, 1819,	" 9 "
Petersburg—Imperial Hospital, 1817,†	" 4·5
Geneva—Hospital, 1823,	" 11 "
Brussels—St Peter's, 1823,	" 9 "
Amsterdam—St Peter's, 1796 to 1817,	" 8 "
Turin and Genoa, 1821,	" 7 "
Milan—Large Hospital, 1812 to 1814,	" 6 "
Pavia—San-Matheo della Pieta, 1823,‡	" 10·7
Bologna—Clinic of Tommasini, 1816 to 1819,	" 7·7
Leghorn, 1818 to 1825,	" 7·3
Palermo—Large Hospital, 1823,	" 8·2

It would appear, from these documents, that the mortality in the principal hospitals on the continent is generally greater than in those of England. We may be astonished, moreover, in comparing the principal states of Europe, that we do not find greater differences, especially when we consider the influence which the local position and resources may have, without speaking of the different plans of medical treatment which may be pursued. Mr Hawkins has made a very curious remark on the latter subject. "We *rarely* ought to attribute mortality to bad treatment, which probably seldom *destroys* the patient. A friend took particular notes on the comparative mortality under three physicians, in one hospital. The practice of the one was *eclectic*, the second *expectant*, and the third *tonic*. The mortality was the same, but the duration of indisposition, the character of the convalescence, and the chances of relapse, were very different." §

This is not the place to speak of hospitals for mental infirmity, on the mortality of which we still have little accurate information. I shall have occasion to speak of them when considering the development of the moral and intellectual faculties, and the diseases to which they are subject. Neither shall I stay to consider the mortality of mendicity houses, these establishments being very few in Europe, and based on plans so different as not to admit of comparison. But I ought not to omit mentioning the great mortality observed in those of the old kingdom of the Low Countries. In the seven depôts which were formed at different places in the kingdom, and between the years 1811 and 1822, there annually died of the average population 1 in 8·9; that is to say, as many as in hospitals, whilst the mortality of the whole kingdom was 1 in 43·8. "The mortality in the mendicity houses is indeed more dreadful, since the population of these establishments does not include persons of tender years. We must not forget that a great number of old and infirm persons of both sexes occupy these abodes, and that the state of extreme emaciation in which they are found in general, when they arrive, brings with it the developed seed of a speedy dissolution, and should undoubtedly be classed with the causes to which we must attribute this fatal result. This latter circumstance was made especially remarkable in the disastrous year 1816. A multitude

* [The mortality of the Royal Infirmary of Edinburgh has since that period, namely in 1838-39, risen to 1 in 6, chiefly, as is supposed, from the frightful mortality caused by typhus fever.]

† Beitrage—Das Armen-und Armen Kranken-wezen in Paris.

* Elements of Med. Stat.

† With respect to the hospitals of Russia in 1811, the mortality in establishments containing more than 30 patients was 1 in 8, and 1 in 10 in those which had fewer than 30 patients.

‡ Women are received there during labour.

§ [In fevers of all descriptions, and epidemics, as the plague, cholera, &c., there seems much reason to fear that medical attendance is generally of little avail. On this subject, the translator will be found to treat in the appendix.]

of unfortunate persons then only entered these houses to die in a few days after their arrival, and the greater number of the remainder expired, in the following years, from weakness. On the other hand, it is not impossible that the sudden transition from the most dreadful privation to a diet which comparatively may appear superabundant, here exercised a more deplorable influence than with a little more precaution it could have done. A third observation, which ought not to be passed over in silence, is, that in order to find the laws of mortality in an establishment whose population is moveable, it is not sufficient to compare the number of deaths with the daily entries, but it is also necessary to attend to the number of individuals to whom this number of entries have a reference. The greater this latter number, especially in asylums of human misery and infirmity, the more chances are there for the mortality to appear great."*

The mortality which has just been pointed out is no doubt very considerable; but I do not think that it has ever fallen in any of the mendicity houses of Belgium lower than it was towards the commencement of this century in the mendicity houses of France. Indeed, according to M. Villermé,† the mortality at Laon, during a period of thirteen years ending in 1826, was 1 person in 4·32; at Nancy in 1789, 1 in 5, and in 1801 it was 1 in 3·22; at Auch, during a period of five years, at least 1 in 3; at Metz 1 in 8·13 in 1789, and 1 in 2·22 in 1801. This dreadful mortality cannot be compared to any thing except what took place, also about the commencement of the century, in one of the principal prisons of Belgium: it is scarcely credible that, in the prison of Vilvorde, there died

In 1802, 1 prisoner in		1·27 of the average population.		
" 1803,	"	1·67	"	"
" 1804,	"	1·91	"	"
" 1805,	"	7·77	"	"
" 1806,	"	20·31	"	"
" 1807,	"	30·36	"	"

In 1801, the evil had not begun to exist; it was in 1802 when it attained its greatest intensity. In 1805, M. Chaban, prefect of the ancient department of Dyle, and M. Rouppe, inspector-general of the prison, began some improvements, which could not be completed until 1807.‡ M. Villermé, who has also taken care to register this remarkable mortality, in his work on the Mortality of Prisons, adds the following reflections:—"After these last facts, what need be said to show the power of the government? I do not think that imprisonment should always be barbarously severe, but I think the bad discipline almost always renders it so. Those who are intrusted with the care of prisoners, having never made researches of the present kind, what they have said of them has often appeared as clamorous sympathy merely. But when we take the numbers of the men, and determine the annual proportion of their deaths, every thing is reduced to a simple calculation, the elements of which may be verified. If it be correct, all the evil or all the good which the figure expresses is real."

To understand to what extent the evil reached in the prison of Vilvorde, and how defective the discipline of it was, it is sufficient to quote the mortality since this period. At the same time, I shall give the mortality of two other large prisons in Belgium.§

Years.	Deaths on the Average Population.		
	At Vilvorde House of Confinement.	St Bernard House of Correction.	Ghent House of Confinement.
1825,	29·00	18·71	31·69
1826,	29·00	22·68	45·99
1827,	29·62	17·81	77·53
1828,	48·14	17·99	51·35
1829,	29·74	15·06	101·67
1830,	36,66	11·93	101·68
1831,	39,78	30·51	57·99

We may now be enabled to judge if the mortality of men left to themselves, and giving themselves up to the greatest excesses, may not be aggravated rather than otherwise, by a negligent and unenlightened administration: men during the most dreadful pestilences, and soldiers during the most destructive wars, have not been exposed to such a mortality as the prisoners of Vilvorde, during the early years of the present century.

The evil was far from being so great during the same period in the prison-house of Ghent; indeed, there was only 1 death to 20·4 prisoners in 1801; in 1789 there was only 1 death to 25·8 prisoners. According to M. Villermé, the annual mortality in the prisons of the department of the Seine has been, during the years 1815, 1816, 1817, and 1818, as follows:—

At la Grande Force,	1 in 40·88	prisoners.
.. the Madelonnettes,	.. 38·03	..
.. the Conciergerie,	.. 32·06	..
.. la Petite Force,	.. 26·63	..
.. Sainte-Pélagie,	.. 24·48	..
.. the Bicêtre,	.. 18·75	..
.. the Sainte-Lazare,	.. 17·92	..
.. the Mendicity House at St Denis,	.. 3·97	..

We see that in the department of the Seine the mortality of the depôt of mendicity is also much greater than that of the prisons, and appears frequently to result from the injured constitutions of the poor, and their privations and miseries before entering prison [the depôts?], and from the impossibility they found of procuring the necessaries of life.*

The prisons in the departments of France are generally far from presenting as favourable results as those of the department of the Seine; indeed, the mortality in the central houses (*maisons centrales*) and of those of justice and correction, were—

At Montpellier, 1822,	1 in 9·33	prisoners.
.. Riom, 1821 to 1827,	.. 9·87	..
.. Baulieu near Caen, 1814 to 1825,	.. 11·59	..
.. Melun, 1817 to 1825,	.. 14·81	..
.. Gaillon, 1817 to 1825,	.. 11·86	..
.. Metz, 1801,	.. 18·43	..
.. Toulouse, 1822 to 1824,	.. 35·07 †	..
.. Lyons, 1820 to 1826,	.. 43·00 ‡	..
.. Saint-Flour, 1813 to 1826,	.. 47·00	..
.. Rouen, 1815 to 1826—Maison de Justice,	.. 51·18 §	..
.. .. 1820 to 1825—Bicêtre,	.. 59·07 ‖	..

It is calculated that, for the average period of confinement in 1827, there was 1 death to 22 sentenced, in the central houses of imprisonment of France; and the average ratio was 1 in 16 for the men, and 1 in 26 for the women. M. Villermé, from whom I bor-

* These judicious observations are extracted from the notes with which M. le Baron Reverberg has ehriched my *Recherches sur les Populations, les Naissances, &c.*

† Mortalité dans les Prisons, *An. d'Hygiène*, tome i. p. 9.

‡ Tableau Statistique de la Maison de Detention de Vilvorde, par M. Rouppe.

§ Rapport sur l'Etat Actuel des Prisons en Belgique, &c., par Ed. Ducpétiaux.

* Mortalité dans les Prisons, p. 5.

† In 1814, a year of misery, with a crowded prison, 1 prisoner died out of 7·95.

‡ One in 19, from 1800 to 1805 inclusive; 1 in 31, from 1806 to 1812; 1 in 34, from 1813 to 1819.

§ The infirmaries have been better organised, and the nursing better conducted. The mortality in 1812, 1813, and 1814, was 1 in 4·06!

‖ The mortality was 1 in 8·46 from 1811 to 1814; 1 in 20·70 from 1816 to 1820; after this period, those condemned to one year of confinement and more were withdrawn.

row the preceding data, estimates the mortality of the galley-slaves' prison as follows :—

At Rochefort, from 1816 to 1828,	1 in 11·51
.. Toulon, ...	.. 20·55
.. Brest, ...	.. 27·06
.. L'Orient, ...	.. 39·17

We have often taken the prisons of Switzerland and the United States as patterns; it may be interesting, therefore, to know the mortality there.*

Penitentiary of Berne,	1 in 25·00
Lausanne, from 1803 to 1825, old method,	.. 21·49
.. .. from 1826 to 1829, new method,	.. 12·25
.. .. from 1830 to 1831,	.. 36·00
.. Geneva, 1826 to 1831,	.. 49·00
Prison of Philadelphia (Pennsylvania),	.. 16·06
.. of Newgate (New York),	.. 18·80
Penitentiary of Sing-sing (New York), 12 years,	.. 36·58
.. Wethersfield (Connecticut),	.. 44·40
.. Baltimore (Maryland),	.. 48·57
.. Auburn (New York),	.. 53·95
.. Charlestown (Massachusetts),	.. 58·40

It is to be regretted that census of the mortality of prisons in England are wanting; it only appears that it is very small. This subject is perhaps more entitled to the attention of statisticians than any other, for there are few which present values so liable to change, and consequently the discipline should be more enlightened. Indeed, we have seen that, according to the negligence or zeal of the governors of prisons, the mortality of the establishment need not exceed what it is in ordinary society, or may become more dreadful than the most destructive scourges. The loss of liberty, and the humiliation connected with the condemned state, are punishments so great, that we need not aggravate them by a mortality unequalled by all the other scourges to which the species is exposed. The mortality of prisons has diminished in almost all establishments without exception; it is a fresh benefit resulting from the diffusion of knowledge, and I dare say from the care with which statisticians have brought forward results on which we did not possess any precise data, and which consequently produced less impression, because we readily deceived ourselves as to the nature of the evil.† I cannot better conclude this chapter than by quoting the principal conclusions to which M. Villermé has been led—one of the men who has thrown most light on this important subject:‡—

1st, The mortality of prisoners is generally much greater than that of free people.

2d, It is in the direct ratio of the bad management of prisons, the state of misery and nakedness of those detained therein, and the privations and sufferings which they passed through before imprisonment.

3d, If the management or discipline is almost powerless in correcting these latter causes, it may always, by care and understanding, prevent or very much extenuate the former.

4th, If, taking away the difference owing to locality and good or bad treatment, we arrange the prisoners in the order of their mortality, they stand as follows:—

Accused.
Condemned.
Detained in mendicity hotises.

* Rapport sur l'Etat Actuel des Prisons en Belgique.

† Mortalité des Prisons, &c.

‡ One of the most remarkable works which has been written on the amelioration of prisons, and the moral reformation of the inmates, is that of Dr Julius of Berlin—*Vorle-sungen über die Gefangniss Kunde*, 8vo. Berlin, 1828. This work has been translated into French. The author, who has investigated the state of prisons with the most remarkable zeal, has been called to Berlin by the Prussian government, to give public lectures on the objects of his researches. He has published a collection called *Jahrbücher der Straf-und Besserungs-Anstalten, Erziehungshauser, &c.*, more especially containing information on crimes and prisons. See also the works of Mr Lucas.

5th, To appreciate the effects of the salubrity or insalubrity, of the good or bad management of each prison, and the different chances of life of each class of prisoners, the best means will be to determine the annual proportion of deaths, not by comparing the latter to the total number of the inmates, but to their average annual population.

6th, Ignorance of the lot of prisoners, of their wants, especially of the wants and the fate of the poorest of them, is the first cause to which may be attributed the excessive mortality shown by the numbers we have quoted.

CHAPTER VII.

RELATIONS OF POPULATION TO SOCIAL PROSPERITY.

1. Of Population and its Increase.

UNTIL now I have been considering the principal facts which relate to the birth, life, reproduction, and mortality of man, but without examining his condition in the social mass. This research, however, is the philosophical end towards which all our efforts should lead: we cannot dissemble as to the great difficulties which it at present presents, notwithstanding it has exercised the sagacity of several writers of the highest merit; and it is with the greatest deference that I present some new observations, which I think capable of receiving useful application.

Populations arise imperceptibly; it is only when they have reached a certain degree of development that we begin to think of their existence. This increase is more or less rapid, and it proceeds either from an excess of births over deaths, or from immigrations, or both. In general, it is a mark of well-being, and of the means of existence being superior to the wants of the actual population. If we approach or exceed this limit, the state of increase soon stops, or a contrary condition may take place. It is then interesting to examine how different countries are populated, what are the means of subsistence and the rate of increase of the people, and to assign the limit which they may reach without danger. After that, the consideration is, to know the composition of the population, and if the constituent elements are advantageously distributed, and contribute, in a more or less efficient manner, to the well-being of the whole. But it would be proper first to take the questions of highest moment, and to establish, in a summary and clear manner, the ideas on population promulgated by the most distinguished economists.

It appears incontestible, that population would increase in a geometrical ratio, if no obstacle were presented to its development.

The means of subsistence are not developed so rapidly; and, according to Malthus, in the most favourable circumstances for industry, they can never increase quicker than in an arithmetical ratio.*

* *Essay on the Principle of Population*, vol. i. p. 13. (Translation of MM. Prévost, Geneva, 1830). This law of the increase of subsistence may appear doubtful, and the ideas of economists are very different on this subject. Mr Senior thinks that there is a tendency in the means of subsistence to increase faster than the population.—See *Two Lectures on Population*, p. 49. On this subject we may also consult the correspondence between this gentleman and Mr Malthus. Mr M'Culloch, in the notes on Dr Smith's *Wealth of Nations*, vol. iv. p. 133, thinks, on the contrary, that the progression established by Mr Malthus is too high for the countries where the best lands are already under cultivation. Since these things cannot be decided until all parts of the globe are under culture, it would be difficult to establish any thing experimentally, of a positive nature, on this head; for if a population consume all the products of the land which they inhabit, they may still, by the exchange of other produce, supply themselves with what before was wanted, and in this case they will receive new accessions: thus the multiplication of machinery, by seconding human labour in England, has allowed the means of subsistence to undergo an increase since the com-

The obstacle to population, then, is the want of food, proceeding from the difference of ratio which these two quantities follow in their respective increases. When a population, in its development, has arrived at the level of its means of subsistence, it ought to stop at this limit, from human foresight; or if it have the misfortune to overleap this limit, it must be forcibly brought back by an excess of mortality.

The obstacles to population, therefore, may be arranged under two heads—the one acts by preventing the growth of population, and the other by destroying it in proportion as it is formed. The sum of the first forms what may be called the *privative obstacle*, that of the second the *destructive obstacle*.*

Mr Malthus has analysed, with great sagacity, the principal obstacles to its increase which population has met with; he has determined, with no less credit, the limit which it cannot pass without being exposed to the greatest danger. However, it may be necessary to remark, notwithstanding the researches of the English philosopher, and of the economists who have followed in his track, that the *modus operandi* of the obstacles has not been clearly made out. The law has not been established by virtue of which they operate: in a word, they have not afforded the means of carrying the theory of population into the domains of mathematical science, to which it seems particularly to belong.† Hence it results, that the discussion of this delicate point has not been completed at the present day, and the dangers attending society have perhaps been exaggerated, from not finding sufficient security in the action of the obstacles against an evil, the dreadful rapidity of which followed a geometrical progression.

To endeavour to fill up so important a *lacuna*, I have made numerous researches, the details of which it will be superfluous here to present; and an attentive examination of the state of the question has proved to me, that the theory of population may be reduced to the two following principles, which I consider will hereafter serve as fundamental principles in the analysis of the development of population, and of the causes which influence it.

Population tends to increase in a geometrical ratio.

The resistance, or sum of the obstacles to its development, is, all things being equal, as the square of the rapidity with which it tends to increase.

The obstacles to rapidity of increase of a population, really operate, then, like the resistance which the media oppose to the passage of bodies through them. This extension of one of the laws of physics, which is most happily confirmed when we apply it to the documents which society supplies, presents a new example of the analogies which are found in many cases between the laws regulating material phenomena and those which apply to man. So that, of the two principles which I take as the basis of the mathematical theory of population, the one is generally admitted by all economists, and scarcely appears contestible, and the other has been verified in all the applications where we had to consider the movements and the obstacles in a continuous manner.

However, notwithstanding the prejudices we might have in favour of them, it would undoubtedly be necessary to reject them, if, by submitting them to analysis, they could not support this proof to the extremest detail.

I thought, therefore, that I ought to examine, first of all, the consequences which the theory involved, and I have had the satisfaction to find them entirely conformable to the results of experience. Thus, when population can develop itself freely and without impediment, it increases in a geometrical ratio; if it be developed in the midst of obstacles of every kind, which tend to arrest it, and which operate in an uniform manner, that is to say, if the *social state does not change*, the population does not increase in an indefinite manner, but tends more and more to become stationary. Hence it results, that population finds, in its very tendency to increase, those causes which ought to prevent the fatal catastrophes which might be feared from too great fullness, if I may so express myself, brought on in a sudden manner, and before which all human prudence would fail. The experience of our old Europe proves very fully, that population arrives at its state of equilibrium, increases, or recedes, by generally following one law of continuity. The bound which it cannot pass is variable, and depends on the quantity of food: population can never be developed so rapidly as to strike suddenly against this bound; the obstacles which previously arise, having the same tendency, are too numerous to render a violent shock possible. Nature does not raise a smaller tribute of deaths; but since we pay this tribute in detail, it is less sensible to us than if we required suddenly to discharge it.

It is thus that the greater part of our population has progressively arrived at the level of the means of subsistence, by continually preserving a tendency to develop, and consequently to reproduce an excess of mortality, nearly in the same manner as the cloud suspended in the air has a continual tendency to descend and diffuse the fullness which it holds. In the midst of the causes innumerable which may disturb this state of equilibrium, population advances or recedes almost in the same manner as we see the cloud ascend or descend according to the temperature, direction of the winds, and a crowd of other atmospherical circumstances, which, however, does not prevent its always reaching a certain average height, depending on its constitution and the obstacle which the resistance of the air opposes to its descent.

When the social system undergoes any changes, the obstacles always preserve the same mode of action; but their intensity may vary in an infinite manner, so that the development of population may be infinitely modified likewise. If we possessed exact census for different periods, the analysis would show the intensity of the causes which have been able to accelerate or oppose the development of population, and the circumstances which have given origin to them. Supposing, for example, that a population which increases continually in an arithmetical progression, the constant difference of which is also known, we might determine, by means of the two laws announced above, what energy the obstacles have successively opposed to the development of the population; in other terms, the law according to which these obstacles have been enabled to manifest themselves. It will suffice to know the law according to which a population is developed, to deduce, at least approximatively, the law according to which the obstacles have developed themselves, and *vice versa*. But such problems as these belong exclusively to analysis; I can only point them out here, reserving a return to them in a special work.

I have said that, when the state of equilibrium has been once attained, population would become stationary, or at least would oscillate around a fixed state,

menecement of the present century, which appears to me to be greater than an arithmetical ratio. We cannot but continue to look upon the products of industry as equal to the products of agriculture, until the exchange of money for food becomes impossible by too great a development of the population on the surface of the globe.

* Malthus—*Essay*, &c. p. 20, tome i. In the view which I have adopted, the destructive obstacle acts generally by natural powers, and the privative obstacle by the disturbing powers of man.

† May I be allowed to recall the ideas on this point which I expressed in 1827, at the opening of a public course on the history of the sciences?—"It is to be observed," I said, "that the more progress the physical sciences have made, accordingly have they tended to enter within the bounds of mathematical science, which is a sort of centre to which they converge. We might even judge of the degree of perfection to which a science is capable of being carried, by the greater or less facility with which it admits of calculation."

in consequence of corresponding variations produced by climate and amount of food; but since it is essential to the nature of man to endeavour to increase the quantity of his produce by a greater degree of manual and intellectual labour, population may be enabled to find the means of development; in such a manner that, if all the physical circumstances were the same in the different countries of Europe, there could not be a better measure of produce and industry than the density of the population found there. The specific population is indeed the result of all the influential elements of a country, and should be found carried to a limit which is in relation to all the facilities which a country could present for its development during the preceding periods.

In adopting the measure of productive power, in a first approximation, it may be interesting to know the specific population of each country, that is to say, the number of inhabitants on a square league of ground: for this purpose I shall adopt the numbers given by M. Balbi in the *Precis de la Geographie Universelle de Malte-Brun*, liv. 16. I thought it necessary to omit the small states having fewer than one million of souls.

	Inhabitants to a Square League (of 25 to the Degree.)
Low Countries,	1829
Lombardo-Venetian kingdom,	1711
Wurtemburg,	1502
England (properly so called),	1457
Kingdom of Saxony,	1252
States of Sardinia,	1122
France,	1062
States of the Church,	1043
Bavaria,	968
Prussian monarchy,	792
Switzerland,	783
Hungary,	750
Kingdom of Naples and Sicily,	747
Spain,	641
Denmark,	616
Portugal,	446
Turkey,	324
Russia,	161
Sweden and Norway,	82

The Low Countries, Lombardy, Wurtemburg, and England, are, then, the countries which really support the densest populations in Europe, and consequently those which, all things being equal, should produce the most for their suitable support. Portugal, Turkey, Russia, Sweden, and Denmark, on the contrary, have populations of less density. Now, since the people of these countries have been increasing for many centuries back, with all the facilities which their locality and institutions allowed, it is to be presumed that if they are not the same in the different countries of Europe, there have been some obstacles to their propagation, either in the lands not being equally fertile, or because it has been more difficult to develop the trade and industry of man, or because there was not a secure basis for social institutions, or, lastly, owing to moral causes, and the other motives, the influence of which on the number of births and deaths I have examined.

There is also an important distinction to be established, and which, because it has not been observed, has often thrown strange confusion into all questions on population; namely, that it is necessary to know not only of how many individuals a people is composed, but also in what manner each individual obtains the means necessary for his own existence. There is an infinity of shades among the people: some have a more cultivated mind, more industry, and more wants; one individual alone consumes by himself what otherwise might support three persons, or even more; but these three men would live miserably, and propagate a people as miserable as themselves. It would then be inaccurate to say that, because the last nation has a population three times as dense as the first, that it produced three times as much. In order that the figures of the preceding table may be compared with each other, it is necessary to multiply them individually by a constant coefficient, being what is necessary for one individual of each nation to supply his wants.

We should also be wrong in judging that, because one nation had a stationary population, it made no progress. The state of industry and knowledge may ameliorate the condition of the population very much, without any traces of it being discernible (namely, the amelioration). This increase of well-being, all things being equal, is measured by the quantity of things which one individual consumes, and in an equitable division of the matter which is consumed. This constant coefficient is destined to play an important part in the theory of population. It is this which defines the limit towards which population tends in its successive growth, almost in the same manner as the point at which a body remains *in equilibrio* in any medium, is regulated by its density. In general, when a population is stationary, according as the consumption of the inhabitant increases or diminishes, in such proportion may the people be said to be made richer or poorer.

Because a population is increasing, we must not conclude any longer that its prosperity increases. It is necessary, first, to consider the constant coefficient, which is the measure of the degree of comfort of the individual, just as, on the other hand, the specific population is the measure of the degree of affluence or comfort of any country. When we wish to establish comparisons between the people, it is of the greatest importance to consult the quality, if I may so express myself, as well as the quantity.

In general, statisticians continue to employ the annual increase of the population, to calculate in what time it would double itself, although experience almost constantly falsifies the results of their calculations. This inquiry, which leads us into the hypothesis that there is no obstacle to the development of a people, can scarcely be directly applied to old Europe, any more than we should expect to see the results of experience accord with those of the theory of the fall of bodies through a vacuum. These calculations, for the most part, are only suited to satisfy curiosity, since they belong to an hypothesis which cannot be realised, or at least is available only within very narrow limits.

If a country, by virtue of its increasing civilisation, takes a new impulse, and from the increase of its produce carries onwards the boundary which limits the extent of its population, it would be in the most favourable circumstances, by a geometrical progression, that it would first tend to reach that boundary; but this rapidity of increase would soon abate, from the effect of obstacles, and would soon be extinguished. The same applies to a decreasing population; but the motion takes place in the opposite direction. Analysis supplies us with some formula, which very accurately express these different states.

Countries most happily divided, scarcely present a population increasing in a geometrical ratio. England, however, is a striking example, which ought to occupy the highest degree of attention. After having been stationary, or even retrograde, at the commencement of the last century, its population then began to increase progressively, undergoing various oscillations until the middle of the century, when, receiving a second impulse, it began to take an arithmetical ratio. A fresh and more energetic impulse was given to it at the commencement of the present century, and it has not since ceased to increase in a geometrical ratio; so that it has passed through states contrary to those of a population which tends to its limit, and where the obstacles go on increasing. Here the obstacles have been diminishing in consequence of the immense progress of industry, and the introduction of such an incredible quantity of machinery, the products of which represent a population which England is far from possessing.

Years.	Population.*	Decennial Increase.	Annual Increase per cent.	Period required for the Population to double itself.
1700, -	5,134,516	— 68,179	—0·13	— 500 years.
1710, -	5,066,337	+279,014	+0·54	+ 129 ..
1720, -	5,345,351	342,642	0·62	112 ..
1730, -	5,687,993	141,712	0·25	278 ..
1740, -	5,829,705	209,979	0·35	197 ..
1750, -	6,039,684	440,046	0·70	100 ..
1760, -	6,479,730	747,856	1·09	63 ..
1770, -	7,227,586	587,241	0·78	89 ..
1780, -	7,814,827	725,911	0·89	77 ..
1790, -	8,540,738	646,438	0·73	96 ..
1800, -	9,187,176	1,220,300	1·25	56 ..
1810, -	10,407,556	1,550,005	1·39	49 ..
1820, -	11,957,565	1,883,186	1·46	48 ..
1830, -	13,840,751	..	..	.. ..

The same ratio of increase does not take place twice successively during the period included in this table, except for late years, when a geometrical progression is very marked, the value of which is 1·38. From 1760 to 1800, the progression was arithmetical, and the constant difference had an annual value of 67686·1. Availing myself of these numbers, I have calculated the successive values of the population, placing by the side of my results the observed values.

Periods.	Population.		
	Observed.	Calculated.	Difference.
1760, - -	6,479,730	6,479,730	0
1770, - -	7,227,586	7,156,591	— 70,995
1780, - -	7,814,827	7,833,453	+ 18,626
1790, - -	8,540,738	8,510,314	— 30,424
1800, - -	9,187,176	9,187,176	0
1810, - -	10,407,556	10,531,900	+ 124,344
1820, - -	11,957,565	12,073,400	+ 115,835
1830, - -	13,840,751	13,840,751	0

These differences between the calculated and observed results do not exceed the limits of the fluctuations which attend the results of different years; the greatest difference of one period of ten years does not amount to 125,000 inhabitants; this inequality does not amount to 1-80th of the population.

We are about to find a second very instructive example, and a much less complicated one, in what takes place in the United States of America, a new country which rose to liberty by one effort, proud of the industry of its inhabitants and the fertility of its soil. Population immediately developed itself there with a rapidity most astonishing, and unknown altogether in this old Europe; immigration also added still further to the excess of births over deaths. But this rapid increase was soon met by obstacles which multiplied, and the rapidity of increase, great as it was, became uniform. It is an arithmetical and not a geometrical progression which is observed. Such are the facts presented by the population of the United States, which has been so often quoted as an example, and which has not been attended to with sufficient scrutiny. I quote the printed numbers of Professor Rau.† They are, moreover, conformable to those which have been given by other statisticians.

Years.	Inhabitants.	Annual Increase.
1780, - - -	2,051,000	6·2 in 100
1790, - -	3,929,326	3·0 ..
1800, - - -	5,306,035	3·1 ..
1810, - -	7,239,763	2·67 ..
1820, - - -	9,654,415	1·9 ..
1825, - -	10,433,000	1·9 ..

* The value of the population is given according to the numbers of Mr Rickman, *Preface to the Abstract, &c.*, 1831, p. 45. Mr Rickman, at page 24, gives as the annual increase for the periods 1901, 1811, 1821, 1831, the values 1·41, 1·57, and 1·54; the difference of my results may be occasioned by the method of calculation employed. I thought proper to compare the annual increase, not to the population of the first year of each period, but to that of an average year of this period.

† *Bulletin de M. Ferussac*, Fév. 1831. See also the numbers given by M. Warden in the *Bulletins de la Société Philomathique*, 1832.

I shall first observe, that the population has made almost regular increases from year to year, so that its successive values form an increasing arithmetical progression, of which the difference between one year and another may be considered as of the value of 190,822.* Proceeding with this hypothesis, we shall have—

Years.	Inhabitants.	Annual Increase.
1780, - - -	2,051,000	6·3 in 100
1790, - -	3,959,220	3·7 ..
1800, - - -	5,867,440	2·8 ..
1810, - -	7,775,660	2·2 ..
1820, - - -	9,683,880	1·9 ..
1825, - -	10,637,990	.. ..

Thus, although in fact population has received considerable increases, things are still in the same state as in 1780; there is as much room and food for new comers, because, nearly every year, about 190,822 individuals come to occupy the wastes which remain to be inhabited. These increases are less sensible when we calculate them, as is generally done, by comparing them to the population. The population is, indeed, less prolific, because the care taken to fill the places which remain vacant, is divided amongst a greater number of persons.†

In the greater number of the countries of Europe, population is increasing, and it is according to the value of the annual increase that statisticians have established their calculations to determine the period at which each of the populations would be found to have doubled. I here quote the results obtained by two gentlemen whose names are esteemed in science.

Countries.	According to Professor Rau.		According to M. Ch. Dupin.	
	Annual Increase.	Period required in which to Double.	Increase.	Period required in which to Double.
Ireland, -	2·45	28·6 years.		
Hungary, -	2·4	29·2 ..		
Spain, -	1·66	41·9 ..		
England, -	1·65	42·3 ..	1·67	42·0 years.
Prussia, -	..	..	2·70	26·0 ..
Prussia on the Rhine,	1·33	52·33 ..	..	..
Austria, -	1·3	53·6 ..	1·01	69·0 ..
Bavaria, -	1·08	64·6 ..	..	..
Low Countries,	0·94	74·8 ..	1·24	56·5 ..
Kingdom of Naples, -	0·83	83·5 ..	1·11	63·0 ..
France, -	0·63	110·3 ..	0·65	105·0 ..
Sweden, - -	0·58	118·0 ..	..	..
Kingdom of Lombardy,	0·45	152·8 ..	..	..
Russia, -	..	..	1·05	65·0 ..

* Representing this difference by d, and P standing for the population in 1780, and x for the number of years which have elapsed, we have for the population of this xth year $Px = P + dx$: it is according to this formula that the numbers of the following table have been calculated. It also follows that the increase a relative to the population, had, as a general value, or for a period of n years after the xth,

$$a = \frac{2\,d}{Px + Px + n}$$

It is according to this formula that the successive increases of the population have been calculated. If by means of lines we represented the degree of increase of the population in proportion to the years, we shall have on one hand a straight line, and on the other an hyperbola. The asymptote marks the limit towards which the increases tend.

† The theory would, moreover, prove, that at first the population has been smaller than the table indicates, for at the end of the last century it should have been more numerous. I hear, indeed, from M. Warden, that the United States, from political motives, and in order to acquire more importance, have, during the time of war, exaggerated the amount of the population, especially in the interior of the country, where strangers can exercise less inquisitive control.

If the doubling of the population were indeed to take place according to this table, we should certainly have to fear a dreadful catastrophe, owing to the means of subsistence not being able to follow so rapid a development; but we have already seen that it is only in very rare cases that a continued and rapid increase can take place. If such catastrophes could happen, we should already have seen them long ago in Europe. No doubt, the mortality may be accidentally increased by famines, pestilence, and other plagues; but these evils, the influence of which civilisation tends to diminish, may take place in countries which have not yet reached their bound.

The calculation of the annual increase of the population is not the only source of deception in estimating the doubling of populations. The subject is still open to great errors in other respects. It will almost always be impossible to agree upon these matters, unless we quote the years and the numbers according to which the increases take place. Many authors only estimate the increase of population from one or two years of observation, and are thus exposed to the greatest errors. This is mixing the influences which we wish to determine, with those resulting from an infinity of causes, which may often cause the former to be entirely misunderstood. It appears to me, that, in order to pronounce with any degree of certainty on the state of a country, we must at least employ the results of ten years' observation; that is to say, of periods during which institutions have remained the same, and no remarkable events have taken place. Thus we might hope to find out the influence of accidental causes, and only retain what results from the nature of the country, its institutions, and the industry of the people. It is especially necessary to avoid taking any numbers of critical years, and those years immediately succeeding them. At the present day, Europe is enjoying a respite after long and bloody wars—after more or less stagnation of commerce; and, under the influence of more liberal institutions, it is easy to understand that produce should become more abundant, and population increase; but does this give any reason to suppose that the increase shall continue the same? It appears to me, that this would be a great error, and I do not fear to appeal the point to experience.

It is very remarkable that a population is more numerous, if it have been constantly stationary during a certain number of years, than if, during the same period, it has been alternately increasing and decreasing, when the ratio of the increase itself has been equal to the ratio of the decrease, the effect of one year not compensating that of another. This seems, at the first view, to be a paradox; we may nevertheless be assured of its truth. If we seek to find what becomes of a given number of individuals after $m+n$ years (m indicating the years during which the population has been stationary, and n those during which it has received an increase or decrease of a determinate quantity), we find that the number of survivors continues the same, in whatever manner the years $m+n$ have succeeded each other. Thus, whether a population increases regularly during ten years, and then is stationary for twenty more—whether these two periods succeed each other in an inverse order, or are intermixed—a given number of individuals who shall be born, will present the same number of survivors when the thirty years have passed over.*

2. Of Tables of Population.

Populations present very great differences, according to the manner in which the individuals who compose them are grouped, either by families or houses; however, when considering only one country, these differences are less apparent. In the country of Belgium, for example, we have about five individuals to one family, and this number is a little smaller in town. We also calculate, almost exactly, in each province and in the country, 106 families to 100 houses, whilst we find 125 to 174 in towns.

We observe, also, that in the country of Belgium the individuals of both sexes are nearly balanced. It is not so in towns; the number of men is every where smaller than that of women. This difference may be owing to the greater mortality of men, as well as to the more frequent employment of female domestic servants. In the country, on the contrary, male servants are most sought after for cultivating lands.

If we divide the population of the two sexes into three classes, namely, unmarried, married, and widowers, we shall have, still preserving the distinction of town and country—

In Town.	In 1000 Men.			In 1000 Women.		
	Unmarried.	Married.	Widowers.	Unmarried.	Married.	Widows.
Flanders, East,	652	311	37	643	281	76
" West,	646	317	37	638	278	84
Brabant, - -	629	332	39	625	284	91
Hainault, -	642	316	42	604	307	89
Liege, - -	635	323	42	624	293	83
Anvers, -	655	312	33	646	276	78
Namur, - -	663	297	40	622	291	87
In the Country.						
Flanders, East,	687	276	36	651	272	67
" West,	671	293	36	645	283	67
Brabant, - -	652	313	35	623	311	66
Hainault, -	647	317	36	611	318	71
Liege, - -	646	312	42	618	305	77
Anvers, -	672	289	39	639	289	72
Namur, - -	634	331	35	596	332	72

Whence we see that,

1. In general, two-thirds of the population are unmarried; the other third is composed of married persons or widowed.

2. Taking 1000 individuals of each sex, the unmarried males are rather more numerous than the unmarried females: it is the same with the married men.

3. The unmarried are still more numerous in country than in town; so that we find the greatest number of unmarried persons out of 1000 in the country, who are also males.

4. The number of widows is almost double the number of widowers.

This latter result, which is very remarkable, becomes more striking when we compare the number of widowers with that of widows.

Provinces.	Widowers to 100 Widows.	
	City.	Rural Districts.
Flanders, East, - -	44	53
" West, -	39	53
Anvers, - - -	38	55
Brabant, - -	37	53
Hainault, - - -	46	50
Namur, - - -	45	47
Liege, - - -	46	52

Thus the number of widowers, compared with the number of widows, is incontrovertibly more numerous in town than in country, and especially in the provinces of Brabant, Anvers, and Western Flanders.

This circumstance may be owing to men marrying later in town than in country. Indeed, we shall observe that the three provinces which have just been pointed out, are those which, all things being equal,

* Recherches Statistique sur le Royaume des Pays-Bas, p. 61, *et seq.*

have the greatest part of their population shut up in the cities. Men have also more facility of passing from the state of widowhood than women.

The distribution of the population according to age, has long occupied the attention of statisticians more than any other element. Tables of population are of two kinds—the one kind are obtained directly by a census, the other are deduced from tables of mortality. When we may rely on the accuracy of the census, the former are always preferable to the latter, and more faithfully represent the actual state of the population.

The table which I here present is the result of a great census made in Belgium about the end of 1829; it has been calculated from original documents, and I think I can guarantee its accuracy. In the *Recherches sur la Reproduction et la Mortalité*, all the documents belonging to it may be seen.

TABLE OF THE POPULATION FOR BELGIUM.

1,000,000 Persons are taken as a basis, and classed according to the indications of the Table.

Age.	Men.				Age.	Women.			
	Unmarried.	Married.	Widowers.	Total.		Unmarried.	Married.	Widows.	Total.
0 years,	317,202	146,164	17,949	481,315	0 years,	335,930	146,053	36,702	518,685
1 "	303,058	146,164	17,949	467,171	1 "	322,212	146,053	36,702	504,967
2 "	288,997	146,164	17,949	453,110	2 "	308,595	146,053	36,702	491,350
3 "	276,369	146,164	17,949	440,482	3 "	296,379	146,053	36,702	479,134
4 "	263,815	146,164	17,949	427,928	4 "	284,204	146,053	36,702	466,959
5 "	251,389	146,164	17,949	415,502	5 "	272,067	146,053	36,702	454,842
6 "	239,166	146,164	17,949	403,279	6 "	260,449	146,053	36,702	443,204
8 "	216,910	146,164	17,949	381,023	8 "	238,863	146,053	36,702	421,618
10 "	195,861	146,164	17,949	359,974	10 "	218,646	146,053	36,702	401,401
12 "	176,439	146,164	17,949	340,552	12 "	199,828	146,053	36,702	382,583
14 "	158,023	146,164	17,949	322,136	14 "	181,683	146,053	36,702	364,438
16 "	137,837	146,164	17,949	301,950	16 "	162,364	146,049	36,702	345,115
20 "	104,068	146,072	17,945	268,105	20 "	128,083	145,654	36,694	310,431
25 "	66,240	142,847	17,892	226,979	25 "	89,894	139,767	36,600	266,251
30 "	39,818	129,077	17,637	186,532	30 "	63,823	123,892	26,219	223,934
35 "	25,465	108,696	17,139	151,300	35 "	47,243	102,762	35,421	185,426
40 "	18,187	89,973	16,488	124,648	40 "	36,216	81,499	34,024	151,739
45 "	13,736	71,939	15,571	101,246	45 "	28,249	61,419	31,916	121,584
50 "	10,311	54,700	14,460	79,471	50 "	21,857	44,218	29,167	95,242
53 "	8,404	44,050	13,402	65,856	53 "	18,069	34,223	26,709	79,021
56 "	6,962	35,231	12,296	54,489	56 "	15,095	25,417	24,385	65,897
59 "	5,094	27,787	11,164	44,645	59 "	12,535	20,090	21,719	54,344
62 "	4,430	20,764	9,633	34,827	62 "	9,948	14,672	18,603	43,223
65 "	3,434	15,120	8,242	26,796	65 "	7,749	10,301	15,683	33,783
67 "	2,817	11,599	7,112	21,528	67 "	6,049	7,685	13,416	27,150
69 "	2,317	9,020	6,113	17,450	69 "	4,940	5,732	11,367	22,039
71 "	1,772	6,540	5,100	13,412	71 "	3,773	4,054	9,175	17,002
73 "	1,391	4,976	4,286	10,653	73 "	2,994	2,563	7,571	13,528
75 "	1,027	3,575	3,389	7,991	75 "	2,254	2,030	5,930	10,214
77 "	710	2,369	2,538	5,618	77 "	1,589	1,300	4,369	7,258
79 "	482	1,517	1,845	3,844	79 "	1,085	814	3,102	5,001
81 "	305	831	1,191	2,327	81 "	690	451	1,968	3,099
83 "	198	516	804	1,518	83 "	434	239	1,350	2,063
85 "	123	302	510	935	85 "	276	144	854	1,284
87 "	76	161	300	537	87 "	154	78	502	734
89 "	39	90	172	291	89 "	88	41	299	428
90 "	26	48	123	197	90 "	60	27	216	303
91 "	17	32	79	128	91 "	39	17	143	199
92 "	14	26	57	97	92 "	29	14	109	152
93 "	11	19	41	71	93 "	18	13	76	107
94 "	7	15	31	53	94 "	12	10	54	76
95 "	5	11	22	38	95 "	10	6	38	54
96 "	4	8	16	28	96 "	6	5	24	35
97 "	1	5	10	16	97 "	3	3	18	24
98 "	1	4	6	11	98 "	2	2	10	14
99 "	0	1	5	6	99 "	1	1	5	7
100 " and upwards,	0	0	3	3	100 " and upwards,	1	1	2	4

Without staying, for the present, to bring forward some results which may be deduced from this table, I shall examine how far two tables of population, obtained by a census and from the list of mortality, can agree with each other.*

When a population is stationary, that is to say, when we have annually as many deaths as births, the tables of mortality are considered as the true tables of population. Thus, according to the general table given above, of 100,000 births, we found 77,528 children of one year, 70,536 of two years, 66,531 of three years, and so on; and the sum of all these individuals formed the whole population, which, according to the same table, had raised itself to 3,264,073 souls. If we then successively cut off from this sum the number of births, the number of individuals of one year old, of two years, &c., the remainder will express the number of survivors at these different ages. In this manner, we should form a table of population; but to render it comparable to that which has been obtained directly by the census, we should also require to take 100,000 as the basis, instead of 3,264,073, and reduce all the other numbers to a proportion with it. The following table has been obtained in this indirect manner from the table of mortality, supposing the population stationary. It is found to correspond with the table of population obtained by the census, and such as has been given above, but without preserving the distinction of places and sex. We may judge of the errors which these tables present.

* We may consult some writings on census, recently published, with advantage—*Census of the Population*, by Mr Babbage, *Edin. Rev.* No. xcvii. *Letter to his Grace the Duke of Hamilton and Brandon Respecting the Parochial Registers of Scotland*, by Mr J. Cleland: Glasgow, 1834, 8vo. Notes by M. le Baron de Keverberg, being the Appendix to the *Recherches sur la Population, les Naissances, les Décès, &c., en Belgique.*

Table of the Population of Belgium.

Age.	Deduced from the Table of Mortality.	Obtained Directly by the Census.	Age.	Deduced from the Table of Mortality.	Obtained Directly by the Census.
Birth,	100,000	100,000	67 years,	6,404	4,868
1 year,	96,937	97,214	69 ..	5,194	3,951
2 years,	94,952	94,446	71 ..	4,116	3,041
3 ..	92,401	91,962	73 ..	3,179	2,418
4 ..	90,361	89,489	75 ..	2,379	1,820
5 ..	88,400	87,034	77 ..	1,724	1,388
6 ..	86,487	84,643	79 ..	1,205	894
8 ..	82,763	80,274	81 ..	816	543
10 ..	79,143	76,133	83 ..	530	358
12 ..	75,590	72,314	85 ..	327	222
14 ..	72,094	68,657	87 ..	190	127
16 ..	68,648	64,707	89 ..	104	72
20 ..	61,932	57,854	90 ..	76	50
25 ..	53,952	49,323	91 ..	55	33
30 ..	46,506	41,047	92 ..	39	25
35 ..	39,524	33,673	93 ..	27	18
40 ..	32,992	27,639	94 ..	19	13
45 ..	26,908	22,283	95 ..	12	9
50 ..	21,289	17,471	96 ..	8	6
53 ..	18,154	14,488	97 ..	4	4
56 ..	15,220	12,039	98 ..	2	2
59 ..	12,495	9,899	99 ..	1	1
62 ..	9,953	7,811	100 & upwards,	1	1
65 ..	7,746	6,058			

The table of population deduced from the table of mortality gives results which are generally greater than those of the table obtained directly by the census. Thus, it indicates that in a population of 100,000 souls, there were 53,952 individuals who were more than 25 years old, and the other table gives only 49,323 individuals having more than this age. How does this difference arise, and how may it be explained?

According to several distinguished authors who have written on this subject, it would be sufficient (as we said above, if the population were *stationary*, that is, the number of births annually being constantly nearly equal to that of deaths)* to calculate the table of population from that of mortality. We shall here remark, that it would undoubtedly suffice, in the greater number of cases, where the population is stationary; but this single condition is not enough: it is also necessary that the same number of deaths correspond annually also, in order that the proportion of the survivors may remain nearly the same at the different periods of life, and that the numbers entered on the tables of mortality for each year may be reproduced almost identically. To perceive the necessity of this condition, let us suppose that we form a table of mortality for a triennial period, during which the population shall have been stationary; and let us suppose, moreover, from some cause, that the mortality during this period affected individuals of fifty years in preference, and, as a compensation, sparing those newly born, that afterwards all may be re-established in the usual order. It would happen, that the population table which we deduce from this table of mortality, will not truly represent the actual state of things: it will indicate too great a population for the fiftieth year, and too small a one for the children.

We may begin to see that a population may be stationary, without our being able to deduce from its bills of mortality, calculated for a certain number of years, a table of the population. We see, on the contrary, that this calculation may be made without inconvenience, in the case where the population was not stationary. Indeed, let us suppose a stationary population, and also admit that the tables of mortality may annually present numbers identically the same; it is evident that, by multiplying each of these numbers by a constant ratio, greater or less than unity, that these multiplications will have no other effect than to make an increase or decrease, in the same ratio, of all the numbers of the table of mortality, and consequently those of the table of population.*

In this manner, the bases merely of the tables will have varied: now, the base which we employ is quite arbitrary; we have adopted 100,000, so that we might have numbers which we could compare with each other, and with those of other tables. Thus, all has been done as if we had multiplied by a constant ratio each one of the numbers which are placed in the tables, whilst really the population was increasing or decreasing.

After what has been said, we see *that the necessary conditions to enable us from a table of mortality to deduce a table of population, are, that the deaths at each age preserve annually the same proportion to each other, whether the population be stationary, increasing, or decreasing.*

Applying the preceding to the tables of population given above, we conceive that the differences which they present do not simply arise from the circumstance that in Belgium the population is in a state of increase, but because the mortality has not each year struck the same ages in the same proportions; and no doubt also owing to the years having not been equally fruitful. It is necessary to observe, on the other hand, that, under the French government, certain parts of the population were decimated by wars, and consequently must present vacuities.

3. Can Data on Population Furnish any Marks of the Prosperity of a People?

In seeking to measure the prosperity of a people, the movements of the population have often been made use of. The possibility of arriving at satisfactory results, by following such a course, would undoubtedly deserve to be deeply examined. It is a question of great interest; but I confess the data alone of the population do not appear to me to be sufficient to resolve the question. Local influences, climate, customs, institutions, &c., are elements which we can scarcely neglect, when comparing one people with another: perhaps there would be less danger when comparing a people with itself at different periods, during which these elements have not undergone any sensible variation.†

* Lacroix — Traité Elémentaire du Calcul des Probabilités, p. 210: 1833.

* Some lines of calculation will better enable us to comprehend this mode of reasoning. Let us designate by the letters

$$a^1, a^2, a^3, a^4, a^5, \&c.,$$

the deaths observed from 0 to 1 year, from 1 to 2 years, from 2 to 3 years, &c. Moreover, let us designate by A, A^1, A^2, &c., the numbers written in the table of mortality opposite 0 year, 1 year, 2 years, 3 years, &c., so that

$$\begin{aligned} A &= a + a^1 + a^2 + a^3 + a^4 + \&c. \\ A^1 &= a^1 + a^2 + a^3 + a^4 + \&c. \\ A^2 &= a^2 + a^3 + a^4 + \&c. \\ A^3 &= a^3 + a^4 + \&c. \\ &\&c. \end{aligned}$$

We shall have, for the corresponding ages of the table of population—

$$\begin{aligned} \Sigma A &= A + A^1 + A^2 + A^3 + A^4 + \&c. \\ \Sigma A^1 &= A^1 + A^2 + A^3 + A^4 + \&c. \\ \Sigma A^2 &= A^2 + A^3 + A^4 + \&c. \\ \Sigma A^3 &= A^3 + A^4 + \&c. \\ &\&c. \end{aligned}$$

If we now multiply by n each of the numbers of the deaths, we shall have, for the numbers of the tables of mortality—

$$nA, nA^1, nA^2, nA^3, nA^4, \&c.;$$

and for the numbers of the table of population—

$$n\Sigma A, n\Sigma A^1, n\Sigma A^2, n\Sigma A^3, \&c.$$

But in certain cases we may have $n > 1$, $= 1$, < 1, with an increasing population, stationary or decreasing; in both these cases, the table of population and the table of mortality will continue to present the same numbers for the same ages, if we take the same base as the starting-point.

† I shall here bring forward, in a great measure, an article which I inserted in the *Revue Encyclopedique* for August 1830.

The Academy of Moral and Political Sciences, during the Session June 7, 1834, put the following question to the meeting:—*To determine in what the misery of different countries consists, and by what signs it is manifested: to examine the causes which produce it.*

We might be exposed to serious errors in not taking notice of the number of marriages and births of a nation; for if it be true that disheartening circumstances sometimes add evil to evil, as in Ireland, and since moral degradation is a great stimulus to precocious marriage,* it may still happen that mortality only makes greater ravages; and one of the most fatal scourges of a people is to see its generations renewed with a degree of rapidity which does not allow it to preserve useful men. Now, it generally happens that the births are regulated by the number of deaths; that is to say, the countries which produce the greatest number of children, are precisely those in which the mortality is the greatest. When reproduction is greater than the limits of prudence, it appears that the weakest part of the population is the first to feel the consequences, the excess of the population passing rapidly from the cradle to the tomb. If, therefore, the number of births could be useful to show the degree of prosperity of a people, it would be more particularly in considering it in relation to the mortality. But, as I have said, the mere number of births appears to me absolutely insufficient.

I should have more distinct confidence in the number of deaths, if it only established a measure by which we might be assured of a population having attained or exceeded the limits which it could not cross without condemning itself to pauperism. M. D'Ivernois has very clearly shown† the utility of it on this head; and the publication of the work which he announces under the following title is much to be desired — *On the Average Mortality Considered as a Measure of the Comfort and Civilisation of a Nation.* This universal measure, says the author, I flatter myself I have found in the *mortuary number* of the people, by which I understand that which indicates whether the proportion of deaths annually, compared with the total number of living persons, increases or diminishes. Perhaps we may be wrong in precalculating the results; but if we observe that this measure does not change when the total amount of those alive remains the same, as well as that of deaths, we may have some fear of its precision. A population may remain numerically the same from different causes, and present a greater or less number of useful men, without our being able to say, for that reason merely, that its comfort also remains the same. If so, we should estimate a child as equal to a useful man.

To take one example only. If, from any cause whatever, the mortality in a flourishing country were to attack useful men more particularly, and spare the children, the number of deaths and that of births remaining otherwise the same, it would infallibly happen, after some years, that this population would be deteriorated, and would have lost many of the elements of prosperity; and yet the loss which it had experienced would not in any manner be detected by the measure employed. The mortuary figure would remain the same; and a considerable number of useful and productive men would be replaced by unproductive children.

Certainly we cannot deny that very strict relations exist between the happiness of a country and the movements of its population; the thing is, to ascertain how to express them. It seems to me that on this head we ought to make an important distinction. We may consider the question in two points of view. We may propose, when considering a people, to examine which are the disastrous years—those during which it has suffered more or less; or, on the other hand, we may examine, in an absolute manner, what is the number of useful men at disposal—in a word, what is its strength, which is also one of the principal elements of its prosperity. In the first case, the number of deaths would almost always be employed with considerable success; for a disastrous year is generally accompanied and followed by numerous privations, even amongst the most highly favoured people, and privations are mortal to the human species. Thus, if we only knew that 1817 was a year of famine for Belgium and a great number of countries, we should attain our end without trouble, because the number of deaths was greater than for the years which preceded or followed. This increased mortality was also felt in the mendicity houses, in which it was almost double what it had been heretofore, as also in the hospitals and asylums for foundlings.

As to the second manner of considering the question, I have endeavoured to show why the number of deaths merely appeared to me insufficient. It is important, indeed, to know not only how many deaths take place in the population, but also at what age these deaths occur. Some writers have employed, in such estimates, the duration of the average life, others the duration of the probable life; and they have sought to establish their valuation according to the changes which the one or the other of these values undergoes. But here we meet with an obstacle nearly similar to the one I have before pointed out; namely, that the duration of the probable life, as also that of the average life, may have a value of different kinds. This inconvenience is especially felt, when we employ the number which expresses the probable life, since, in fact, we only consider the period at which a certain number of individuals of the same age are reduced to one-half; and we do not express whether those who died first were able to make themselves useful during a longer or a shorter time, neither does it establish any thing with respect to those who survive.

Taking the figure which expresses the average duration of life, or the average of the ages to which a certain number of individuals have attained, whom we suppose to have been born at the same time, we also give the same value to one year of the life of an infant as to that of a man whose labours have been profitable to society.

There is one difficulty to which the preceding questions are liable, and which deserves particular attention, because very important and interesting considerations are connected with its solution—considerations of high moment to statistics and political economy. M. D'Ivernois, whose labours have been so beneficial to these sciences, has kindly called my attention to this difficulty, and asked my advice on this delicate point: he was desirous of knowing if two nations, who, as regarded the ratios of births and deaths, might stand at precisely the same numbers, might not have two averages of life, by virtue of the eventual difference in the order of mortality for the age of their dead.*

For the sake of simplicity, let us suppose a people who have each year the same number of births and deaths, and let us examine if the average duration of life may not vary from year to year; this question returns, in fact, to the same point as that which was proposed above. If we formed a table of mortality after the deaths of one year, and deduced the average duration of life from it, I suppose that we should find it 30 years exactly. The year following, if the mortality took place in the same manner and in the same proportion, the duration of average life would still be 30 years. But if, in the lists of deaths of this second year, we substitute an infant of one year for a man of forty, which will not affect the proportional number of births or deaths, we shall find, however, when taking account of the infant substituted for the full-

* See an article by M. D'Ivernois inserted in the *Bibliothèque Universelle de Genève*, March 1830.

† Bibliothèque Universelle, 1831.

* In inserting my answer in the *Bibliothèque Universelle de Genève*, March 1834, M. D'Ivernois announces that he had come to the same conclusions as myself, and that he received similar results from M. Villermé.

grown man, that the average duration of life became rather shorter, since the sum of years which had been lived would be reduced by 39 years. We see already, that if the tables of mortality and the duration of average life were only calculated according to the observations of this year, they could not present the same identical results as for the first year. Average life would be shorter; but it is evident that society would have gained, since it preserved an useful man instead of an infant.

We conceive that, if instead of one such substitution, a greater number were made, average life, calculated according to the deaths of this year, would be found diminished in a very sensible manner; and nevertheless we should have cause to be glad at what at first appears a paradox. In fact, we should have preserved useful years to the state, in exchange for some years which are expensive to it.

But it may be objected that these 39 years are not lost to the sum of the years lived, and that the individual of 40, who has been replaced, will lengthen the average duration of life, when he dies, by the whole period which he has gained by the substitution; and, indeed, if the period of time according to which we calculate the average duration of life is also extended, so as to comprise the death of the individual in question, it is evident that this debt of 39 years has only been deferred, and that the sum of years lived is not found affected. Thus, the average life remains the same; but it is always correct to say, that even then society has been benefited, since, for a longer or a shorter time, useful years have been substituted for expensive ones.

If, by a concurrence of circumstances which civilisation ought to produce, such substitutions are made as those we have just been considering, not for one year only but for several, and if this state of things should continue increasing, we conceive that it would become impossible, still preserving the same proportional numbers of births and deaths, to preserve the same average life: it must begin to diminish. However, how is it that such extraordinary results are not met with? It is, I think, because the substitutes are never sufficiently numerous, nor their duration long enough, to leave sensible traces amidst the other influencing elements.

However, this teaches us how necessary it is to guard against the inductions which we might draw from the average duration of life, calculated from few years of observation, and among a people in progress or decay. By extending the preceding reasoning, we readily arrive at the following conclusions:—

1. A people may annually have figures of exactly the same value, as proportional numbers of births and deaths, without the average life continuing the same.

2. When, all things being equal, the mortality spares the perfect men and takes off the children, the duration of the average life diminishes, and *vice versa*: it being understood that we calculate the average life from the number of deaths.

3. The number of births, deaths, and of the average life, may preserve the same value, whilst, indeed, the population experiences great losses, or receives great benefits, which remain unobserved.

4. To estimate suitably what a population gains or loses, it is necessary, when making the division of years, to establish the average life, to take into account the *quality* of these years, and to examine whether they are *productive* or not.

When, for example, it is intended to estimate the forces which a state can command, in considering the problem in a purely physical point of view, as has been done, it appears to me that the most certain way would be, to compare the number of useful men with those who are not so. The elements of comparison, in this case, would require to be extracted from the tables of mortality, or rather from accurately constructed tables of population; and it would be necessary to inquire how many children there are, not in a condition to be useful, in a given number of individuals, and how many of the old men contribute to the benefit of society: we might divide a population into two parts, the one being less, and the other more than 15 years of age. I allow that I here suppose that a man cannot render himself more useful at 30 or 40 than at 16 or 80; but this is an inconvenience which we also find in other methods of valuation, and which, moreover, we might cause to disappear, by attributing more importance to certain years of life than to others, if extreme accuracy did not become illusory in such a case. To give us a somewhat accurate idea at first, of the manner in which the population is composed, I have here collected the most accurate data from some of the principal countries previously considered. We shall find the numbers classed separately belonging to the two categories which I have established between productive individuals and those whose maintenance may be considered as a charge to society.

Ages.	Great Britain: 1821. Marshall.	Ireland: 1821. Marshall.	England: 1821. Marshall.	England and part of Wales: 1813 to 1830. Rickman.	France: before 1789. Annuaire.	Belgium: 1829. Annuaire.	Sweden: 1820. Marshall.	United States: 1830. Marshall.
Below 5 years,	1647	1535	1472	1487	1201	1297	1307	1900
5 to 10 ··	1385	1355	1300	1307	981	1089	1010	1455
10 to 15 ··	1209	1218	1119	1114	939	946	894	1243
15 to 20 ··	1046	1219	1000	992	897	883	899	1112
20 to 30 ··	1558	1760	1583	1574	1638	1630	1711	1781
30 to 40 ··	1180	1150	1176	1181	1404	1341	1362	1091
40 to 50 ··	878	771	931	934	1161	1017	1067	688
50 to 60 ··	545	600	653	659	892	793	855	430
60 to 70 ··	348	273	469	456	577	604	586	253
70 to 80 ··	160	96	227	228	255	279	240	110
80 to 90 ··	40	23	62	63	50	66	41	31
90 to 100 ··	3·4	3	5·5	5	4·3	4·9	1	4
Above 100 ··	0·1	0·5	0·3	0·2	0·2	0·1	0	0·2
Below 15 years,	4241	4108	3891	3908	3121	3332	3211	4498
Above ··	5738·5	5895·5	6105·8	6092·2	6879	6668	6782	5500·2
Ratio, · ·	1·36	1.43	1·57	1·56	2·20	2·00	2·11	1·22

The results of this table, although in some degree foreseen, surprised me very much. I confess I did not expect to find so great a difference between the numbers of France, Belgium, Sweden, and those of England and the United States. In the former countries, the adult population is double the other, whilst in the latter it is only one-fourth or one-third more. The United States, especially, appear to be in an

extremely unfavourable condition, since they, of all countries we have been considering, present the fewest adults in the population.

The great disproportion which has been pointed out, is more especially owing to the rapid increase of population in England and the United States of late years: the greater number of the individuals proceeding from this great development of fecundity, are still little advanced in the career of life; so that there will be a greater number of persons not adults. The prodigious increase of population which has been observed in the United States, has taken place within little more than 30 years; we also see that the number of individuals under this age is comparatively superior to that of other countries. It is the same in England and Ireland in ascending from 20 to 30 years: Sweden, France, and Belgium, on the contrary, present populations which have slowly increased, and which may thus pretty well represent the usual proportion of adults in ordinary times.

I do not think that, up to the present time, sufficient attention has been paid to the great number of children which too rapid an increase of population throws into a country, and the smaller intrinsic value which this population momentarily receives from it, which must be a very powerful obstacle to ulterior development.

In France, Belgium, and Sweden, for example, of three inhabitants, two at least are in a state for reproduction, whilst in the United States only one in two, or more accurately, six out of eleven.

In conclusion, it is production which regulates the *possible limit* of the inhabitants of a country. Civilisation narrows this limit, and tends to increase the produce which belongs to each individual, so as to increase his well-being, and secure him the means of existence. As to medicine, it is limited to close certain passages to the tomb, but only by enlarging others; for it cannot increase the list of the living, except in causing the supernumeraries to live at the expense of society. "Esculapius himself could not, by his art, confer immortality on one-half of men, except by condemning them to abstain from reproduction, unless by doubling the mortality of the other half, or by pushing production to the point of supplying the new wants which would arise."* Yet it would be also misrepresenting the immense benefits which have accrued to humanity from medicine, to deny its power in lengthening the average life of man; but this grand conquest, due to the progress of knowledge, can only be maintained by the knowledge and foresight of men, who prevent, by celibacy, new births and new food for death.† When there takes place no sudden change, nature annually levies upon us the same tribute of deaths, from which each of us seeks as much as possible to withdraw: each is desirous to belong to the privileged class; but the effect of this kind of fraud is not so much to diminish the amount of tribute, as to transfer it to those of our neighbours who are less favourably placed in their social position.‡

The average duration of life, could it be ascertained exactly, would furnish us with a measure of the prudence and hygienic state of a country: the consumption of the inhabitant would give the state of civilisation and the exigencies of climate; and the proportional number of inhabitants, keeping in view this latter measure, would give that number which represents its production.*

* ["Esculape lui-même ne pourrait, par son art, donner l'immortalité à la moitié des hommes, qu'en les condamnant à ne point se reproduire, à moins de doubler la mortalité de l'autre moitié, ou de porter la production au point de fournir aux nouveaux besoins qu'il aurait fait naître."]

† By prolonging the average duration of life, the medical sciences substitute useful years for unproductive ones. The adult man has a longer career, produces more, and society has fewer infants to feed; so that, in this point of view, medical sciences really increase production and render a new service. This remark was made to me by a friend, and I mention it here because I believe it to be true.

‡ M. Villermé has observed to me, whilst this work was in the press, that he has advanced the same idea, but under another form, in his work on epidemics.

* M. Chitti, who makes *social economy* consist in obtaining the greatest possible utility, with the least possible labour, has given the following measure of riches:—"The degree of the riches of a people, as well as those of an individual, is indicated by the ratio between the sum of the wants and the sum of the available funds which he possesses to satisfy them."—*Cours d'Economie Sociale au Musée de Bruxelles, 3d Lecture.*

BOOK SECOND.

DEVELOPMENT OF STATURE, WEIGHT, STRENGTH, &c.

Apparently but little interest is attached to the determination of the stature and weight of man, or to his physical development at different ages; nor, until the present time, has any one particularly attended to this subject. Man has only been studied in his most conspicuous relations; the correlative study of his qualities, and the numerical determination of the modifications which are consequent upon age, have been neglected. This state of things leaves immense voids in science, and the result is that we generally want the necessary means for solving a great number of interesting questions, especially relating to the natural history of man. For example, we are almost totally ignorant of the ratios which may exist between the laws of development of his different faculties, and what are the elements which predominate at such or such an age: hence the critical periods of life can only be determined in a very indefinite manner.

The researches which have been made to measure the height and weight of man, especially relate either to the period of birth or to the period of complete development; but the intermediate ages have scarcely been attended to. Physiologists have connected the first of these determinations with a question in legal medicine; they have even anticipated the period of birth, and sought to value the size and weight of the fœtus. Natural philosophers, who studied man as a mechanical agent, have rather been occupied with the determination of his weight when he has acquired complete development. La Hire has made some very remarkable researches of this kind, which prove that the subject now occupying us has a much deeper interest than that resulting from mere curiosity.

To show how little advanced is the state of the study of the progressive development of man, let us suppose that we want to establish the age of an individual, from the aggregate of his physical qualities: we may be allowed to say, that we shall not find in science any assistance for the determination of this question—we shall be reduced to mere empirical conjecture. However, legal medicine presents numerous examples where such determinations become necessary. We may ask, no doubt, if it will ever be possible to obtain them, especially for advanced ages? This fear, well founded as it may appear, ought not, however, to lead us to reject such researches: that would not be very philosophic. If to the data furnished by the habit of observation, and the *tact* resulting therefrom, we can join physical qualities susceptible of measurement, prudence bids us not neglect them. When a physician is called to examine the body of an infant found lifeless, and when, in a legal inquiry, he, from simple inspection, establishes the presumed age of this child, it is evident that he cannot but impose his judgment on those who read the inquiry, however erroneous it may other-

wise be, since there are no elements existing for the verification of it. If, on the contrary, to the assistance of the estimate which has been made of the age, is joined the height and weight of the child, and some other physical qualities susceptible of computation; and if, moreover, there were exact tables which might enable one to ascertain, at different ages, the values of these physical qualities, and the limits within which they are found connected in individuals regularly formed, the judgment given of the age would be capable of verification—it would even become useless, if the elements of verification admitted of great accuracy. Such appreciations, then, ought not to be neglected by legal medicine, since they tend to substitute precise characters and exact data for conjectural estimates, which are always vague and often faulty.

Thus, apart from the interest which is presented by the determination of man at different ages, and in researches relating to the average man, it may present another important element, as we shall see more perfectly farther on, for the solution of the following problem of legal medicine: *To determine the age of an individual after death, from the aggregate of his physical qualities.* In this sense, weight would be one of the elements which it would be necessary to connect with the distinguishing of individuals; and this physical character naturally takes a place near that of the stature.

Researches on the height of man, and on his development, may have another useful end, that of enlightening governments on many points; as, for example, as regards the fixing of the age of recruits.

There is another element, the determination of which is equally important, and which, also, is but little known, namely, the strength. I do not flatter myself that I have filled up the voids which science presented on this subject, but I shall think myself happy if my researches may induce other persons to attempt it.

CHAPTER I.

OF THE DEVELOPMENT OF THE HEIGHT.

I DO not think that, before Buffon, any inquiries had been made to determine the rate of human growth successively from birth to maturity; and even this celebrated naturalist cites only a single particular example; neither has he examined the modifying influences which age exerts on height. The only researches at all precise which science possesses, refer to the length of the child before birth, and to that of the fully developed man.*

Chaussier, who invented the *mecometre*, an instrument adapted to measure the length of children, thought that we might view as regular the increase in length of the child for six months before its birth; and he estimated this increase at two inches per month. In the *Dictionnaire des Sciences Medicales*, the length of the fœtus is estimated by the following numbers:—

	Metres.
At birth,	0·487 to 0·541
One month before birth,	0·433 to 0·487
Two months	0·379 to 0·433
Three months	0·300 to 0·379
Four months	0·216 to 0·300
Five months	0·162 to 0·216 †

The medium length of the child at birth would then be 0·514 metres: this estimate differs but slightly from that obtained at the Foundling Hospital in Brussels, by means, also, of Chaussier's *mecometre*. On measuring the length of fifty male and as many female children immediately at birth, the following numbers were obtained:*—

Length.	Boys.	Girls.	Total.
From 16 to 17 inches French,	2	4	6
.. 17 to 18 ..	8	19	27
.. 18 to 19 ..	28	18	46
.. 19 to 20 ..	12	8	20
.. 20 to 21 ..	..	1	1
	50	50	100

With regard to the mediums or averages and the limits, they have given the following values for the two sexes:—

Value.	Boys.	Girls.
Minimum,	16 inches 2 lines. †	16 inches 2 lines.
Medium,	18 .. 6 .. nearly.	18 .. 1½ .. nearly.
Maximum,	19 .. 8 ..	20 .. 6 ..

From these results it follows, that, from the period of birth, the height or length of one sex is superior to the other; being, for boys, 0·4999; for girls, 0·4896; giving thus in favour of boys a trifle less than half an inch.

By uniting these numbers to those which have been obtained in the junior schools of Brussels, the Orphan Hospital, boarding-houses, and in public life, in respect to young persons of different classes, I have been able to construct the following table, comprising the rate of growth from birth to 20 years: the height of the shoe is not included:—

Table showing the rate of Growth in the two Sexes.

Ages.	Boys.	Girls.	Difference.
	metres.	metres.	metres.
Birth,	0·500	0·490	0·010
1 year,	0·626	..	..
2 years,	0·796	0·780	0·016
3 ..	0·897	0·883	0·014
4 ..	0·930	0·913	0·017
5 ..	0·986	0·978	0·008
6 ..	1·045	1·035	0·010
7 ..	..	1·091	..
8 ..	1·160	1·154	0·006
9 ..	1·221	1·205	0·016
10 ..	1·280	1·256	0·024
11 ..	1·334	1·286	0·048
12 ..	1·384	1·340	0·044
13 ..	1·431	1·417	0·014
14 ..	1·489	1·475	0·014
15 ..	1·549	1·496	0·053
16 ..	1·600	1·518	0·082
17 ..	1·640	1·553	0·087
18 ..	..	1·564	..
19 ..	1·665	1·570	0·095
20 ..	..	1·574	..
Growth terminated,	1·684	1·579	0·105

We observe by this table that, towards the age of 16 to 17, the growth of girls is already, *relatively*, almost as much advanced as that of boys from 18 to 19.‡ Moreover, the annual growth for boys is about 56 millimetres [somewhat more than two inches] between 5 and 15 years of age; whilst for girls it is only about 52 millimetres [or rather less than two inches.] In the *Dictionnaire des Sciences Medicales*, in the article *Giants*, M. Virey attributes the lower stature of woman to the circumstance of her arriving sooner at the age of puberty, or having reached perfection, and also to her having less vital energy. We may add, that her annual growth, up to the age of puberty, is also less rapid than that of man.

* See on this latter subject an excellent memoir of M. Villermé, inserted in the first volume of the *Annales d'Hygiène*.

† [The French metre is equal to 3 feet English and ·2808 of a decimal; or 3 feet and 2-10ths.]

* I have been greatly aided in numerous researches into the height, weight, strength, and other physical qualities of man, by Messrs Guiette and Van Esschen, Professors in the School of Medicine at Brussels, as well as by M. Plataw. Without their assistance, it would have been impossible for me to have obtained all the measurements in the various charities, hospitals, public schools, Prison of Vilvorde, &c.

† [The French line is equal to the 12th part of an inch.]

‡ [The proposition may be easier understood by stating it in this way: A girl is relatively as tall at 16 as a boy is at 18, the sex and full growth of each being taken into account.]

After having spoken of what relates to the sexes, it must be interesting to consider the influence of a town or a country residence upon human growth. Already Dr Villermé, in the second part of the *Annales d'Hygiène*, had proved, contrary to the generally received notion, that the inhabitants of towns are taller than those of the country. I have arrived at the same conclusion in respect to the inhabitants of Brabant. Extracts from the government militia registers, which I communicated at that time to Dr Villermé, were published in the fifth number of the *Annales d'Hygiène*; they gave the following numbers: —

Arrondissements.	1823.	1824.	1825.	1826.	1827.	Average.
	metres.	metres.	metres.	metres.	metres.	metres.
1. Brussels,	1·6719	1·6540	1·6631	1·6647	1·6528	1·6533
1. Rural Communes,	1·6325	1·6317	1·6343	1·6353	1·6296	1·6325
2. Louvain,	1·6424	1·6349	1·6329	1·6460	1·6335	1·6303
2. Rural Communes,	1·6296	1·6229	1·6090	1·6145	1·6127	1·6177
3. Nivelles,	1·6398	1·6446	1·6581	1·6384	1·6330	1·6428
3. Rural Communes,	1·6264	1·6260	1·6409	1·6431	1·6053	1·6323
Annual Averages. Cities,	1·6514	1·6478	1·6537	1·6497	1·6398	1·6485
Annual Averages. Rural Communes,	1·6295	1·6269	1·6289	1·6309	1·6225	1·6275
General Average,						1·6380

The averages of each year were taken from 400 individuals for Brussels, and from 150 for Louvain and Nivelles. Those of the rural parishes were deduced from 400 individuals for each district. Thus, the general average for the whole province was drawn from 3500 individuals living in towns, and from 6000 living in the country.

By these numbers, we see that the inhabitant of towns is taller than the inhabitant of the country; and in arranging the cities and rural districts according to the respective height which man attains in them *in his nineteenth year*, the order would be as follows:— Brussels, Nivelles, Louvain; and the same order for the rural districts around these towns. In spite of the differences we have thus remarked as taking place at the age of 19, it might still happen that the inhabitant of the country might attain a greater height than the inhabitant of the town previous to the completion of his full growth, in such a way that the growth of man in cities might be at first more rapid up to a certain point than in the country, and might even be nearly terminated in cities, whilst in the country the growth would be very far from having attained its complete development. And these remarks coincide pretty nearly with the deductions of Dr Villermé, in respect to the height of man in France. The doctor remarks, that "human height becomes greater, and the growth takes place more rapidly, other circumstances being equal, in proportion as the country is richer, the comfort more general, houses, clothes, and nourishment better, and labour, fatigue, and privations during infancy and youth less; or, in other words, the circumstances accompanying misery put off the period of the complete development of the body, and stint human stature."

It becomes, then, important to determine the epoch at which human growth terminates; and the government registers for Brussels, being examined with this view, gave the following results. These registers refer to a great levy made about eighteen years ago; I have divided them into three series, each comprising 300 individuals:—

	19 Years.	25 Years.	30 Years.
	1·6539 metre.	1·6822 metre.	1·6834 metre.
	1·6595 "	1·6735 "	1·6673 "
	1·6620 "	1·6692 "	1·6817 "
Medium,	1·6648 "	1·6750 "	1·6841 "

Thus we see that human growth,* as regards height, does not terminate at 19, or even invariably at 25. I have to regret exceedingly that the state of the government registers does not allow of my making similar researches in regard to the inhabitants of the country; we might then have known if the growth in towns terminates more rapidly than in the country, and also if man, when fully developed, is tallest in the country.

When we class the 900 individuals of whom I have spoken above, in the order of their height, we come to the following results:—

Heights.	Number of Individuals of 19 Years.	of 25 Years.	of 30 Years.
From 15 to 16 decimetres,	32	17	15
" 16 to 17, "	173	174	163
" 17 to 18, "	92	103	109
" 18 to 19, "	3	5	12
" 19 to 20, "	..	1	1
	300	300	300 *

Thus, at 19, 3 individuals only were more than 18 decimetres [above 5 feet 10 inches] high; at the age of 25, there were 6; and at the age of 30 there were 13.† It seems to me that we are entitled to conclude, from the whole of these results, that human growth, in respect to height, does not terminate in Brussels even at the age of 25, which is very much opposed to the generally received opinion.

According to M. Hargenvilliers,‡ the average height of conscripts of 20 years, taken for all France, is 1·615

* [The translator had observed some years ago, that the male human height had evidently not attained its maximum previous to at least 30 years of age, and probably not even then. This he was led to remark by observing large numbers of students, who, leaving college at the age of 20, 21, or 22, have returned seven or eight years afterwards. Examination proved that these persons had grown very considerably, not only in breadth but also in height.]

* [The value of the decimetre in English measures is 3 inches and ·937 decimal parts, or nearly 4 English inches.]

† In the preceding numbers were comprised the men who were rejected, or had leave to withdraw from the corps, as of under size.

‡ *Inquiries and Considerations on the Formation and Recruitment of the French Army*: 1817. M. Villermé, in his Memoir on the Height of Man in France, quotes the opinion of Tenon and also some facts, which show that, during the time of the Empire, continual wars had lowered the human stature.

[A question naturally arises here, whether the stature was actually lowered, or the young conscripts merely called on before their time of full development; but the remark of Dr Villermé suggests other considerations, well worthy the attention of statisticians—such, for example, as the effects produced in Prussia, by the maintaining of a standing army of somewhat more than 200,000 men in time of peace, it being admitted that these are the finest and best proportioned men in the kingdom. For we have first the withdrawal of the very choicest of the male population from the exercise of the arts and the cultivation of science, at precisely that period of life when they are best fitted for such pursuits; and, secondly, the effects upon the population in respect to the restraints upon marriage, and the preference given by the soldier to a debauched and irregular life. The same remarks, modified, apply to all other European nations, none of them being without standing armies of greater or less magnitude.]

metre [4 feet 10 inches nearly]; and of 100,000 there were as follows:—

Under 1·570 metre,	23,630
1·570 to 1·598 ..	11,580
1·598 to 1·624 ..	13,900
1·624 to 1·651 ..	14,410
1·651 to 1·678 ..	11,410
1·678 to 1·705 ..	8,780
1·705 to 1·732 ..	5,530
1·732 to 1·759 ..	3,190
Above 1·759 ..	2,490
	100,000

We might consider the inhabitants of the ancient department of Bouches-de-la-Meuse, which was partly formed of Holland, and of which the Hague was the chief place, as affording the limits of the statures observed in France from the time of the Empire. The average height of conscripts for the years 1808, 1809, and 1810, raised before the age of 20, was 1·677 metre.* On the other hand, in the ancient department of the Apennines, of which Chiavari was the chief place, the country mountainous, without industrious occupations, extremely poor, and where the men toil from a very early age and are ill fed, the average stature of the conscripts for the same three years, was 1·560 metre. "The difference of these results," says M. Villermé, "is striking. In the former place, where the stature is highest, there were but few excused or rejected even for diseases; on the contrary, in the latter place, where the stature is very low, there are many excused even for this latter cause; so that all the advantages are in favour of men of high stature."†

It is remarkable that the inequality of statures is not merely observed between the inhabitants of town and country, but is also felt in the interior of towns between individuals of different professions, and having different degrees of affluence, as M. Villermé has shown for the different arrondissements of Paris, where the stature of men seems to be, all other things being equal, in proportion to the good fortune, or at least in inverse proportion to the difficulties, toils, and privations experienced in infancy and youth.‡ Of 41 young persons between 17 and 20 years of age, measured at the Athenæum of Brussels, 13 were found between 16 and 17 decimetres, 26 between 17 and 18 decimetres, and 2 between 18 and 19 decimetres; so that the young persons between 17 and 18 were double the number of those between 16 and 17 decimetres; whilst, in the interior of the town, the number of the former is not equal to the latter, even at the age of 30 years.

The young girls measured in the Female Orphan Hospital of Brussels, and who, during their infancy, have been brought up in the country, are generally smaller than girls of the same age, in easy circumstances, who have been measured in town.

In the Prison (*Maison de Détention*) of Vilvorde, by forming three groups, each of 23 individuals for each sex, the average results have been—

	For men.	For Women.
	1·657 met.	1·572 met.
	1·664 ..	1·581 ..
	1·670 ..	1·585 ..
General average,	1·664 ..	1·579 ..

* Sur la Taille, &c.

† [The translator is firmly persuaded that Dr Villermé and M. Quetelet, have failed to detect the real cause of difference of stature in those two departments: it is a question purely of *race*, and not of feeding or locality. The taller conscripts were Saxons, drawn from the departments of Holland and the Mouths of the Meuse; the shorter conscripts, found in the Apennines and around Chiavari, were the descendants of the ancient Celtic population of that country. The difference in stature, then, depends, in this instance, in a great measure on the difference in blood, or on the race of men: it has existed for thousands of years, and will continue so, altogether independent of locality, feeding, or government.]

‡ Annales d'Hygiène, No. 2, p. 370.

Classing them according to size, we find—

Sizes.	Men.	Women.
From 14 to 15 decimetres,	1	3
.. 15 to 16 ..	6	36
.. 16 to 17 ..	42	27
.. 17 to 18 ..	19	3
.. 18 to 19 ..	1	..
	69	69

These results show that the prisoners were generally shorter than fully developed individuals measured in Brussels; their average stature being nearly equal to that of young persons of 19 years of age, and it may correspond with the average stature of the inhabitants of the province.

With the view of appreciating the modifications which painful toil in manufactories may produce on the development of children, Mr J. W. Cowell has made different observations at Manchester and Stockport; he has inserted the details in the first volume of *Factory Reports*, and has kindly assisted me in obtaining the results, which I have reduced to the métrical measure. The girls and boys have been measured with their shoes on; no deduction has been made for this circumstance: but, as the observations were made on the Sunday, the thickness of the soles for boys would probably be from one-half to one-third of an inch (English), and for girls from one-eighth to one-sixth of an inch. This being laid down, the following are the values obtained:*—

Average Stature of Children of the Lower Orders, at Manchester and Stockport.†

Ages.	Boys		Girls	
	Working in Factories.	not Working in Factories.	Working in Factories.	not Working in Factories.
	metres.	metres.	metres.	metres.
9 years,	1·222	1·233	1·218	1·230
10 ..	1·270	1·286	1·260	1·254
11 ..	1·302	1·296	1·299	1·323
12 ..	1·355	1·345	1·364	1·363
13 ..	1·383	1·396	1·413	1·389
14 ..	1·437	1·440	1·467	1·479
15 ..	1·515	1·474	1·496	1·502
16 ..	1·565	1·605	1·521	1·475
17 ..	1·592	1·627	1·535	1·542
18 ..	1·608	1·775	1·593	1·645

It appears, from these numbers, that the statures of male and female children do not differ much in Belgium and England: we also see that, until the age of puberty, there is no great difference in size of the children of the lower orders, whether they work in factories or not. But for the latter years of the table there is a very sensible difference. Will it be found that the growth in factories, after puberty, is diminished, or only retarded? or, which seems more probable, does not the amelioration remarked for the lower ages proceed from the useful changes which have already been made, from the apprehension of parliamentary inquiries?‡

When, in England, we chose the terms of comparison from rather higher classes of society, we find the stature of men higher than in France or the Low

* [It has been suggested to the translator, by a gentleman well acquainted with the manufacturing districts of Yorkshire and Lancashire, that wooden clogs, and not shoes, seemed almost universally worn by the manufacturing population of these counties, more especially of Lancashire. Now, the soles and heels of these clogs are of great thickness: a question then arises with respect to Mr Cowell's measurements. If this class of the population wear clogs on Sundays, this circumstance may partially affect the value of Mr Cowell's statements.]

† The number of children measured was—factory boys, 430; others, 227: female factory children, 652; others, 201. Very few non-factory children, of the ages of 16, 17, and 18, have been measured.

‡ It has been found, by this inquiry, that in some districts the children were forced to work standing upright, with the legs fastened in tin pipes.

Countries, at least for young persons between 18 and 23 years of age. The following are the results of 80 measurements made on students of the University of Cambridge, in groups of 10 each :*—

Ten individuals,			58 feet 3½ inches.
"			58 " 6½ "
"			58 " 9 "
"			57 " 7½ "
"			56 " 9½ "
"			57 " 9½ "
"			58 " 3 "
"			58 " .. "
Average,			58
Height of one person,			5 feet 9 3-5th inches.

I have enumerated different causes which influence the growth of man in town, but their number increases when the researches embrace a large extent of territory; thus, the complete development of stature stops more suddenly in very hot or very cold countries than in those of a moderate temperature; more suddenly in low plains than on mountainous heights, where the climate is severe. The kind of food and drink farther influence growth; and individuals have been known to grow considerably by changing their mode of life, and making use of moist food calculated to distend and increase their organisation. Some diseases, and particularly fevers, may also excite rapid and extraordinary growth. The case of a young girl is related, who, becoming unwell (*pendant ses menstrues*) by an attack of fever which she had, acquired a gigantic stature.† Lastly, it has also been remarked that lying in bed is favourable to growth, and that a man in the morning is somewhat taller than in the evening; during the day, he undergoes a degree of depression.‡

I shall now pass to a more particular examination of the law of growth of man, from birth to complete development. The numbers on which my results are based, have been collected at Brussels, and as much as possible from individuals of different classes: by the side of the observed values, I have written down the calculated ones, according to an empirical formula, which I shall explain subsequently.

* It is a custom at Cambridge to measure and weigh the young persons coming to the university, with great accuracy, at a merchant's warehouse, where a book is kept for the purpose of entering the data. It is from this book that, through the kindness of Mr Whewell, the accompanying numbers have been taken.

† See *Dictionnaire de Medicine*, article *Geant*, by Virey.

‡ [M. Quetelet has unaccountably omitted, in the above paragraph, the great cause productive of differences in stature of men and animals—to wit, difference in race or blood. The diminutive Bosjeman of Southern Africa, the athletic Caffre, reaching the full European stature, and the gigantic Boor, the descendant of the Saxon race, are as nearly alike in respect to food and climate as may be; the extraordinary differences, therefore, which these men present, are ascribable to one cause alone—a difference of blood or origin; and the historic evidence derived from ancient Rome, and from the equally authentic figures depicted in the tombs of Egyptian Thebes, prove that these differences caused by blood or race are now neither greater nor less than they were at least 4000 years ago, thus, as it were, setting at defiance all minor causes, such as food, climate, localities, &c. Whether the Hun resides in the fertile plains of Hungary, the shores of the Caspian, or the frozen regions of Scandinavia or of Lapland, the general stature of the race remains perfectly unaltered.

In respect to what M. Quetelet observes regarding the influence of rest and horizontal position on the stature, it is a fact well established that, by such a position, in bed for example, the elastic fibro-cartilages connecting the spinal bones together, seem to recover their full depth, and the stature may gain an inch or more thereby. Recruits for the army and deserters avail themselves of a knowledge of this fact, and occasionally succeed in making their identity difficult to be established.]

Table of the Growth of Man.

Ages.	Stature Observed.	Stature from Calculation.	Difference.
	metres.	metres.	metres.
Birth,	0·500	0·500	0·000
1 year,	0·698	0·698	0·000
2 "	0·796	0·791	+ 0·005
3 "	0·867	0·864	+ 0·003
4 "	0·930	0·928	+ 0·002
5 "	0·986	0·988	— 0·002
6 "	1·045	1·047	— 0·002
7 "	"	1·105	"
8 "	1·160	1·162	— 0·002
9 "	1·221	1·219	+ 0·002
10 "	1·280	1·275	+ 0·005
11 "	1·334	1·330	+ 0·004
12 "	1·384	1·385	— 0·001
13 "	1·431	1·439	— 0·008
14 "	1·489	1·493	— 0·004
15 "	1·549	1·546	+ 0·003
16 "	1·600	1·594	+ 0·006
17 "	1·640	1·634	+ 0·006
18 "	"	1·658	"
19 "	1·665	1·669	— 0·004
25 "	1·675	1·680	— 0·005
30 "	1·684	1·684	0·000

I have endeavoured to render the preceding results *sensible* by the construction of a line, which indicates the growth at different ages, but in one-tenth of the real proportions.

Thus, supposing that the new-born infant sets out from the point *o*, and proceeds along the axis *o*A, reaching in succession the points I., II., III., IV., &c., at the age of 1, 2, 3, 4, &c., years, his head will always be at the height of the curve *o*B, at the different points 1, 2, 3, 4, &c. We see that—

1. The most rapid growth takes place immediately after birth: the child in the course of one year grows 2 decimetres [7 8-10th inches] nearly.

2. The growth of a child diminishes as its age increases, until towards the age of four or five years, the period at which it reaches the maximum of probable life. Thus, during the second year after birth, the growth is only one-half of what it was during the first; and during the third year, only about one-third.

3. Proceeding from the fourth or fifth year, the increase of stature becomes almost exactly regular until about the sixteenth year, that is to say, until the age of puberty, and the annual increase is 56 millimetres [2 2-10th inches] nearly.

4. After the age of puberty, the stature still continues to increase, but only inconsiderably: from the sixteenth to the seventeenth year, it increases 4 centimetres [1 5-10th inches]; in the two succeeding years, it only increases 2½ centimetres [or a little less than 1 inch; in exact numbers, 0·984].

5. The full growth of man does not appear to be attained at his twenty-fifth year.

In what has just been said, I have only spoken of absolute growth: if we compare the annual growth with the stature already acquired, we shall find that the child increases in size two-fifths from birth to the end of the first year; during the second year, one-seventh; during the third year, one-eleventh; during the fourth year, one-fourteenth; during the fifth year, one-fifteenth; during the sixth year, one-eighteenth, &c.; so that the relative growth is continually decreasing from the time of birth.

The curve representing the growth of females, would be a little under that of males, and would be nearly equidistant from it, until the age of eleven or twelve years, when it tends more rapidly to become parallel to the axis *o*A.

It remains for me to speak of the formula by which I have calculated the numbers shown in the table given above. Letting the co-ordinates y and z represent the stature and the age corresponding to it, we have the following equation :—

$$y + \frac{y}{1000\,(T - y)} = ax + \frac{t + x}{1 + \frac{2}{3}x};$$

t and T are two constants which indicate the stature of the child at birth, and that of the fully developed individual: their values for Brussels are 0·500 and 1·684 metre. The coefficient a of the first term in the second number, will be calculated according to the different localities, from the regular growth which annually takes place between the fourth and fifth, to the fifteenth or sixteenth year: for Brussels, its value has been made equal to 0·0545 metre. I think that, in giving these three constants, we may use this formula with considerable advantage for other localities.

If we make $t = 0{\cdot}49$ metre, $T = 1{\cdot}579$ metre, $a = 0{\cdot}052$ metre, agreeably to the observations above quoted for calculating the law of the growth of women for Brussels, we shall have—

$$y + \frac{y}{1000\,(1{\cdot}579 - y)} = 0{\cdot}0521\,x + \frac{0{\cdot}49 + x}{1 + \frac{2}{3}x}.$$

By using this formula, I have calculated the numbers which appear in the third column of the following table:—

Law of the Growth of Woman.

Ages.	Stature Observed.	Stature Calculated.	Difference.
	metres.	metres.	metres.
Birth,	0·490	0·490	0·000
1 year,	..	0·690	..
2 ..	0·780	0·781	— 0·001
3 ..	0·853	0·852	+ 0·001
4 ..	0·913	0·915	— 0·002
5 ..	0·978	0·974	+ 0·004
6 ..	1·035	1·031	+ 0·004
7 ..	1·091	1·086	+ 0·005
8 ..	1·154	1·141	+ 0·013
9 ..	1·205	1·195	+ 0·010
10 ..	1·256	1·248	+ 0·008
11 ..	1·286	1·299	— 0·013
12 ..	1·340	1·353	— 0·013
13 ..	1·417	1·403	+ 0·014
14 ..	1·475	1·453	+ 0·022
15 ..	1·496	1·499	— 0·003
16 ..	1·518	1·535	— 0·017
17 ..	1·553	1·555	— 0·002
18 ..	1·564	1·564	0·000
19 ..	1·570	1·569	+ 0·001
20 ..	1·574	1·572	+ 0·002
Growth terminated,	1·579	1·579	0·000

The differences between the observed numbers and the calculated ones, are greater than in the table (already given) of the growth of man. It may be owing to the circumstance, that the observations have been less numerous, and made on fewer of the different classes of society, for the one sex than for the other. What appears to give additional support to my conjecture is, the manner in which the positive and negative signs succeed each other in the differences of the observed and calculated numbers. Moreover, it is remarkable that the formula may be entirely determined, when we have been enabled to give the statures of an individual corresponding to three different ages, sufficiently distant from each other.

Although the equation of which I have availed myself in the calculations, is of the third order, it resolves itself, like those of the second, into an unknown one, when we give the successive values of the other. Considered as belonging to a curve, it points out to us that there still exists another branch than the one we are occupied with; for to each value of the abscissa x, there are two values of y.

The curve of growths oB has an asymptote parallel to the axes of the abscissæ, situate at a distance from this axis equal to T, which is the height of man fully developed; moreover, this curve, proceeding from the point o, which corresponds to birth, towards the thirteenth or fourteenth years, is sensibly confounded with an hyperbola; for in these limits, the second term of the first order is so small as to be considered nothing, so that we shall have—

$$y = ax + \frac{t + x}{1 + \frac{2}{3}x}.$$

The curve oB does not merely indicate the growth of man from birth to complete maturity, but also those of the other side of the axis Oo; that is to say, for the months which precede birth, the results which it presents are conformable to those observed with regard to the fœtus. This concordance is not always manifested until towards the fifth or sixth month before birth, which is the age at which the embryo becomes a fœtus. It is, moreover, true, that before this period the child is in a state which hardly yet appears to belong to human nature. The curve singularly represents this state, if we give any significance to it; for between five and six months before birth, it suddenly passes under the axis oA, and the values of statures, positive as they were, become negative: the curve in the negative region is lost in infinity, approaching an asymptote which corresponds to a value of $x = -\frac{3}{2}$; or, in other words, at nine months before birth, the period of conception. Without occupying ourselves with the stature of the infant while it is still an embryo, or altogether unformed, if we confine our calculations to the growth of the fœtus about five months before birth, we shall find the following results, by the side of which are written the results of measurements given in the *Dictionnaire des Sciences Medicales*:—

Age of the Infant.	Stature Calculated.	Stature Observed.
	metres.	metres.
Birth,	0·500	From 0·487 to 0·541
1 month before birth,	0·464	.. 0·433 to 0·487
2	0·419	.. 0·379 to 0·433
3	0·361	.. 0·300 to 0·379
4	0·281	.. 0·216 to 0·300
5	0·165	.. 0·162 to 0·216

The calculated values fall, for each month, between the limits of the results of the observations. Moreover, it is well to observe that these results do not carry the same degree of exactness as those obtained after birth, because of the uncertainty of the period of conception, as well as the varying duration of pregnancy. What is most important for us to observe here, in my opinion, is the law of continuity which exists for the growth of the child immediately before and after birth. Admitting the approximative calculations of M. Chaussier, it will be found that *the fœtus increases almost as much in length in one month, as a child between six and sixteen years does in one year.*

In what has preceded, I have endeavoured to point out how the development of the stature of man and woman takes place: it now remains for me to say some words on the diminution which this element undergoes by age. From a great number of observations, of which we shall make greater use when speaking of the corresponding diminution of weight, it appears that it is chiefly towards the fiftieth year that the decrease becomes most apparent, and towards the end of life it amounts to about 6 or 7 centimetres [2 3-10th inches, or 2 6-10th inches]. From the number of individuals who have been measured, those have been carefully excluded who were much round-shouldered, or who could not make themselves straight during the observation.

Ages.	Stature of Men.	Stature of Women.
40 years,	1·684 metre.	1·579 metre.
50 ..	1·674 ..	1·536 ..
60 ..	1·639 ..	1·516 ..
70 ..	1·623 ..	1·514 ..
80 ..	1·613 ..	1·506 ..
90 ..	1·613 ..	1·505 ..

It may be asked if the diminution of stature towards the end of life is not rather apparent than real, and if it be not owing to the circumstance that longevity is generally shorter for individuals of great stature. At least, it would be interesting to examine if the size of man has any influence on the duration of his life.

I shall endeavour, in a few words, to present such of the results of my researches as appear to me most interesting: it is almost unnecessary to observe that these results only apply to Brussels and the province of Brabant.

1. The limits of growth in the two sexes are unequal: first, because woman is born smaller than man; second, because she sooner finishes her complete development; third, because the annual increase which she receives is smaller than that of man.

2. The stature of the inhabitant of towns, at the age of 19, is greater than that of the country person by 2 to 3 centimetres [7-10ths to 1 inch nearly].

3. It does not appear that the growth of man is entirely completed at 25 years of age.

4. Individuals who live in affluence generally exceed the average height: misery and hard labour, on the contrary, appear to be obstacles to growth.

5. The growth of the child, even from several months before birth until complete development, follows such a law of continuity, that the increase diminishes successively with age.

6. Between the 5th and 16th years nearly, the annual growth is pretty regular, and it is one-twelfth of the growth of the fœtus during the months before birth.

7. Subsequently to the 50th year, man and woman undergo a diminution of stature which becomes more and more marked, and may amount to from 6 to 7 centimetres [2 3-10ths or 2 0-10th inches] nearly, about the age of 80 years.

CHAPTER II.

OF THE DEVELOPMENT OF THE WEIGHT, AND OF ITS RELATIONS TO THE DEVELOPMENT OF THE HEIGHT OF THE BODY.

1. Weight and Height at Different Ages.

Researches on the height and weight of new-born infants have been made at the Foundling Hospital of Brussels. To ascertain the weight, the ordinary balance has been used; but in the different observations, the weight of the swaddling clothes has been taken. The average values obtained for 63 male and 56 female children, are as follows:—

	Weight.	Height.
Male children,	3·20 kilogrammes.	0·496 metre.*
Female children,	2·91 ..	0·483 ..†

Thus, *from the time of birth, there is an inequality in the weight and height of children of the two sexes, and this inequality is in favour of males.* The height corresponds nearly with what I have found from other observations.

By classing the infants who furnished the preceding average values according to their total weight, we find—

Infants Weighing	Boys.	Girls.	Total.
From 1·0 to 1·5 kilog.	..	1	1
.. 1·5 to 2·0 ..	..	1	1
.. 2·0 to 2·5 ..	3	7	10
.. 2·5 to 3·0 ..	13	14	27
.. 3·0 to 3·5 ..	28	23	51
.. 3·5 to 4·0 ..	14	7	21
.. 4·0 to 4·5 ..	5	3	8
	63	56	119

* Here those children only have been measured whose weight had been ascertained. The number of observations is greater than I could avail myself of in my former researches.

† [The kilogramme is, as nearly as possible, 2 1-5th lbs. English.]

The extremes were as follows:—

	Boys.	Girls.
Minimum,	2·34 kilog.	1·12 kilog.
Maximum,	4·50 ..	4·25 ..

Professor Richter has made researches similar to the preceding at the Foundling Hospital of Moscow;* and, according to his observations, of 44 new-born children, the sexes of whom are not stated, the average value was 9 1-15th pounds in weight, and 18½ inches (Paris) in length. I regret that I do not know the value of the weight which he employed. The height, which is 0·501 metres, new measure, is almost precisely the same as we have found for boys. The extremes obtained by M. Richter were as follows:—

	Weight.	Height.
Minimum,	5 pounds.	15 inches.
Maximum,	11 ..	21 ..

Thus, the weight of boys varies as 1 to 2, as I have found at Brussels. The extremes of length do not differ so much, and present values which differ very little from those which we have obtained.

Moreover, the extremes, at least of weight, may differ as much as the averages. We read in the *Dictionnaire des Sciences Medicales*, article *Fœtus*—"The researches made at the Foundling Hospital, on more than 20,000 infants, prove that one infant, born at the full period and well-formed, generally weighs 6½ pounds. Only a very small number of infants have been seen at this hospital weighing 10½ pounds, or others weighing only 3 pounds, or 2 pounds and some ounces." This value of 6½ pounds, or 3·059 kilogrammes, obtained from so great a number of observations, agrees very nearly with the value—3·055 kilogrammes—obtained for Brussels, leaving out of consideration the distinction of the sexes: the extreme values likewise present very little difference.

It is remarkable that learned men who have made observations on the weight and height of new-born infants, should have attended so little to the distinction of the sexes. Although our results are not deduced from so large a number of observations as could be desired, yet we think we may conclude, with sufficient probability, that the average values of the weight and height of children of the two sexes present a very sensible difference.

From all the researches which have been made on the relations existing between the weight and the age of the fœtus, it appears that the ratios present so much uncertainty, that we can scarcely make any use of them.

It is M. Chaussier, if I am not mistaken, who has made the remark, that an infant diminishes a little in weight immediately after birth. This curious remark deserves to be carefully verified: unfortunately, I have only been able to procure seven series of observations, which do not extend beyond the seventh day after birth. The average calculations for each day present the following values:—

	Weight of the Infant.
After birth,	3·126 kilog.
On the 2d day,	3·057 ..
.. 3d ..	3·017 ..
.. 4th ..	3·035 ..
.. 5th ..	3·039 ..
.. 6th ..	3·035 ..
.. 7th ..	3·069 ..

It really appears, then, from these numbers, that *the weight of the child diminishes a little immediately after birth*, and that it does not begin to increase in a sensible manner until after the first week.

* Synops. Praxis Medico-Obstetriciæ: 1810.

Thus we see that, from birth, there is an inequality in the weight of children of the two sexes: however, we shall examine if this inequality is produced again at different ages, and examine the modifications which it undergoes. I have already stated the analogous results for height; nevertheless, I thought it would be useful to state again the new numbers which have been obtained from the individuals of both sexes, on whom observations were made to determine the weight. It was interesting to place these two elements, during their progressive development in the same individual, opposite each other.

In estimating the weight, I have generally used the balance of Sanctorius. Since this balance is not so sensible when slightly charged, and also since great care is required in placing the bodies to be weighed by it, children of tender age have been almost constantly weighed in the arms of persons whose weight had previously been taken.

The observations on children from 4 to 12 years of age, have for the most part been made in the schools of Brussels and at the Orphan Hospital. The weights of young persons have been taken more especially in the colleges and at the Medical School of Brussels. For more advanced ages, individuals of different classes have been taken, though those of the lower orders have been least numerous.

For old men, the weights have chiefly been taken in the large and magnificent hospital recently erected at Brussels. The two following tables point out the results, such as they are, for men and women.

The first column gives the ages; the second and third point out the average values of the height and weight which correspond to these different ages. The values of the height are almost the same as those previously given, except for individuals who are more than 16 or 17 years of age; which no doubt arises from individuals of the lower class having been less numerous in these than in the former observations. Indeed, I have already shown that young persons who apply themselves to study, and persons in the affluent classes generally, are taller than others. In the third column, the ratios of weight and size for different ages are calculated, their values being considered as abstract numbers. These ratios are not deduced immediately from the numbers contained in the two preceding columns, but are the average of the ratios calculated for each individual. In the last place, the four last columns point out the maximum and minimum of height and weight at each age, for individuals who are well-formed.

Table of the Size and Weight of Man at Different Ages.

Ages.	Size.	Weight.	Ratio of Weight to Size.	Size Observed.		Weight Observed.	
				Max.	Min.	Max.	Min.
	met.	kilog.		met.	met.	kilog.	kilog.
Birth,	0·496	3·20	6·19	0·532	0·438	4·50	2·34
1 year,	0·686	10·00	14·20	0·750	0·632	11·00	9·00
2 ..	0·797	12·00	15·00	0·824	0·730	13·50	10·50
3 ..	0·860	13·21	15·36	0·875	0·840	13·60	12·10
4 ..	0·932	15·07	16·32	0·965	0·810	18·20	12·50
5 ..	0·990	16·70	16·98	1·030	0·915	18·30	14·00
6 ..	1·046	18·04	17·44	1·115	0·960	20·40	15·80
7 ..	1·112	20·16	18·31	1.162	1·109	24·50	17·20
8 ..	1·170	22·26	18·92	1·260	1·120	28·50	19·00
9 ..	1·227	24·09	19·68	1·325	1·150	29·00	22·20
10 ..	1·292	26·12	20·37	1·325*	1·163	32·00	22·70
11 ..	1·327	27·65	21·58	1·405	1·215	33·80	25·00
12 ..	1·359	31·00	22·80	1·450	1·270	36·30	25·00
13 ..	1·403	35·32	25·39	1·490	1·300	39·50	34·60
14 ..	1·487	40·50	27·49	1·630	1·330	45·00	37·00
15 ..	1·559	46·41	29·83	1·658	1·390	61·50	37·00
16 ..	1·610	53·30	33·09	1·730	1·430	61·50	40·00
17 ..	1·670	57·40	34·25	1·790	1·467	65·50	45·00
18 ..	1·700	61·26	35·67	1·790	..	67·00	45·00
19 ..	1·706	63·32	37·00	1·800	..	70·00	48·20
20 ..	1·711	65·00	37·99	1·838	..	72·70	..
25 ..	1·722	68·29	39·66	1·830	..	98·50	..
30 ..	1·722	68·90	40·02	..	..	..	..
40 ..	1·713	68·81	40·03	..	..	..	..
50 ..	1·674	67·45	40·14	..	..	..	..
60 ..	1·639	65·50	40·01	..	..	..	..
70 ..	1·623	63·03	38·83	..	..	..	49·1
80 ..	1·613	61·22	37·96	1·820	1·467	83·00	49·7

Table of the Size and Weight of Woman at Different Ages.

Ages.	Size.	Weight.	Ratio of Weight to Size.	Size Observed.		Weight Observed.	
				Max.	Min.	Max.	Min.
	met.	kilog.		met.	met.	kilog.	kilog.
Birth,	0·483	2·91	6·15	0·555	0·438	4·25	1·12
1 year,	0·690	9·30	13·50	0·704	0·660	10·5	8·3
2 ..	0·789	11·40	14·50	0·798	0·720	12·0	8·3
3 ..	0·850	12·45	14·70	0·895	0·795	15·8	10·5
4 ..	0·910	14·18	15·10	0·950	0·810	15·8	11·5
5 ..	0·974	15·50	15·70	1·035	0·876	17·5	13·3
6 ..	1·032	16·74	16·24	1·085	0·956	20·3	13·3
7 ..	1·096	18·45	16·85	1·177	1·050	23·4	16·0
8 ..	1·139	19·82	17·45	1·330	1·050	23·4	16·0
9 ..	1·200	22·44	18·65	1·330	1·110	25·7	18·3
10 ..	1·248	24·24	19·45	1·330	1·160	28·3	20·3
11 ..	1·275	26·25	20·60	1·365	1·160	30·8	21·6
12 ..	1·327	30·54	23·00	1·476	1·160	42·8	21·6
13 ..	1·395	34·65	24·50	1·500	1·160	42·8	21·6
14 ..	1·447	38·10	25·35	1·589	1·160	51·0	32·0
15 ..	1·475	41·30	28·10	1·638	1·160	55·2	32·0
16 ..	1·500	44·44	29·62	1·638	1·160	57·6	32·0
17 ..	1·544	49·08	31·75	1·688	1·284	61·6	..
18 ..	1·552	53·10	34·05	1·740	..	79·9	..
20 ..	1·570	54·46	34·70	..	..	..	..
25 ..	1·577	55·08	35·26	..	..	..	..
30 ..	1·579	55·14	35·20	..	..	..	..
40 ..	1·555	56·65	36·50	..	..	..	..
50 ..	1·536	58·45	38·15	..	1·444	90·5	39·8
60 ..	1·516	56·73	37·28	..	1·436	..	..
70 ..	1·514	53·72	35·49	..	1·431	93·8	..
90 ..	1·506	51·32	34·21	1·701	1·408	72·5	38·0

The numbers in the preceding tables are such as have been obtained from direct observation; but they must be subjected to two corrections—in the first place, because the persons have always been weighed in their dresses; and, secondly, because observations have not been made on all classes of society.

The first cause of error which has been pointed out, may be removed, or at least diminished to some extent. The average weight of the clothes at different ages may be determined very precisely, and then it is only necessary to subtract its value from each of the corresponding numbers of the table of weights. From different experiments, I think we may admit, as near the truth, that the average weight of the clothes at different ages is one-eighteenth of the total weight of the male body, and a twenty-fourth part of the total weight of the female. With this value, I have corrected the numbers of the preceding table, except for new-born infants, because the numbers had already undergone this correction, from direct experiment, immediately after weighing them [the infants].

The second cause of error may also be removed: indeed, we shall soon see, that of individuals of the same age, the weight may be considered as having a pretty constant relation to the size of the body. It will be sufficient, then, to know the ratios inserted in the fourth column of the preceding tables, and to have a good general table of the growths, to deduce the corresponding table of the weight. It is in making use of the *table of growths* given above, and constructed with elements collected from all classes of society, that I have calculated the following table, in which I have also made the necessary correction for clothing:—

* When a number is repeated, it is because the maximum of this year was less than that of the preceding. The inverse takes place in the column of the minima.

Table of the Development of the Height and Weight.

Ages.	Men.		Women.	
	Height.	Weight.	Height.	Weight.
	metres.	kilog.	metres.	kilog.
Birth, -	0·500	3·20	0·490	2·91
1 year, - -	0·636	9·45	0·630	8·79
2 " -	0·791	11·34	0·781	10·67
3 " - -	0·864	12·47	0·852	11·79
4 " -	0·923	14·23	0·915	13·60
5 " - -	0·968	15·77	0·974	14·36
6 " -	1·047	17·24	1·031	16·00
7 " - -	1·105	19·10	1·086	17·54
8 " -	1·162	20·76	1·141	19·08
9 " - -	1·219	22·65	1·195	21·36
10 " -	1·275	24·52	1·248	23·52
11 " - -	1·330	27·10	1·299	25·65
12 " -	1·385	29·82	1·353	29·82
13 " - -	1·439	34·38	1·403	32·94
14 " -	1·493	38·76	1·433	36·70
15 " - -	1·546	43·02	1·499	40·37
16 " -	1·594	49·67	1·535	43·57
17 " - -	1·634	52·65	1·555	47·31
18 " -	1·658	57·65	1·564	51·03
20 " - -	1·674	60·06	1·572	52·28
25 " -	1·680	62·03	1·577	53·28
30 " - -	1·684	63·65	1·579	54·33
40 " -	1·684	63·67	1·579	55·23
50 " - -	1·674	63·86	1·536	56·16
60 " -	1·639	61·94	1·516	54·30
70 " - -	1·623	59·52	1·514	51·51
80 " -	1·613	57·83	1·506	49·37
90 " - -	1·613	57·83	1·505	49·34

To render the preceding results more apparent, I have constructed two lines, which represent the increase of weight which men and women undergo at different ages: these lines have, for abscissæ, the ages, and for ordinates, the corresponding weights. We perceive, at the first glance, that, *at equal ages, man is generally heavier than woman; about the age of twelve years only are individuals of both sexes nearly of the same weight.* This circumstance is owing to the development of the weight being inconsiderable in both sexes, until the time of puberty, when, on the contrary, it becomes very apparent. Now, since puberty takes place sooner in woman, this acceleration causes a temporary disappearance of the inequality of weight which existed between children of both sexes, and which is, for children between one and eleven years of age, from one kilogramme to one and a half. The difference of weight of the sexes is more considerable in adult persons; it is about five kilogrammes between the sixteenth and twentieth years, and more than seven after this period.

Man reaches his maximum of weight about the age of 40, and he begins to waste in a sensible manner about the age of 60: at the age of 80 he has lost about six kilogrammes [16 lbs. troy]. *His height has also diminished, and this diminution is about seven centimetres* [2 7-10ths inches].

The same observation applies to women: in old age, they generally lose from six to seven kilogrammes in weight, and seven centimetres in stature. I have taken care not to include ricketty individuals in these valuations, or badly formed persons, or even those who were round-shouldered, and unable to stand upright for many minutes.

Woman attains her maximum of weight later than man; she weighs the most about the age of 50 years: setting out from about the age of 19, the development of her weight is nearly stationary, until the period of procreation is passed.

The extreme limits of the weight of well-formed individuals have been 49·1 and 98·5 kilogrammes for men; and for women 39·8 and 93·8 kilogrammes.

The limits of height have been 1·467 and 1·890 metres for men; and 1·444 and 1·740 metres for women.

The average weight at 19 years, is nearly that of old persons of the two sexes.

When man and woman have attained their complete development, they weigh nearly exactly twenty times as much as at birth; whilst the height is only about three and one-fourth times what it was at the same period.

One year after birth, children of both sexes have tripled their weight; boys weigh 9·45 kilogrammes, and girls 8·79 kilogrammes. At 6 years, they have doubled this latter weight, and at 13, they have quadrupled it.

Immediately before puberty, man and woman have one-half the weight which they have after their complete development.

I am indebted to the kindness of M. Villermé for the communication of the unpublished researches of Tenon on the weight of man, which appear to have been made in 1783. They were made in a village in the environs of Paris—the village of Massy—where Tenon had his country house. These researches, which comprise observations on 60 men between 25 and 40 years of age, and as many women of the same ages, give the following results:—

	Maximum. kilog.	Minimum. kilog.	Average. kilog.
Weight of man, -	83·307	51·306	62·071
" woman, -	74·038	36·905	54·916

In all these observations, the weight of the clothes has been subtracted, and care has been taken not to include any female who was pregnant.

If we now compare these numbers with those I obtained at Cambridge, made on men from 18 to 23 years of age, weighed with clothes, we shall find, dividing into series of tens the 80 individuals whose weights were obtained—

	Stones.	Pounds.
1st series, - - - -	108	9
2d " - - - -	111	2¾
3d " - - - -	114	0¾
4th " - - - -	101	0¾
5th " - - - -	102	5
6th " - - - -	107	12½
7th " - - - -	103	6¾
8th " - - - -	112	2¾
Average, - - -	107	$10\frac{2\,7}{3\,2}$

Which gives, for the weight of one individual, about 151 pounds, or 68·465 kilogrammes, which is nearly the weight of a man of 30 in Brabant, when weighed with his clothes on.

If, on the other hand, we compare the weight of children of the lower classes in England, we shall find the following results, which have been communicated to me by Mr J. W. Cowell, taken on 420 boys working in the factories, and 223 not working in factories; and 651 girls working in factories, and 201 not working in those places.

Average Weight of Children of the Lower Orders.

Ages.	Boys		Girls	
	Working in Factories.	not Working in Factories.	Working in Factories.	not Working in Factories.
	kilog.	kilog.	kilog.	kilog.
9 years,	23·47	24·15	23·18	22·67
10 "	25·84	27·33	24·85	24·68
11 "	28·04	26·46	27·06	27·72
12 "	29·91	30·49	29·96	29·96
13 "	32·69	34·17	33·21	32·97
14 "	34·95	35·07	37·62	37·63
15 "	40·06	39·37	39·94	42·44
16 "	44·43	50·01	43·62	41·33
17 "	47·36	53·41	45·44	46·45
18 "	48·12	57·27	48·22	55·32

These numbers were collected at Manchester and Stockport; the children were weighed in summer, and consequently were lightly clothed, and they had nothing in their pockets. We see here again, as in

the height, that it is only after puberty that, at equal ages, we observe a difference in weight. The comparison of weights seems to be rather in favour of Belgic children; it is true that those of England were taken from the lower orders.

2. Relations between the Weight and Height.

If man increased equally in all his dimensions, his weight at different ages would be as the cube of his height. Now, this is not what we really observe. The increase of weight is slower, except during the first year after birth; then the proportion which we have just pointed out is pretty regularly observed. But after this period, and until near the age of puberty, the weight increases nearly as the square of the height. The development of the weight again becomes very rapid at the time of puberty, and almost stops at the twenty-fifth year. In general, we do not err much when we assume that, *during development, the squares of the weight at different ages are as the fifth powers of the height*; which naturally leads to this conclusion, in supposing the specific gravity constant, that the transverse growth of man is less than the vertical.

However, if we compare two individuals who are fully developed and well-formed with each other, to ascertain the relations existing between the weight and stature, we shall find that *the weight of developed persons, of different heights, is nearly as the square of the stature.* Whence it naturally follows, that a *transverse section, giving both the breadth and thickness, is just proportioned to the height of the individual.* We furthermore conclude that, proportion still being attended to width predominates in individuals of small stature.

Taking twelve of the smallest individuals of both sexes, and twelve of the largest, of those who have been submitted to our observations, we have obtained the following values as the average of stature, and the ratio of weight to the stature:—

Men.	Stature.	Ratio of Weight to Stature.
The smallest,	1.511 metre.	36·7 kilog.
The largest,	1·822 ..	41·4 ..
Women.		
The smallest,	1·456 ..	35·6 ..
The largest,	1·672 ..	38·0 ..

Thus, the stature of men and women, fully developed and well-formed, varied in the proportion of five to six nearly: it is almost the same with the ratios of the weight to the stature of the two sexes; whence it naturally follows, as we have already said above, that the weight is in proportion to the square of the stature.*

Now, let us suppose that we have the individuals grouped, not according to age, but to stature, and that we have taken the average of the weight of each group, for example, and that we proceed by ten centimetres at a time: we shall have groups of children at first, then groups of children with whom some adult persons are classed, which will be the case with men commencing at 1·47 metres nearly, and women at 1·41 metres. If we afterwards reduce these numbers to a tabular form, we shall arrive at the following results, the weight of the clothes having been subtracted:—

* Calling t and T the statures, and p and P the corresponding weights of the smallest and the largest individuals, we have, in fact, almost exactly, $t : T :: 5 : 6$, by the numbers of the first column, belonging to men, and $\frac{p}{t} : \frac{P}{T} :: 5 : 6$ for those of the second; from which we find that $t : T :: \frac{p}{t} : \frac{P}{T}$, or, in other words, $t^2 : T^2 :: p : P$. It is the same with the numbers belonging to females.

Relation of Stature to Weight.

Stature.	Men.		Women.	
	Weight.	Ratio.	Weight.	Ratio.
At Birth,	3·20	6·19	2·91	6·03
0·60 metre,	6·20	10·33	..	..
0·70 ..	9·30	13·27	9·06	12·94
0·80 ..	11·36	14·20	11·21	14·01
0·90 ..	13·50	15·00	13·42	14·91
1·00 ..	15·90	15·90	15·82	15·82
1·10 ..	18·50	16·82	18·30	16·64
1·20 ..	21·72	18·10	21·51	17·92
1·30 ..	26·63	20·04	26·83	20·64
1·40 ..	34·48	24·63	37·28	26·63
1·50 ..	46·29	30·86	48·00	32·00
1·60 ..	57·15	35·72	56·73	35·45
1·70 ..	63·28	37·22	65·20	38·35
1·80 ..	70·61	39·23	..	..
1·90 ..	75·56	39·77	..	..

We see that, statures being equal, woman weighs a little less than man until she attains the height of 1 metre 3 decimetres, which nearly corresponds to the period of puberty, and that she weighs a little more for higher statures. This difference, for the most part, proceeds from aged females being mingled with groups of a moderate stature sooner than males are; and, at equal statures, as we have already stated, aged persons weigh more than young ones.

To apply the preceding to determine the age of a *non-adult* person, from a knowledge of the weight and stature only, let us suppose the height of the person to be 1·23 metre, and the weight 24 kilogrammes, he being, moreover, of the male sex. We shall immediately see, from the preceding table, that he is heavy in proportion to his stature; the table before informs us that, by taking the height alone, he ought to be a little more than nine years of age, and considering the weight alone, he should be under ten; so that we may pronounce, with great probability of truth, that the individual in question must be between nine and ten.

3. Weight of a Population.—Weight of the Human Skeleton.

The following table may serve to determine the weight of a population composed of men, women, and children, or of a population composed of individuals of certain limited ages: it has been formed by taking the numbers belonging to each age from a population table, and multiplying them by the weight of individuals of this age.*

Table of the Weight of a Population of 10,000 Souls.

Ages.	Men.	Women.	Total.
	kilog.	kilog.	kilog.
0 to 1 year,	0·294	0·803	1·097
1 to 2 ..	1·462	1·324	2·786
2 to 3 ..	1·504	1·372	2·876
3 to 4 ..	1·676	1·485	3·161
4 to 5 ..	1·864	1·658	3·522
5 to 6 ..	2·017	1·765	3·782
6 to 8 ..	4.251	3·796	8·037
8 to 10 ..	4·768	4·318	9·086
10 to 12 ..	5·263	4·827	10·090
12 to 14 ..	6·332	5·977	12·309
14 to 16 ..	8·205	7·801	16·006
16 to 20 ..	18·902	17·700	36·602
20 to 25 ..	25·292	23·308	48·600
25 to 30 ..	25·003	22·770	48·373
30 to 40 ..	39·396	39·548	78·944
40 to 50 ..	28·720	31·470	60·190
50 to 60 ..	24·122	24·634	48·756
60 to 70 ..	23·620	16·458	40·118
70 to 80 ..	9·620	7·806	17·426
80 and upwards,	2·320	1·998	4·318
Total,	236·471	220·810	457·281

* The population table made use of in these calculations is one which will be found above, taken from the *Recherches sur la Mortalité et la Reproduction. Bruxelles*: 1832.

Thus, taking at once a population of 10,000 souls, without distinction of age or sex, the weight will be 457,000 kilogrammes nearly, 236,000 being that of the male portion. Thus we see that *the average weight of an individual, without reference to age or sex, is* 45·7 *kilogrammes nearly; and, considering the sexes,* 47 *kilogrammes for a man* [125 9-10ths lbs. troy], *and* 42½ *kilogrammes for a woman* [74 lbs. troy]. The whole population of Brussels, which amounts to 100,000, would weigh 4,572,810 kilogrammes; or nearly four and a half times as much as a cube of water 10 metres square: and the whole human race, computed at 737,000,000, would not weigh as much as 33 cubes of water 100 metres square: a value which at first sight appears small, since such a volume of water might be contained in a basin having a surface of less than one-third of an acre [*hectare*], and a depth of 100 metres.

To the preceding data, I shall add some measurements of the human skeleton, which have been communicated to me by MM. Van Esschen and Guiette. They will throw additional light on our present subject.

Dimensions.	Number of Skeletons.				
	No. 1.*	No. 2.†	No. 3.‡	No. 4.§	No. 5.‖
Weights,	kilog. 4·2	kilog. 4·4	kilog. 5·7	kilog. 5·2	kilog. 3·0
Statures,	met. 1·635	met. 1·640	met. 1·667	met. 1·735	met. 1·500
Height of head,	0·138	0·134	0·136	0·135	0·135
" of spinal column,	0·590	0·560	0·563	0·550	0·470
" of pelvis,	0·210	0·186	0·182	0·225	0·152
Length of the upper extremities,	0·779	0·735	0·754	0·790	0·662
Length of the lower extremities,	0·917	0·870	0·885	0·970	0·800

The two last skeletons, belonging to females, did not present any essential difference from the three first, which were males.

We see, from the preceding table, that the weight of a skeleton prepared some years, scarcely exceeds the weight of a child at birth.

From the foregoing, we deduce the following conclusions:—

1. From birth there is an inequality, both in weight and stature, between children of the two sexes; the average weight of a boy being 3·20 kilogrammes [8 5-10ths lbs. troy], that of a girl 2·91 kilogrammes [7 7-10ths lbs. troy]; the stature of a boy is 0·496 metres, and that of a girl 0·483 metres.

2. The weight of a child diminishes a little towards the third day after birth, and does not begin to increase sensibly until after the first week.

3. At equal ages, man is generally heavier than woman: about the age of 12 years only are the individuals of both sexes of about the same weight. Between 1 and 11 years, the difference in weight is from one kilogramme to one and a half; between 16 and 20, it is six kilogrammes nearly; and after this period eight to nine kilogrammes.

4. When man and woman have attained their full development, they weigh almost exactly twenty times as much as at birth; and their stature is about three and one-fourth times greater than it was at the same period.

* No. 1. Natural skeleton of a man of about thirty-five years of age, prepared seven years.

† No. 2. Skeleton of a man about twenty-five years of age, prepared six years.

‡ No. 3. Skeleton of a man. Age and date of the preparation unknown.

§ No. 4. Skeleton of a woman. Age and date of the preparation unknown.

‖ No. 5. Skeleton of a woman aged fifteen years, prepared one year.

5. In old age, man and woman lose about six or seven kilogrammes in weight, and seven centimetres in stature.

6. During the development of individuals of both sexes, we may consider the square of the weight, at different ages, as proportioned to the fifth power of their stature.

7. After the full development of individuals of both sexes, the weight is almost as the square of the stature.

From the two preceding relations, we infer, that increase in height is greater than the transverse increase, including breadth and thickness.

8. Man attains the maximum of his weight at about 40, and begins to waste in a sensible degree about the 60th year.

9. Woman attains the maximum of her weight about the age of 50. During the period of reproduction, namely, from the 18th to the 40th year, her weight scarcely increases in a perceptible degree.

10. The weight of individuals who have been measured, and who were fully developed and well-formed, varies within extremes which are nearly as 1 to 2; whilst the stature only varies within limits which, at the most, are as 1 to 1½. This is inferred from the following values, furnished by observation:—

	Maximum.	Minimum.	Average.
Weight of man,	98·5 kilog.	49·1 kilog.	63·7 kilog.
" woman,	93·8 "	39·8 "	55·2 "
Stature of man,	1·890 met.	1·467 met.	1·634 met.
" woman,	1·740 "	1·403 "	1·579 "

11. At equal statures, woman weighs a little less than man before reaching the height of 1·3 metres, which almost corresponds to the period of puberty; and she weighs a little more for higher statures.

12. The average weight of an individual, without reference to age or sex, is 45·7 kilogrammes; and, taking sex into account, 47 kilogrammes for man, and 42·5 kilogrammes for woman.

CHAPTER III.

OF THE DEVELOPMENT OF STRENGTH OR POWER.

THE measure of strength is one of the elements which we are most anxious to ascertain with some degree of precision; not merely because this subject of investigation has occupied the attention of many observers; but since their principal object was to ascertain the useful effect of power, what they have done has a characteristic nature, which distinguishes their results from those which I propose to determine with a scientific purpose. Thus, Désaguiliers, De la Hire, Guenyveau, Coulomb, Schulze, &c., have chiefly investigated the relations which exist between the speed and the burden carried, in respect to a man employed either in carrying burdens or drawing them. I shall not enter into the details of the results which they have obtained, since they can be found in the principal treatises on practical mechanics. What is of most importance for us to know here is, I think, what relation the intensity of power which man can display (either with his hands or loins, without subjecting him to a day's labour), bears, in its development, to the age of the person: this latter question is composed of more complex elements.

To determine the different degrees of our physical power, different instruments have been proposed, the least imperfect of which is undoubtedly the dynamometer of Régnier.* However, this instrument still

* [The dynamometer cannot well be described in mere words. All that can be said of it is, that it is an instrument so contrived as to exhibit, on a dial-plate, the measure of strength resident in the arms and loins of the parties subjected to trial. M. Quetelet's observations may make this point more clear.]

leaves much to be desired; and, fully perceiving its defects when I commenced the experiments which I am now about to state, I was far from supposing they were so great as they really are. The most considerable results from its form; indeed, the dynamometer is managed with varying degrees of facility, and estimates of power, varying in accuracy, are given, according to the size of the hand and length of the fingers. This defect is especially apparent with children: it is almost necessary to employ different instruments for different ages. These inconveniences led me to think of a dynamometer, in which the two steel plates to be brought into apposition should, with a maximum of power, assume that position in the hand which was most favourable to its development: unfortunately, other labours have prevented me from prosecuting these attempts, and undertaking a new series of observations. Therefore, I must confine myself to giving the results obtained with the dynamometer of Régnier, premising that they do not present that degree of accuracy which I was anxious to give them.

I think we may even already suspect the imperfection of the dynamometer, from the discordant results obtained by different experimenters who have used it.

According to Régnier, a man from 25 to 30, is in possession of his greatest strength, and by pressing strongly with both hands, makes an effort equal to 50 kilogrammes [134 lbs. troy], and raises a weight of 13 myriagrammes [260 lbs. troy, nearly]. He retains this power until nearly 50, when it begins to decrease.* The strength of woman has been considered as equal to that of a man of 15 or 16, or to two-thirds of the power of an ordinary man.

Régnier has also found that, by trying first one hand and then the other, that the right hand is generally stronger than the left; and the sum of these is commonly equal to the power of both hands acting together.

Other experiments have since been made by Peron, who has stated the results in the account of his voyage to Australasia. Ransonnet has also made dynamometric experiments in the roadstead of Havre, on 345 individuals belonging to the companies of two frigates and a brig which he commanded. Collecting the values obtained by these different observers, we have the following table:—

Persons experimented on.	Observers.	Strength.	
		Manual.	Lumbar.
		kilog.	Average.
French, from 25 to 30 years,	Régnier,	50·0	13·0
.. .. 25 to 45 ..	Ransonnet,	46·3	14·2
.. ..	Péron,	69·2	22·1
Natives of New Holland,	..	51·3	14·3
Malays of the Island of Timor,	..	58·7	16·2

The degrees of strength of the French, according to these observations, we see differ very much: the results of Péron differing especially from those of Ransonnet and Régnier.† It would appear that Péron has made a mistake in reading the degrees of the dynamometer; at least this seems to be the case, from the correction which has subsequently been made by Freycinet and Bailly, who were of the number of persons experimented on by Péron, and who are found to have a lumbar power sensibly smaller than that placed opposite their names in the table. According to M. Freycinet, instead of the lumbar powers stated by Péron, we must read as follows:—

15·2 myriagr. instead of 22·1, for the French.
10·1 .. .. 14·3, .. New Hollanders.
11·3 .. .. 16·2, .. Malays of Timor.

However the case may be, by considering the values of Péron as relative, it would appear that the strength of the French sailors was greater than that of savages; and this result agrees with the accounts of many voyagers.

Dynamometric experiments require the greatest precaution. I have seen the same persons obtain exceedingly different results from successive efforts. A cause of frequent error, when sufficient precaution is not taken in using the instrument of Régnier to measure the lumbar power, is, that the needle is made to move as much by pressing the instrument between the knees, as by pulling. Indeed, it is difficult to pull without bringing the knees towards each other, and thus pressing the elliptic spring in the direction of its small axis, where it yields most readily: the position in which we are placed to pull, and the height of the stature, have likewise some influence. It is also necessary to keep trying the accuracy of the instrument, especially towards the bottom of the scale, because it is generally not so sensible for small weights.

I regret that I could not increase my observations to the extent I desired; and I bring forward my results with diffidence. The number of individuals of each age experimented upon was at least 10: these persons generally belonged to the better class; and those below 25, of the young men, were generally taken in the colleges, and at the Medical School of Brussels: the young women, also, were taken from the schools and the Orphan Hospital.

It is well, in measuring the power of a person, to take the average of several successive observations, because we find the results vary slightly; and generally the first effort is more powerful than the second, the second than the third, and so on, until we arrive at a certain limit; but the difference is not very great after the first few trials.* We may find a difference of one or two degrees, or more, between the first effort and the extreme; consequently, these observations admit of great chance of error.

Observations on the Lumbar Power, estimated by means of the Dynamometer.

Ages.	Lumbar Power.		Ratio of the Strength of Men and Women.
	Men.	Women.	
	myriag.	myriag.	
6 years, - -	2·0	..	..
7 .. - -	2·7	..	..
8 .. - -	..	2·4	..
9 .. - -	4·0	3·0	1·33
10 .. - -	4·6	3·1	1·48
11 .. - -	4·8	3·7	1·30
12 .. - -	5·1	4·0	1·28
13 .. - -	6·9	4·4	1·57
14 .. - -	8·1	5·0	1·62
15 .. - -	8·8	5·3	1·66
16 .. - -	10·2	5·9	1·72
17 .. - -	12·6	6·4	1·97
18 .. - -	13·0	6·7	1·94
19 .. - -	13·2	6·4	2·06
20 .. - -	13·3	6·3	2·03
21 .. - -	14·6	7·2	2·05
25 .. - -	15·5	7·7	2·01
30 .. - -	15·4	..	..
40 .. - -	12·2	..	..
50 .. - -	10·1	5·9	1·71
60 .. - -	9·3	..	..

In this table, I have not included boys under six, and girls under eight years of age, because of the difficulty of teaching them how to handle the dyna-

* *Dictionnaire des Sciences Médicales*, article *Dynamometre, et Description et Usage du Dynamometre.* (*Journal de l'Ecole Polytechnique*, Prairial, an 6.)

† M. Ransonnet has kindly favoured me with some accounts of the observations which were required of him, and made with an instrument the accuracy of which he cannot warrant, not having had an opportunity of testing it himself.

* M. Edwards has told me, that after dinner he has generally observed the contrary with strong persons, the first effort being somewhat less intense than the succeeding ones.

mometer, and the errors which would have resulted therefrom. It is necessary to all the preceding values, to add the weight of the dynamometer, which is certainly a part of the resistance to overcome: this amounts to one kilogramme.

If we had extremely sensible and suitable instruments for measuring the lumbar power of children, it is evident that we could not begin to make use of them before the age of two years, since before this period the child cannot stand upright alone, nor carry an additional weight. It is to be observed that, of all the individuals figured in the table, the lumbar power is sufficient to raise a load or overcome an obstacle exceeding the weight of the individual. The load a man can carry relatively to his weight, increases with his growth until maturity, and the perfect man can raise more than double his own weight.

The lumbar power of females differs less from that of males during childhood than after complete development. During childhood, the lumbar strength of boys is about one-third more than that of girls; towards the age of puberty, one-half; and the strength of a developed man is double that of a woman.

Professions produce a very sensible difference. I have seen labouring masons and carpenters move the dynamometer 20 degrees or more. The average of several servants, between 20 and 40 years of age, has given me a value of 10 or 11 degrees.

To measure the power of the hands presents the greatest obstacles. It seems to me that it is almost impossible to rely on the accuracy of the results, unless the observations have been made with the greatest care, and by one and the same person. The first and greatest obstacle proceeds from the unequal size of the hands, and the difficulty of grasping the instrument. From all the corrections which I have made, I think I may rely on the accuracy of my own results; and, nevertheless, they differ so much from those obtained by the observers quoted, that I deliberated some time in using them, the more so since they are, like all the measures taken with Régnier's dynamometer, subject to undergo a previous correction, owing to the unequal size of the hands. To show how important this correction is, I made different trials with the dynamometers, placing my hands in different positions, and I have obtained extremely dissimilar values. We may judge better from the following:—

The dynamometer I have used is made, like all others, of a spring almost of an elliptic form: the lengths of the greater and lesser axis are 30 and 5·5 centimetres respectively; the dial and the index are so placed that the hands, when most approximated, are still 2·5 centimetres distant from each other; and pressure is made at a certain distance from the small axis, where the maximum of effect is produced. We obtain, therefore, only a part of the action which might be produced by pressing both extremities of the small axis. Moreover, it appears that the dynamometer I have used has been graduated, taking this distance into account. I was then desirous to know what would be the effect produced by increasing the distance between the hands, and I have obtained these values:—

Distance of the Hands.	Degrees of the Dynamometer.
25 mill.	80·5
35 ..	64·0
45 ..	54·5
55 ..	49·5
65 ..	44·0
75 ..	38·0
85 ..	34·6

Thus, by placing the hands so that they were each, when least distant, one centimetre from the dial, and consequently 45 millimetres from each other, I only produced an effort of 54·5 instead of 80·5—a difference of 26 degrees. Now, many persons, trying their manual strength by the dynamometer, generally place their hands in the manner I have stated; they must then give very erroneous results. Women and children, especially, have another disadvantage in using the dynamometer, for the opening which they are obliged to allow their hands does not permit them to press with the power they are capable of. Also, I think the values I have obtained for them are generally too low.

Observations on the Power of the Hands, from Experiments with the Dynamometer.

Ages.	Power of Men			Power of Women		
	with both Hands.	with the Right Hand.	with the Left Hand.	with both Hands.	with the Right Hand.	with the Left Hand.
	kilog.	kilog.	kilog.	kilog.	kilog.	kilog.
6 years,	10·3	4·0	2·0	..	..	..
7 ..	14·0	7·0	4·0	..	..	..
8 ..	..	..	..	11·8	3·6	2·8
9 ..	20·0	8·5	5·0	15·5	4·7	4·0
10 ..	26·0	9·8	8·4	16·2	5·6	4·8
11 ..	29·2	10·7	9·2	19·5	8·2	6·7
12 ..	33·6	13·9	11·7	23·0	10·1	7·0
13 ..	39·8	16·6	15·0	26·7	11·0	8·1
14 ..	47·9	21·4	18·8	33·4	13·6	11·3
15 ..	57·1	27·8	22·6	35·6	15·0	14·1
16 ..	63·9	32·3	26·8	37·7	17·3	16·6
17 ..	71·0	36·2	31·9	40·9	20·7	18·2
18 ..	79·2	38·6	35·0	43·6	20·7	19·0
19 ..	79·4	35·4	35·0	44·9	21·6	19·7
20 ..	84·3	39·3	37·2	45·2	22·0	19·4
21 ..	86·4	43·0	38·0	47·0	23·5	20·5
25 ..	88·7	44·1	40·0	50·0	24·5	21·6
30 ..	89·0	44·7	41·3	..	..	..
40 ..	87·0	41·2	38·3	..	..	..
50 ..	74·0	36·4	33·0	47·0	23·2	20·0
60 ..	56·0	30·5	26·0	..	..	..

From this table we may infer, that the manual power of men, at different ages, is greater than that of women. The difference is generally smaller at early periods than afterwards: thus, before puberty, the ratio is 3 to 2, and it afterwards becomes 9 to 5. We also see that the hands, acting together, produce a greater effect than the sum of the effects they produce acting separately; this appears to be partly owing to the weight of the instrument, which is carried twice, and in an inconvenient manner, when the hands are used in succession. Lastly, the strongest hand is that one we use habitually, at least considering masses of people. The right hand is about one-sixth stronger than the left.

Now, if we compare the power of pressing, which I have observed, with that of MM. Régnier, Ransonnet, and Péron, we shall find the greatest differences, and which I can only attribute to the manner in which the hands were placed on the instrument, and the consequent space betwixt them. I have tried the instrument in different ways, and I think I may be certain that the indications are accurate, especially those for the average power of man. Those values which I ought to mistrust are those obtained for women and children; they appear to me to be less than they ought to be, for the reasons above stated.

According to the researches of MM. Régnier and Ransonnet, the average strength of man is not more than 46·3 or 50 kilogrammes [184 lbs. troy]; that is to say, that it does not come up to his weight; whence it follows, that a man could not lift himself by the pressure he can exercise with his hands. Now, experience evidently disproves such a result. Among the sailors experimented upon, there was probably not one who could not hold himself suspended, for some minutes at least, at the end of a cord firmly fixed at the other end. According to Péron, the manual force would be 69·2 kilogrammes: this value approaches nearer the truth. What I have found for a developed man is 89 kilogrammes [238 lbs. troy], nearly 19 kilogrammes more than the weight of a man

in his dress; so that a man may hold at the end of a cord, and bear at the same time a weight as heavy; moreover, the thickness of the cord, or the form of the object which he holds, will necessarily influence the result of the experiment.*

We also see, from the values which I have obtained, that it is about the age of 9 or 10 years that a man begins to acquire sufficient power in his hands to hold himself suspended for a time. Woman, at any age, does not appear capable of exercising a power equivalent to her weight; yet many women, from exercise and habits of labour, at length exceed this limit. Thus we see young girls, by practising gymnastic exercises, acquire the power of raising themselves by means of cords to different heights. It would appear, then, although my values are very superior to those of the observers quoted, that they are rather below than above the truth, at least for children and women.

When the power of the hands is tried several times in succession, it happens, just as with the lumbar strength, that, all things being equal, the subsequent efforts are never so energetic as the first ones. Thus the degrees of power diminish successively, and tend to a limit. The second effort is generally weaker by 4 or 5 degrees than the first; the difference is not so great afterwards.

Trying my strength at different periods of the day, I have not observed any very great differences. The greatest effect I have been able to produce was observed on coming from a public lecture, at a time when I was slightly indisposed by an accession of fever. I was able to bring the needle of the dynamometer nearly 10 degrees beyond the point it habitually reached. In general, the strength was greater after dinner than before; it appears to vary with different times of the day, and especially with the hours of refreshment. My experiments are not so numerous as to enable me here to bring forward numerical results of sufficient accuracy; and, for the same reason, I have been obliged to defer establishing the ratios between the stature, weight, and strength of men at different ages. But it appears to me that affluence, abundance of food, and moderate exercise, favourably assist the development of the physical powers; whilst misery, want, and excess of labour, produce the contrary effect. Therefore, the man who finds himself in affluent circumstances, not merely possesses the advantages of fortune, as well as longer life and less liability to disease; he has also better opportunities for the proper development of his physical qualities.

CHAPTER IV.

INSPIRATION, PULSATION, SWIFTNESS, &c.

1. Inspiration and Pulsation.

In individuals who are well-formed and enjoying good health, the number of inspirations and beats of the heart are generally confined within certain limits, which it may be interesting to know, as well as the average value which they have at different ages. The authors who have written on this subject generally give results which are very discordant, for early ages especially. Kepler appears to have been the first who thought of determining the number of pulsations in a given time; and we may be astonished that, in our own time, we have not more accurate results than those found in the most eminent physiological works.

The following are the numbers which different authors have given for the beats of the heart in one minute:—

Ages.	Number of Beats of the Heart, according to			
	Magendie.*	Rochoux.†	Adelon.‡	Dict. de Méd. vol. 21.
Birth,	130 to 140	140	130 to 140	140
1 year,	120 to 130	..	120	..
2 ..	100 to 110	100	110	100
3 ..	90 to 100	..	90	..
Puberty,	..	..	80	80 to 90
Manhood,	..	..	70	..
Old age,	..	..	60	..

"The number of pulsations of the fœtal heart, in a given time," says M. Paul Dubois,§ "cannot always be easily determined; but when it can, as is usually the case, we find the number from 140 to 150 a-minute, and very frequently 144; it is very natural to think that the number of pulsations should be quick, inversely as the age of the fœtus, and yet our researches do not confirm such an opinion. Indeed, we may affirm, that, from the end of the fifth month, at which period the pulsations of the heart may be readily counted, until the end of gestation, the rhythm [measure] of the double beats has appeared exactly the same to us."

M. Billard has given results which generally do not much agree with those which have been quoted. According to this observer, of 41 children, between 1 and 10 days old, and apparently enjoying good health, he has found—

18	having	fewer	than	80	pulsations per minute.
2	..	..	80	..	..
1	..	..	89	..	..
4	..	..	100	..	..
10	..	..	110 to 129	..	..
1	..	..	130	..	..
2	..	..	145	..	..
2	..	..	150	..	..
1	..	..	180	..	..

Thus, in one-half of the infants, the pulse was almost the same number as of adults; and there were others, the beats of whose heart exceeded in number those of individuals of a more advanced age. These children presented no appearance of disease.

Of 36 children from 1 to 2 months old—

14	presented	80 to 85	pulsations.	
1	..	60 to 62	..	
2	..	90	..	
2	..	94 to 95	..	
5	..	110 to 112	..	
2	..	114	..	
7	..	125 to 130	..	
3	..	140-147 to 150	..	

Of 20 children from 2 to 3 months old—

14	presented	more than	90	pulsations.
2	..	..	100	..
2	..	..	70	..
2	..	..	70 to 80	..

It would be wrong to affirm that children uniformly present a more frequent pulse than adults.‖

It does not appear that the number of inspirations per minute has been examined with as much care as the pulsations. Authors, in general, have not and cannot agree on this point. Haller said he made 20 inspirations per minute; Menzies says 14; Davy observed on himself 26; Thomson, also on himself, 19; Magendie, 15. But we generally say that there are 20, and that every fifth inspiration is deeper than the others.¶

* It would be curious to examine how long an individual could continue suspended by the pressure of his hands only.

* Physiologie. Ed. 1825.
† Dict. de Médicine, 1827.
‡ Physiologie, vol. iii. p. 417.
§ Rapport sur l'Application de l'Auscultation à la Grossesse.
‖ [Notwithstanding these observations, there can be no doubt whatever that the pulsations of the heart, counted at the wrist, are uniformly much more numerous in children under six years of age than in adults.]
¶ Dictionnaire des Sciences Médicales, Art. Respiration.

I shall now present the results of experiments made at Brussels, both on inspirations and the beating of the heart simultaneously.

And first, according to the observations made on 18 male and as many female children, immediately after birth, the following results were obtained:—

	Pulsations.			Inspirations.		
	Aver.	Max.	Min.	Aver.	Max.	Min.
Boys, -	136	165	104	44	70	23
Girls, - -	135	165	108	44	68	27

Therefore, it appears that difference of sex does not influence these phenomena, at any rate at birth.

The following is a classification of the preceding numbers:—

Inspirations.	Boys.	Girls.
25 to 30, - - - -	3	1
30 to 40, - - - -	3	5
40 to 50, - - - -	5	8
50 to 60, - - - -	5	3
60 to 70, - - - -	2	1
Pulsations.		
104 to 115, - - - -	2	1
116 to 125, - - - -	0	0
126 to 135, - - - -	6	7
136 to 145, - - - -	5	5
145 to 155, - - - -	0	1
155 to 165, - - - -	2	1

I think these results susceptible of greater accuracy. Considering the number of inspirations and pulsations in men, at different ages, I have found, per minute, for the average and extreme values, in nearly 300 individuals, as follows:—

Ages.	Pulsations.			Inspirations.		
	Aver.	Max.	Min.	Aver.	Max.	Min.
Birth,	136	165	104	44	70	23
5 years,	83	100	73	26	32	..
10 to 15,	78	98	60	..	..	..
15 to 20,	69·5	90	57	20	24	16
20 to 25,	69·7	98	61	18·7	24	14
25 to 30,	71·0	90	59	16·0	21	15
30 to 50,	70·0	112	56	18·1	23	11

It does not appear that there is a determinate ratio between the pulsations and inspirations; however, in many individuals, and I am of the number, it is as 4 to 1.

The observations made on women have been less numerous than those made on men. Moreover, it does not appear that the difference of sexes is at any period more marked than about the time of birth; perhaps there is a slight acceleration in females, at least this appears from the following numbers:—

Ages.	Pulsations.	Inspirations.
Birth, - -	135	44
15 to 20 years, - -	78	19
20 to 25 -- - -	77	17
25 to 30 -- - -	72	--
30 to 50 -- - -	74·5	19

The temperament, the state of the health, and a crowd of other circumstances, must cause the number of inspirations and pulsations to vary considerably in different individuals. Wakefulness and sleep have also great influence.* From a considerable number of observations made carefully on a male child between 4 and 5 years of age, I have found that, when awake, the number of pulsations was 93·4, and the number of inspirations 29·3; whilst for the same child, during sleep, I counted 77·3 pulsations, and 21·5 inspirations, on an average.* The ratio of these numbers is 1 to 1·21 for the pulsations, and 1 to 1·36 for the inspirations. Similar observations have been made on a young girl between 3 and 4 years old, and on a woman of 26 years. All these observations have presented the following average values:—

Ages.	Pulsations.			Inspirations.		
	Awake.	Asleep.	Ratio.	Awake.	Asleep.	Ratio.
Girl, 3 to 4 years,	102.3	92·0	1·11	30·2	24·8	1·22
Boy, 4 to 5 --	93·4	77·3	1·21	29·3	21·5	1·36
Woman, 26 to 27,	77·5	67·0	1·16	27·0	20·8	1·30

It results from these observations, that sleep causes a more sensible modification of the number of inspirations than of the beats of the heart. In general, it diminishes both numbers, the first in a ratio which may be considered as 7 to 6, and the second in the ratio of 4 to 3 nearly. It is very important to consider the state of the individual in these researches, and not to make the observations when the person is excited by walking quickly, or by passions and emotions of the mind, and still more if the person is not well in health. To observe accurately the number of inspirations is very difficult, and particularly if the individual knows that he is the object of observation. I have seen many persons unable to make such observations on themselves. We must also consider the time of the day: for instance, in the evening we are generally more excited than in the morning, and the beats of the heart, as well as the inspirations, are more rapid.† Neither is it indifferent whether we observe the person before or after a meal. Observing myself at quiet moments, but at different times of the day, I have found the average number of the beats of the heart to be 66·2, and the average number of inspirations 15·8. The first number has varied between the extremes of 74 and 56: this latter value has been observed immediately before dinner, and the former after a public lecture, about one hour after reaching home. The number of inspirations has varied between 17 and 14·5.

MM. Leuret and Mitivié, who have recently published an interesting work on the *frequency of the pulse in the insane*,‡ have sought to determine the influence of temperature and changes of the moon on this frequency; but their observations were not sufficiently numerous to deduce a numerical appreciation of so feeble an element. On the other hand, comparing young people and old persons, they have found that, contrary to the generally received opinion, the pulse of the first is slower than the second: thus they have counted in one minute,

In young persons, - - -	65 pulsations.
-- old persons, - - -	74 --
-- insane women, - - -	77 --

The observations were made in the morning, whilst the persons were still in bed, and the pulse consequently beating slower than during the day. MM. Leuret and Mitivié have also thought that the average number of pulsations was fewer in winter than in

* [It is sufficiently singular that the chief cause modifying the number of pulsations of the heart, during the twenty-four hours, escaped the notice of M. Quetelet. He takes no account of the singular influence exercised in accelerating the pulsations by the slightest muscular exertion. The condition of sleeping or waking, to which he ascribes considerable effect, has little influence on the pulse, further than as regards a quiescent or non-quiescent state of the body. He seems also inclined to ascribe to sleep those effects which have long ago been proved to be solely attributable to another cause, viz., a diurnal revolution in the number of pulsations of the human heart.—See *Edinburgh Medical and Surgical Journal* for 1817.]

* [These observations of M. Quetelet are of little comparative value, from his having neglected to state the *position* of the child during the waking state, and the time of day or night.]

† [The reader is requested to suspend his judgment in respect to these observations until he has perused the documents in the appendix. Certain important elements in these observations have, as we have already said, been overlooked by M. Quetelet.]

‡ Paris, Crochard; 1832. 8vo.

summer, and that the variations do not correspond to changes of temperature.*

2. On Swiftness, and the Activity of some other Physical Qualities of Man.

There are several other physical qualities of man besides those I have just considered, which are likewise susceptible of measurement, and which have been little attended to hitherto. What is generally the best known is the swiftness and the length of the stride of man; but at present, the data for different ages are wanting, and especially when consideration is had to the weight and size of individuals.

A foot traveller can pass over six kilometres [7158 yards] an hour, and continue a long distance, which is at the rate of 100 metres [119 yards] a-minute. We calculate the length of the step at eight decimetres [31·496 inches]: thus the traveller makes 125 steps per minute, and 7500 steps in an hour. He can walk at this rate 8½ hours a-day, and continue as long as he likes, without injuring his health or strength. Then, as a fact, we suppose 51 kilometres [55,743 yards] the average distance which a traveller can walk each day, without overstretching his powers. The average weight of a man in his ordinary clothes is 70 kilogrammes [187 lbs. troy]. Thus, the pedestrian carries each day 70 kilogrammes a distance of 51 kilometres; or, which amounts to the same thing, 3570 kilogrammes the distance of one kilometre.

According to M. Ch. Dupin, from whom I borrow the preceding details,† the military step is computed to be as follows:—

	Length.	The Soldier makes per minute—
Common step,' - -	65 cent.‡	76
Quick march, -	65 "	100
Charging, - -		125

I regret that my own observations do not allow me to treat this subject at present in more detail, or to present a summary of the results obtained by observers who have endeavoured to ascertain the practical effect of speed combined with strength. We find, in general, that wherever the energy of man can be excited, employed as a machine, the physical qualities he can put in force have been measured with more precision. His other qualities have been less studied: thus, we know little of the average speed of man in running; we also know very little of the height and length of his leap, with the exception of the cases of those men who possessed those qualities in an extraordinary degree.

I have been endeavouring to sum up what relates to the height and extent of the leap, in some results which it may be useful to know. However, I ought to premise, that since these results for young ages have been obtained from individuals, several of whom were studying gymnastic exercises, the values may be greater than they otherwise would be. The leaps were made without taking a run, and on a plane and horizontal surface. The length was estimated by measuring the distance from the toes.

Ages.	Length of the Leap. metres.	Height of the Leap. metres.
11 years, - - -	1·52	--
12 " - - -	1·60	--
13 " - - -	1·66	0·64
14 " - - -	1·77	0·79
15 " - - -	1·97	0·80
16 " - - -	2·06	0·83
17 " - - -	2·04	0·81
18 " - - -	2·14	1·00
19 to 30, - - -	2·18	0·93
30 to 40, - - -	1·78	0·88

The height of the leap was estimated by the height of an obstacle over which the person could leap, with his feet close together, and without taking any run.

Estimating the length of the leap at two metres, [6 5-10ths feet] we see that it is about triple that of the ordinary or quick step of soldiers.

I ought, according to the plan I have laid down, to present a great number of other data here, which are capable of being measured, and which vary according to the ages of the persons. I ought, in some manner, to meet those views relative to man which have been put forth by Mr Babbage, with whom I have frequently had the honour to meet during my experiments. Mr Babbage, in wishing for a table of *constants*, had in view a measurement of every thing in the different kingdoms of nature which is capable of measurement. This gigantic plan has not deterred his countrymen, who are not accustomed to shrink from difficulties, when, by surmounting them, they can enrich science: thus, the British Association, at the meeting which took place in Cambridge in 1833, set aside a certain sum to encourage the efforts of those who seek to realise, in some measure, the ideas of Mr Babbage. I have not laboured on so grand a scale as my erudite friend; I have only been considering man: but in another view I have rendered the problem more comprehensive, by seeking to determine the modifications which age induces on physical qualities, which cannot be considered as constant until man is fully developed, and when he has not approached the period of decay.

I recollect that Mr Babbage, in a conversation which we had together on the subject of his constants, told me that he had been investigating how many times a man could do certain things in one minute of time: for example, how many steps he could make, how many strokes of the oar the rower makes, how many blows the smith gives with his hammer, how many stitches the tailor makes, &c.; and that he had observed that these numbers do not vary much in the different countries which he had visited. These constants partly depend on our organisation, and more especially on some of the faculties, as inspirations, pulsations, stature, &c. It would be interesting to determine the ratios which exist between the different constants, and see if they obey simple laws.

Grétry remarks somewhere in his memoirs, that the step of man is easily regulated by an air he sings, the measure being quicker or slower. Pythagoras long ago perceived a certain harmony in the number of blows struck by the forger; this harmony was undoubtedly purely numerical, like that which he guessed at concerning the motions of worlds, and which, indeed, has been acknowledged by Kepler, who was impressed with the same ideas of harmony as the founder of the Italian school. I again repeat, that to judge of the mutual dependencies of each of our faculties, and to determine to what extent they are influenced by each other, it is necessary to have studied them successively with care, before establishing relations which require subsequent impartiality and discernment. Not until then shall we be able to know man, and the effects of all the causes by which he is influenced, whether these causes be extrinsic to him, or whether they depend merely upon his will and his organisation.

BOOK THIRD.

DEVELOPMENT OF THE MORAL AND INTELLECTUAL QUALITIES OF MAN.

1. Of the Determination of the Average Man with Regard to Moral and Intellectual Qualities.

We have been enabled to perceive, in the two preceding books, that an appreciation of the physical qua-

* [The observations of MM. Leuret and Mitivié have been refuted in this country—first by Dr Knox, in 1814, and afterwards by Dr Guy, in 1836.—See *Anatomical and Physiological Memoirs and Medical Gazette*, likewise *Guy's Hospital Reports*.]

† Géométrie et Méchanique des Arts et Métiers, tome iii. p. 75: 1826.

‡ [25 5-10ths inches.]

lities of the average man does not present any real difficulty, whether we can measure them directly, or whether they only become appreciable by their effects. It is not so with the moral and intellectual qualities. Indeed, I do not know that any person had thought of measuring them, before the essay I wrote on the development of the inclination to crime at different ages. At the same time, I endeavoured to mark out the course which it is proper to follow in such researches, and the real difficulties which present themselves, when we attempt to arrive at each particular result. Perhaps it will be useful to give a summary recapitulation of my ideas on the subject, before passing to the application of them.

Certain moral qualities are very analogous to physical ones; and we may value them, by admitting that they are proportioned to the effects which they produce. Thus, we cannot hesitate to say that one operative has twice or thrice the activity of another, if, all things being equal, he performs double or triple the amount of labour which the other one does. Here the effects are purely physical, and like the compression of the spring in the estimation of mechanical forces: we have only to admit the hypothesis that causes are proportioned to the effects produced by them. But in a great number of cases, this appreciation becomes impracticable. When the activity of man is exerted on immaterial labours, for example, what standard can we adopt, except the works, such as books, statues, or paintings, produced? for how can we obtain the value of the researches and thought which these works have required? The number of the works can alone give an idea of the productive power of the author, as the number of children brought into the world gives us the fecundity of a female, without taking into account the value of the work produced.

If, like the fecundity of females, the different qualities of men were manifested by deeds to which we could assign a value, we conceive that these qualities might be appreciated and compared with each other. Thus, we should not be astounded at hearing, that one man has twice the courage of another, but only one-third the genius; but, since such an appreciation has nothing definite and exact, we confine ourselves to saying that a certain individual has courage, or has not courage, or is even a coward; which in mathematical language would be expressed by saying that his courage is *positive*, *zero*, or *negative*. We say that one man has more courage than another. This opinion is formed, when, after having seen both the individuals in question in action, we think one inferior to the other, without being able to form an exact estimate of their degree of courage. Here we see how arbitrary this is, and how much such estimates are matters of debate. It might also be considered absurd in any one to attempt to express by numbers the relative courage, genius, prudence, or evil propensities of two individuals. Yet, let us examine such an impression more narrowly; let us try to find out why it is absurd; and see if the ratio for which we contend may not be laid down in some cases.

Let us suppose that two individuals are every day placed in circumstances inciting to acts of bravery, and that each one has the same readiness to seize them: moreover, let us suppose that each year we enumerate, pretty constantly, 500 acts of the one, and 300 of the other: moreover, these acts, though more or less remarkable, may be considered collectively, as having each the same value, because they are generally produced under similar circumstances. This being admitted, and considering causes as proportioned to their effects, we should have no difficulty in saying that the bravery of these two individuals is as 500 to 300, or 5 to 3. Such an appreciation would have more truth, according as the observations on which it was founded extended over a greater number of years, and varied little from one other. Here, then, the absurdity only proceeds from the *impossibility*, in the first place, of placing two men in equally favourable circumstances to display their bravery and courage; in the second place, of enumerating each of these acts; and, lastly, of collecting a sufficient number of them, in order that the conclusion we form may be as little removed from truth as possible. Consequently, the ratio is only considered as being absurd, from the supposed *impossibility* of determining it. However, let us suppose the two individuals just spoken of are Frenchmen, and that one of them represents the generality of men between 21 and 25 years of age, and the other the generality between 35 and 40: moreover, instead of courageous acts, let us substitute thefts, of such a nature as come under the power of the criminal tribunals, and all the rest will be realised, in such a manner that we may consider it as very probable that in France the inclination to theft is almost as five to three, in men between 21 and 25, and 35 and 40. Indeed, we may admit that men between 21 and 25, who, according to the French tables of population, are as numerous as those between 35 and 40, have the same facility to commit theft as the latter; and, moreover, that the thefts coming under the judgment of the criminal tribunals, have circumstances of equal aggravation in each. If it be objected, that we can, in this consideration, only take in the thefts which come before the tribunals, I shall say that, when we calculate the mortality or fecundity of a nation, we are only acquainted with the births and deaths noted in the civil records, and that a great number may be omitted. Moreover, the probability of omissions is as great for individuals between 21 and 25, as for those between 35 and 40 years of age.

Thus we may say, first, that the individuals we compare are almost exactly in the same circumstances; second, that if we do not know the absolute number of thefts which they have committed, at least we know the probable ratio; third, that this ratio must be entitled to more confidence, since it is founded on the observations of several years, and varies within narrow limits merely. Indeed, the ratio of 5 to 3 has been calculated from the results of four years: for two years, it was exactly as 5 to 3; one time rather more, the other rather less. These differences are such, that if we measure for four days in succession, the ratio of the power of two individuals by Régnier's dynamometer, the differences between these four ratios and the general average will undoubtedly be greater than those which we have observed. Thus we may consider it as very probable, that the degrees of inclination to theft, for France in her present state, are such as we have established.

Now, let us suppose that society, in a more perfect state than its present and real one, takes the opportunity some day to register and appreciate courageous and virtuous actions, as crimes are now done, will there not be some means of measuring the relative degrees of courage or virtue at different ages? Therefore the absurdity which is now attached to an endeavour to appreciate this ratio for the average man, is more apparent than real, and is owing to the impossibility which still exists, in the actual state of society, of procuring the necessary elements of the calculation.

It appears to me that it will always be impossible to estimate the absolute degree of courage, &c., of any one particular individual: for what must be adopted as unity?—shall we be able to observe this individual long enough, and with sufficient closeness, to have a record of all his actions, whereby to estimate the value of the courageous ones; and will these actions be numerous enough to deduce any satisfactory conclusion from them? Who will guarantee that the dispositions of this individual may not be altered during the course of the observations? When we operate on a great number of individuals, these difficulties almost entirely disappear, especially if we only want to determine the ratios, and not the absolute values.

Thus we might estimate the tendency to certain vices or virtues, either for men at different ages or for both sexes, when we are only taking one nation into consideration: but the difficulties increase when we compare different nations, because many circumstances which in the two former cases were the same, become very dissimilar in the latter.

To make a summary of what has been said on the possibility of measuring qualities of men which are only appreciable by their effects, I think we may employ numbers in the following cases, without any imputation of absurdity:—

1. When the effects may be estimated by means of a direct measure, which gives their degree of energy, such as those produced by strength, speed, and activity, applied to material works of the same nature.*

2. When the qualities are such that the effects are almost the same, and in a ratio with the frequency of these effects, such as the fecundity of females, drunkenness, &c. If two men, placed in similar circumstances, became intoxicated regularly, the one every week, and the other twice a-week, we should say that their propensity to intoxication was as 1 to 2.

3. Lastly, we may also employ numbers, when the causes are such that it is necessary to pay as much attention to the frequency of the effects as to their energy, although the difficulties then become very great, and indeed sometimes insoluble, owing to the few data at present possessed by us. This is what we observe especially in regard to the moral and intellectual qualities, such as courage, prudence, imagination, &c. The question generally becomes simplified, when the effects really vary in energy; but these, nevertheless, under their different modifications, are in almost similar proportions. We may, then, leave energy out of the calculation, and only attend to frequency. Thus, comparing the state of man at 25 and at 45 years of age, in his tendency to commit theft, we may, without erring greatly, attend only to the frequency of the thefts at these different ages, because the different degrees of aggravation of these offences may be supposed the same in both cases. In such appreciations as these, the values we obtain have the greater likelihood of approaching the true values which are wanting, according as, all things being equal, they are more numerous—just as when we put two individuals to the proof, to form an idea of their knowledge, veracity, memory, &c., we mark the number of mistakes they make. Moreover, as I have already remarked, these modes of appreciation are almost impracticable, when two individuals are concerned, because the facts are not sufficiently numerous to draw any satisfactory conclusion from them; and, moreover, the individuals may alter during the course of the observations. It is not so with the average man: indeed, we can obtain a great number of observations in a short time. It would be impossible, when comparing two men, the one between 21 and 25, and the other between 35 and 40, to determine, all things being equal, their degree of proneness to theft, or any other crime, for this proneness may not have been disclosed, even in one single action, in the course of the observations; which is no longer the case when we take all men, collectively, of the same age: the number of acts or effects is then great enough to allow us, without any serious error, to neglect the different degrees of energy of these acts. Again, if we find that the number of crimes remains nearly exactly the same, from year to year, it is very probable that the result obtained will not be far from the truth.

I think all the qualities of man which are only appreciable by their effects, may be referred to the three heads I have laid down above: I also think it will be perceived that the impossibility of employing numbers at present, in such appreciations, is rather owing to the insufficiency of the data than to the inaccuracy of the methods.

If the law established for the average man is liable to some exceptions, as all the laws of nature are, yet this will be what expresses most nearly what the state of society has been; and nothing can be more important. At birth, man is possessed of the germs of all the qualities which are developed successively and in different degrees; prudence predominates in one, avarice in another, imagination in a third: we also find some tall in proportion to their age, others having a precocious imagination, and possessed of activity and vigour in old age. The single fact that we remark the existence of these differences, proves that we have some notion of a general law of development, and reason accordingly. Therefore, I am not aiming at something unheard of, but only to give more precision to these commonly vague appreciations, because they rest on incomplete or defective observations, and are almost always few in number.

After all which has been said, I think it not only not absurd, but even *possible*, to determine the average man of a nation, or of the human race; the apparent absurdity of such a research only proceeds from the want of a sufficient number of accurate observations, so that the conclusions may present the greatest possible probability of truth. In the preceding book, I have already attempted to determine the laws of the development of the physical powers of the average man: I am now going to continue my researches, and extend them to the moral and intellectual qualities.

CHAPTER I.

DEVELOPMENT OF THE INTELLECTUAL FACULTIES.

1. Development of the Intellect.

The field we are going to traverse is immense; in the actual state of science, we must confine ourselves to simple indications, which will serve as posts to denote the first attempts made with a design of taking in and observing the whole field. It will first be necessary to determine the period at which memory, imagination, and judgment, commence, and the stages through which they successively pass in their progress to maturity; then, having established the maximum point, we may extend our inquiries to the law of their decline. I have already stated the mode in which memory is to be estimated, and I shall here endeavour to show how we ought to proceed with reason and imagination.

We can only appreciate faculties by their effects;

* Perhaps we might reduce to the same class the effects of memory, whether considered in its readiness to apprehend or its power of retention. For example, two persons, the mind of each being equally calm, and constituted alike favourably for the experiment, will commit some pages of a book to memory, the one in two hours, the other in four hours: but the first person, after a month, will not be able to repeat the passage in question without stopping, whilst the second finds no defect of his memory until two months have elapsed. After such an experiment, the facility to apprehend (in the two individuals) is as 1 to 2, and the facility to retain in the inverse ratio: the time here serves as a measure. We should say, undoubtedly, that it is impossible to note the precise moment when we have committed the passage entirely to memory, as well as when the memory begins to be defective. But here we may act as is done in physical phenomena, which present the same inconvenience, when calculating the duration of the sensation of sight or hearing, or the loss of electricity by a moist medium, or the cooling of bodies. Memory seizes and loses in a gradual manner, and according to a certain law; but there is a ratio between the facility of seizing and retaining in different persons, independently of this law. This ratio must vary very much according to the age of persons. I think these variations may be ascertained by increasing the number of experiments, to correct what may have been defective in other observations. I do not think that the changes which age produces on sensations of sight and hearing have yet been studied: I do not speak of the other senses, the mode of operation of which is but little understood.

in other words, by the actions or works which they produce. Now, in attributing to a nation, as we should to an individual, all the works which it has produced, we may form an opinion both of the fecundity and the power of intellect of that nation, compared with others, making allowance for the influence of causes impeding their production. Afterwards, by bearing in mind the ages at which the authors have produced their works, we possess the necessary elements to follow the development of the mind, or its productive power. In such an examination, it will be necessary to separate the different kinds of works; placing together works of art or design, music, mathematics, literature, philosophy, &c., so as to perceive immediately the different shades of development of the different faculties.

This research should be repeated in passing from one nation to another, to see if the laws of development vary by locality more than by the nature of the works. It will also be necessary that these examinations be most accurate and impartial; we should not select, but take the works promiscuously, without classing them. This might be tedious and irksome; but would present curious and very unexpected results.

I shall now give an example of such an analysis of dramatic works only, and I shall take France and England as the subject of observation. To exclude all idea of system, I shall only consider those works truly deserving of mention which are given in the Repertory of Picard for France, and the British Theatre for England. I know that, in attributing as much merit to the Misanthrope as to the Sicilian, and as much to Don Sancho of Arragon as to Cinna, there can be no similarity; but here, as well as in the researches into crime, it happens that the greater number of the obstacles disappear, and the ratio of works of the first order to those of the second may be considered as being essentially the same, in the groups we have formed. Besides, when examining the degrees of merit of the different works in detail, we may still in some measure meet and parry this inconvenience and difficulty. We may still deceive ourselves in such an estimate, but generally the probability of error will be lessened as the observations are more numerous. We have, moreover, the valuable advantage of being able to prove the law of development, by passing from one nation to another, and seeing how the maximum is influenced by locality.

In the review I have made of dramatic works, I have thought proper to take, not the period at which the works were written, which is generally impossible, but the time when they were represented, which, on an average, will generally be two or three years later.

Ages.	French Theatre.			English Theatre.		
	Principal Works.	Authors who have produced them.	Works which might have been produced.	Principal Works.	Authors who have produced them.	Works which might have been produced.
20 & under,	0	47	0	1	24	1
20 to 25, -	5	47	5	6	24	6
25 to 30, - -	15	47	15	8	24	8
30 to 35, -	26	47	26	9	23	9
35 to 40, - -	26	46	27	7	22	8
40 to 45, -	25	45	26	7	22	8
45 to 50, - -	23	43	30	6	19	8
50 to 55, -	23	41	26	0	15	0
55 to 60, - -	5	33	7	1	12	2
60 to 65, -	6	28	10	1	11	2
65 to 70, - -	4	23	8	0	7	0
70 & upwards,	2	18	5	1	7	3

The first column for each country indicates the number of principal dramatic works; the second the number of authors who composed them, and who survived to the ages pointed out; and the third column informs us how many works might have been produced, all things being equal, if the number of authors had not been reduced by death. Thus, between their 65th and 70th years, 23 authors have produced four works; and I have supposed that if the 24 others had continued to live, they would have been able to produce other four, which would give a total of 8 dramatic works. Admitting, then, that each had the same opportunity to produce, at a given age, I have multiplied each number of the first column, which gives the principal dramatic works, by the ratio $\frac{47}{a}$, in which a stands for the number of surviving authors.

Now, if we proceed to examine the results which the table presents, we shall perceive that, both in England and France, dramatic talent scarcely begins to be developed before the 21st year; between 25 and 30, it manifests itself very decidedly; it continues to increase, and continues vigorous, until towards the 50th or 55th year; then it gradually declines, especially if we consider the value of the works produced.

Moreover, it would appear that authors were rather more precocious in England than in France: this may be owing to the manner in which the numbers have been collected, and to the difficulty which French authors experience before they procure the representation of their pieces.

It would be interesting to compare these results with those which have been obtained by considering the number and relative merit of the different works. This I have endeavoured to do in the following table, which I only bring forward as an essay, not pretending that the classification of French works is according to their real merit. I have thought proper only to make three degrees of comparison of the works given by Picard as forming the French stage; and I have quoted a small number of those which I conceive to belong to the first rank:—

Ages.	Order of the Works.			Relative Aggregate.	Name of the Works of the First Order.
	1st.	2d.	3d.		
20 and under,	0	0	0	0	
20 to 25, -	1	0	4	7	Œdipe.
25 to 30, - -	3	3	9	24	Le Cid, Andromaque, Britannicus.
30 to 35, -	4	8	14	42	Les Horaces, Cinna, Polyeucte, Iphigénie.
35 to 40, - -	4	8	14	42	Phèdre, Le Joueur, Zaïre, Le Méchant.
40 to 45, -	2	9	14	38	Le Distrait, Alzire.
45 to 50, - -	6	10	12	50	Le Misanthrope, Le Tartuffe, L'Avare, Mahomet, Mérope, La Métromanie.
50 to 55, -	3	8	12	37	Les Femmes Savantes, Athalie, Le Glorieux.
55 to 60, - -	0	3	2	8	
60 to 65, -	0	2	4	8	
65 to 70, - -	0	1	3	5	
70 & upwards,	0	1	1	3	

In the approximative estimate I have made of the relative degrees of merit of works of the first, second, and third orders, I have taken the numbers 3, 2, and 1; and from them I have deduced the values of the last column, which entirely confirm those given by the former table. It is also easy to see, whatever numbers we may employ to express the relative degrees of merit of works, that the general results still remain the same.

Another very curious result which the tables I have formed show, although the details are here suppressed, is, that tragic talent is developed more rapidly than comic. The *chefs-d'œuvre* which enrich French comedy,

were not begun until the 38th or 40th year; and we scarcely find any works belonging to elevated comedy before the 30th year; though I am only speaking of the French authors included in the Repertory of Picard. But I leave this discussion to more competent judges; here I confine myself to just pointing out the plan to be adopted. Others are more able to ascertain if the talent of the tragic author really arrives at maturity earlier than the comic author; and if this maximum is more precocious because it is naturally connected with the time of life when the passions are in the highest state of exaltation. The best mode of analysing this question will be, to ascertain the law of development of musical talent and the art of design, and things generally which excite the passions; and, on the other hand, to study our faculties, the development of which does not so much require the conjunction of the passions and an exalted imagination, as observation and reflection. I shall soon present a remarkable example of analysis of the development of the passions, which tends to show that their maximum of energy takes place about the 25th year; so that, if an art existed, the exercise of which would follow a ratio proportional to the development of the passions, and where previous studies were dispensed with, its maximum of development would also take place about the 25th year: this maximum will afterwards draw near to that which reason attains, according as the intervention of this faculty becomes more necessary. It will also be necessary to take into account the time required for the studies which are indispensable in the production of works.

Our intellectual faculties arise, increase, and decay: each one attains its energy towards a certain period of life. It would be of the highest interest to ascertain those which occupy the two extreme limits of the human scale; that is to say, those which are the first and those which are the last in arriving at maturity; because they have the property of being simple, and not resulting from combination: thus, for example, dramatic talent is a combination of several other faculties, such as imagination, reason, &c.; but, I again repeat, such an analysis requires infinite care, numerous researches, and great shrewdness of observation.

After having rapidly sketched the course to be pursued in studying the development of the intellectual faculties, I think it will be proper to speak of their diseases, which are dreadful affections, the intensity and number of which seem to keep pace with the development of the mind.

2. Of Mental Alienation.

"Sloth and misconduct give birth to poverty; immorality and intemperate passions lead to crime; insanity may attack the most honourable, and does not always spare the wisest men."* This opinion, put forth by a man whose name has great weight in science, will be sufficient to convey an idea of the importance I attach to any thing bearing on the statistics of the deranged. If it be true that diseases of the mind increase in proportion to the development of this faculty, we shall have a new measure or standard, which may regulate what I have previously attempted to establish. However, it is well to be aware that, by taking all insane persons indiscriminately, we may be led to very inaccurate results. Moreover, it is right to distinguish the two classes of insane persons carefully: for, according to M. Esquirol, it is insanity, properly so called, with which idiocy has been confounded, that is in a direct ratio with civilisation. Idiocy is a state depending on soil and material influences, whilst insanity is the product of society and of moral and intellectual influences. In idiocy, these causes have prevented the development of the organ, and, consequently, the manifestation of intelligence. In the production of insanity, the brain is over-excited, and goes beyond its physiological power.*

To form an idea of the influence of this fatal malady, we shall commence by a glance at some of the principal countries where its influence has been most decided.

Countries.	Population.	Deranged Persons.	Population to one Deranged Person.
Norway, - -	1,051,318	1,900	551
England, - -	12,700,000	16,222	783
Wales, - - -	817,148	896	911
Scotland, 1825, -	2,093,454	3,652	573
New York, 1821,	1,616,458	2,240	721
France,† - -	30,000,000	30,000	1000

In Norway, idiots form one-third of the total number of deranged persons, and one-half in Scotland and Wales: it is the great number of idiots which makes the proportion of deranged persons in Scotland so much greater than it is in England. In general, we observe that in mountainous countries there are many more idiots than in level ones; and in plains where agriculture is solely pursued, we find more idiots than in towns. In France and New York, the number of idiots is very small.

From numerous researches into the ratio in which the sexes are affected, collected from several countries, having great differences in temperature, customs, and laws, M. Esquirol has enumerated 37,825 males to 38,701 females; from which it appears that difference of sex has not much influence on mental derangement. But this is not the case with the seasons; their influence is very marked; at least we may infer this from the following returns of insane persons admitted at Charenton:—

Months.	Admissions: 1828-1829.		Admissions before 1829.	Cures.	Deaths.
	Men.	Women.			
January, -	42	21	37	11	21
February,	40	33	49	10	24
March, -	49	25	53	10	16
April, - -	50	38	58	16	22
May, - -	58	36	44	15	18
June, - -	55	34	70	19	18
July, - -	52	36	61	23	18
August, -	45	24	64	22	13
September,	48	26	47	22	11
October, -	44	47	49	24	30
November,	47	22	35	22	22
December,	35	28	52	15	8
Total,‡ -	565	370	619	209	221

Thus, the summer months have produced the greatest number of cases: the cures have also been most numerous in summer and autumn. We may conceive that, from cases of acute insanity breaking out during the hot season, and being more readily cured, also, than chronic ones, the three months of autumn ought to furnish the greatest number of cures.

If we examine what influence age has on the development of mental alienation, we shall again find very curious results. It would appear that mental alienation may be divided, according to ages, into imbecility in infancy, mania in youth, melancholy in mature age, and madness in advanced age.§

The following table will show us the degree of frequency of this disease at different ages. It is constructed from the data given by M. Esquirol in the

* *Remarques sur la Statistique des Aliénés*, &c., par M. Esquirol (*Annales d'Hygiène*, Décembre 1830).

* M. Esquirol. The data of this chapter are extracted principally from articles inserted by this philosopher in the *Annales d'Hygiène*.

† These numbers relating to France are from casual not statistical observation. See also the *Memorial Encyclopedique*, May 1833.

‡ The numbers for the five years from 1829 to 1833, given in this and the following table, have been kindly furnished me by M. Esquirol, from an unpublished work.

§ See the article *Folie* of the Dict. des Sciences Médicales.

Annales d'Hygiène for April 1829. To estimate the degree of frequency of mental alienation, I have thought it necessary to count the number of individuals between 15 and 20, 20 and 25, &c., years of age. In this table I have also included the number of cures, and their ratio to the number of patients.* Lastly, the numbers of both the last columns are those which M. Esquirol has kindly permitted me to take from his work about to be published.

Ages.	At Charenton before 1829.		Ratio.	Lunatics to the Population.	At Charenton: 1829 to 1833.	
	Admissions.	Cures.			Men.	Women.
15 to 20 years,	22	11	2·0	24	24	11
20 to 25 "	67	30	2·2	79	65	23
25 to 30 "	86	40	2·2	109	78	31
30 to 35 "	98	36	2·7	134	79	47
35 to 40 "	81	25	3·3	125	65	64
40 to 45 "	79	21	3·8	129	64	59
45 to 50 "	72	14	5·1	131	52	44
50 to 55 "	52	12	4·3	108	54	37
55 to 60 "	21	6	3·5	51	32	20
60 to 65 "	21	9	2·3	63	33	18
65 to 70 "	6	1	6·0	24	14	9
70 & upwards,	14	4	3·5	45	6	7

We have already seen that, all things being equal, it is between the 30th and 50th years that the greatest number of standard dramatic works have been produced in France—that is, the period when imagination and reason are most productive; and, by a singular contrast, it is also about the same age that mental alienation is most frequent, and the cure of it most difficult. The intellectual life of man, and the diseases of his mind, especially develop themselves about the age of 25 years, when physical development has almost ceased: man, indeed, at this age, is almost entirely developed in stature, weight, and strength; and it is at this time that the greatest tendency to crime is manifested. Again, it is remarkable from another comparison, namely, that the period of reproduction falls between the 25th and 30th years. Thus, the average man, between 25 and 30 years of age, has completed his physical development, and this is also about the period when his intellectual life is most vigorous.†

M. Esquirol, in a work published in 1830, in the *Annales d'Hygiène*, has given the following numbers, which establish a difference between sexes and ages:—

Ages.	Paris.			Norway.		
	Men.	Women.	Total.	Men.	Women.	Total.
Before 20 years,	436	348	784	188	141	329
From 20 to 25,	624	563	1,187	101	83	184
" 25 to 30,	635	727	1,362	97	88	185
" 30 to 40,	1441	1607	3,048	214	173	387
" 40 to 50,	1298	1479	2,777	150	155	305
" 50 to 60,	847	954	1,801	128	115	243
" 60 and upwards,	875	1035	1,910	117	140	257
Total,	6156	6713	12,869	995	895	1890

* According to a work by M. Klotz, *De Vesaniæ Prognosi*, the annual ratio of admissions to dismissions in the principal lunatic hospitals of Europe, would fall within the limits 0·330 and 0·500. In the generality of the establishments in Belgium, the entries are to the exits as 330 to 1000.—*Traite sur l'Alienation Mentale*, &c., *par J. Guislain*, 2 vols. 8vo. 1826.

† M. Pierquin, in his *Arithmetique Politique de la Folie*, finds, as the principal conclusion of his researches, that "crimes are always, from being proportionate to the population, also in a relative proportion to the degree of insanity," and seeks to refute the assertion of M. Esquirol, that insanity is a disease of civilisation. I certainly think, with him, that in general, the causes which tend to produce alienation, also influence the number of crimes, and especially crimes against persons, but without there being a direct and necessary ratio between the number of insane and that of criminals, because all crimes have not their source necessarily in mental alienation.

We may first observe, that at Paris insane men, up to the age of 25 years, are rather more numerous than women; after this age, the contrary takes place. In Norway, the number of insane women only exceeds that of men towards the end of life. In the latter country, the number of insane under 20 years is 329, which is one-sixth of the total number existing in the kingdom; whilst at Paris, the number of insane under 20 years of age, is only 784, or one-fourteenth. This difference arises, no doubt, from the great number of idiots entered in the returns of Norwegian statistics. If in Norway there are more imbecile persons from the time of infancy or early youth, the contrary takes place for the periods beyond 60 years of age. In Norway, scarcely one-eighth of the insane are more than 60 years old; whilst in Paris one-sixth exceed that age.

To form a better opinion of the influence of age, I have reduced the preceding numbers to 1000, and I have compared them with the corresponding numbers of the same ages, given in the tables of population in the *Annuaire du Bureau des Longitudes* of France, and those of Sweden for 1820:—

Ages.	Paris.			Norway.		
	Population.	Insane.	Ratio.	Population.	Insane.	Ratio.
Before 20 years,	0·402	0·061	0·15	0·411	0·174	0·42
20 to 25 "	0·084	0·092	1·09	0·067	0·097	1·11
25 to 30 "	0·080	0·106	1·32	0·064	0·083	1·17
30 to 40 "	0·140	0·237	1·69	0·136	0·205	1·51
40 to 50 "	0·114	0·216	1·90	0·109	0·161	1·48
50 to 60 "	0·091	0·140	1·54	0·096	0·129	1·50
60 & upwards,	0·069	0·148	1·66	0·087	0·136	1·56
Total,	1·000	1·000	1·00	1·000	1·000	1·00

The numbers for France also concur to show that mental alienation is most frequent between the 40th and 50th years. In Norway, its frequency becomes great between the 30th and 40th years, and preserves the same value almost to the end of life.

These results agree well with the observation of M. Esquirol, that insanity is a disease which attends and increases with civilisation. The fortress of the understanding is attacked, either by too much mental labour, or by passions and disappointments which are too acutely felt.

We cannot collect too many documents to verify, with still greater accuracy, the results of the tables which I have just given. It is with this object that I now bring forward some new documents taken from a *Rapport Statistique sur la Maison d'Aliénés de Bon-Sauveur à Caen*, during the years 1829 and 1830, by M. Vastel.* The author classes the insane in the following manner, according to age. In the last column, the total numbers are reduced to 100:—

Ages.	Insane.	Men.	Women.	Insane.
From 15 to 20 years,	10	7	3	0·03
" 20 to 30 "	54	38	16	0·17
" 30 to 40 "	94	44	50	0·29
" 40 to 50 "	82	32	50	0·25
" 50 to 60 "	57	18	39	0·17
" 60 to 70 "	25	6	19	0·08
" 70 to 80 "	3	1	2	0·01
Total,	325	146	179	1·00

Here, again, we find the same analogies, the same laws of development, proceeding, as it were, in a parallel manner.

M. Falret has written a work on insanity, suicide, and sudden death, of which at present we only know the general contents, from a report made by M. Serres to the Institute.† The principal conclusions of this

* Annales d'Hygiène, Oct. 1832.

† The work of M. Falret has gained the prize for Statistics, founded by M. de Monthyon.

work, on the influence of season, sex, and age, are the following:—"Of the total number of the insane, women form one-third more than men. Women are most subject to the attack of insanity in July; but for men this month is in the third rank; with a reference to civil statistics, we find that more than one-fourth of the men are bachelors: as to age, we find mental diseases develop themselves in men between the 30th and 39th years, and in women between the 40th and 49th years; as to the nature of the affections, melancholy predominates in women, and the tendency to homicide in men. The same contrast is found in the cures, deaths, and relapses."

CHAPTER II.

DEVELOPMENT OF MORAL QUALITIES.

1. Of Foresight, Temperance, Activity, &c.

I HAVE already observed, that it is not so much a method which we want, when endeavouring to appreciate the development of moral qualities, as sufficient and trustworthy data. For example, if we are considering the virtues most essential to the social state, we have scarcely any data, and those which exist, having been collected with intentions very different from our own, are either unfit for purposes of comparison, or utterly incomplete. For example, let us suppose that we want to ascertain the degree of foresight at different periods of life, as well as the modifications of this virtue by the differences of sex, locality, profession, &c. We are obliged to recur to actions by which this foresight has been manifested; and if we cannot collect them all, it is at least necessary to unite as great a number as possible, and to take care that the classes of individuals who are the subject of comparison are in the same circumstances. It is in choosing, classing, and reflecting upon the materials, that discernment and unprejudiced reasoning are so essentially necessary, since the examples to be followed have not yet been laid down. Those who first enter upon this field of research, will no doubt often go astray; but their efforts will be valuable and useful, if they are conducted with candour and impartiality. Nothing is more injurious to the interests of science, than to undertake such researches with notions previously formed.

If we had authentic documents respecting savings' banks, assurance societies, and the different institutions which encourage foresight—if these documents gave the age, sex, profession, and every other requisite information concerning the individuals who take part in the operations of these establishments—it is evident that we should already have very satisfactory elements to enable us to obtain an approximation to the values we are seeking. We may conceive, moreover, how much discernment is necessary, in placing the individuals concerned in similar circumstances, and distinguishing those among whom it is impossible to establish any comparison; not to mention other data necessary to enable us, from the time at which they were taken, to render all chances equal on both sides. We should be able, with due precautions, to make other documents, furnished by establishments of another nature, available for the same purpose, and which would serve in this manner to verify the former conclusions. Thus, the number and value of the objects placed in pawnbrokers' hands, will better exemplify the want of foresight of a community than any misery in its condition. For, if it be true that accidents and reverses of fortune sometimes compel men, even the most prudent, to have recourse to such establishments, it much more frequently happens that the deposits are placed there from want of due care and economy. The passion for gambling, the number of failures, the frequenting of coffee-houses and low haunts, drunkenness, and many other circumstances, would furnish useful elements for our purpose in appreciating the want of order and foresight. On most of the subjects of inquiry which I have just mentioned, there exist evidences which are more or less complete, but which are little understood in general, as I have already observed.

Drunkenness is a vice of which we ought to have exact records in countries where the police are active; yet it is to be regretted that they are altogether unknown to those who have the greatest interest in making use of them. As drunkenness is a common source of many other vices, and also of crimes—tending to demoralise and to deteriorate the species—governments ought to favour the researches of learned men, who seek to ascertain the condition of the people, and who try to improve them. Drunkenness is influenced by a great number of causes which are easily estimated, because the necessary data require less investigation than those relating to other analogous estimates. I am persuaded that a work, well written, which would endeavour to make known the injuries this pestilence inflicts on society, would be of the greatest utility, and would furnish an explanation of a great number of isolated facts which depend upon it, and which we are in the habit of considering as purely accidental.

In England, about half a century ago, strong drinks and liquors were used in excess; and authors were not long in finding out to what extent this vice led to thoughtlessness and injury in the nation, how much the health of man suffered, and how much the mortality increased with the demoralisation of the people. Their observations have not been lost; and a progressive reformation took place, commencing with the better classes. This defect, formerly so common, and of which they were almost proud, is not to be seen now, except in the lower orders, from among whom it will gradually disappear, as much as the nature of a moist climate will allow, where cordials, taken moderately, are calculated to produce a useful effect. When climate creates a necessity, it is very difficult to prevent the public from abusing it. I am obliged to Mr Babbage for the communication of some curious documents, containing a list of all the drunken persons who have been arrested by the London police in the year 1832, and who were immediately released, because no charge was brought against them. Although the results of one year cannot be very useful, I have thought proper not to omit them. If we possessed an extensive series of similar documents, we should find in them the most precious memorials of the manners of the English people, and, in particular, all which relates to changes in the condition of the population.

Number of Drunken Persons taken up by the London Police in 1832.

Months.	Men.	Women.	Ratio.
January,	1,190	825	1·44
February,	1,175	740	1·59
March,	1,190	710	1·67
April,	1,150	690	1·67
May,	1,200	730	1·64
June,	1,225	700	1·57
July,	1,355	990	1·37
August,	1,305	935	1·39
September,	1,198	975	1·23
October,	1,560	1,100	1·42
November,	1,300	880	1·55
December,	1,425	935	1·52
Total,	15,333	10,290	1·49

The number of drunken people taken up by the police was then 25,623; to which we ought to add 3505 individuals brought before the magistrates, and compelled to pay a fine, as well as 3429 others, who have likewise been conducted before the magistrates, but without undergoing condemnation; so that the total amounts to 32,557. We must remark, that we

only know those cases of drunkenness which were so great as to disturb the public tranquillity. Also, in comparisons which we should like to establish between other towns, it would be necessary to be extremely circumspect, and consider the degree to which its suppression was carried; or, rather, in comparing one town with itself at different times, it would be necessary to take into account the effect of the police, and the changes they may have produced.

One would require to have long inhabited London, and to know perfectly the peculiarities which it presented in 1832, to draw all the conclusions inferable from the preceding numbers; still there are some results which it may be very interesting to point out. And, firstly, we have to notice the great number of women, compared with the number of men, which is at least as 2 to 3. This disproportion is great, and must make us think unfavourably of the moral restraint of women in the lower class, especially in a country where the sex is so well conducted in the ranks of society a little higher. This ratio varies according to the different months, and in a manner which would make us think that the variation is not purely accidental. Towards the end of winter, and at the commencement of spring, the men are comparatively the most numerous: the contrary takes place in summer.

If we take the numbers in their absolute value, we find, for men, that they sensibly increase from the commencement to the end of the year; for women, the smallest number is in spring, and the largest in summer and the commencement of autumn. Classing them according to the seasons, we find—

	Men.	Women.
For January, February, and March, -	3555	2275
.. April, May, and June, - - -	3375	2900
.. July, August, and September, -	3858	2900
.. October, November, and December, -	4345	2915

It must be remarked, that this is during the latter months of the year, when the feasts of Christmas and St Andrew take place, which are not always celebrated by the people with the greatest degree of temperance.

If we seek to form an idea of the activity of a people, of the state of its industry, and of its productive faculties, in the absence of direct data, we have, for the means of appreciating its revenue, the value of that which it is able to pay to government, the nature of its contribution, the quantity of imports or exports, the price of ground, of hand work, &c., but particularly the state of the population, because, as we have been able to see, the population is regulated by the number of things produced. I shall present an example of such a valuation, a very poor one, no doubt, but one which will explain my idea:*—

Countries.	Quantity of Pasturage.	One Horse to	One head of Cattle to	Number of Sheep.
British Isles, -	⅛ of territory.	12 inhab.	2 inhab.	2 to 1 inhab.
France, - -	⅓ ..	19 ..	5 ..	1 to 1 ..
Low Countries, -	⅓ ..	13 ..	3 ..	1 to 3 ..
Prussian monarchy,	⅓ ..	10 ..	3 ..	1 to 6 ..
Austrian empire,	⅓ ..	27 ..	8 ..	1 to 3 ..
Spain, - - -	1·65 ..	75 ..	11 ..	1 to 1 ..

Countries.	Population.	Inhabitants to one square mile.	Ratio of the Army to the Population.
British Isles, -	23,400,000	257	229
France, - -	32,000,000	208	138
Low Countries, -	6,118,000	339	142
Prussian monarchy,	12,464,000	155	80
Austrian empire,	32,000,000	165	118
Russian empire, -	56,500,000	37	57
United States, -	11,800,000	7·5	1977

* The first table is taken from the *Revue de Paris* of M. Moreau de Jonnes; the numbers of the second and third tables are from the works of M. Balbi—*La Monarchie Française Comparée aux Principaux Etats*, and *L'Abrégé de Geographie*.

Countries.	Inhabitants living in Town.	Part of the Population employed		Revenue to each Inhabitant.	Debt to each Inhabitant.
		in Manufactures.	in Agriculture.		
				francs.	francs.
British Isles, -	0·50	0·45	0·34	65·2	869
France, - -	0·33	0·36	0·44	30·9	145
Low Countries, -	0·29	?	?	26·3	635
Prussian monarchy,	0·27	0·18	0·66	17·2	29·3
Austrian empire,	0·23	0·09	0·69	10·9	45·6
Russian empire, -	0·12	0·06	0·79	6·6	21·4
United States, -	?	?	?	12·1	34·8

If, in the beginning, we compare France to England, we shall find the first kingdom proportionally less peopled than the latter: there are fewer inhabitants in town, and also fewer employed in manufactures: the Englishman pays into the treasury twice as much as the Frenchman, and his exports are much more considerable: the proportion, as regards the two countries, according to M. Ad. Balbi, is nearly as 3 to 1.

The Prussian monarchy bears almost the same proportion to France which France does to England. It is remarkable, according to our table, that the countries which have the largest population, are generally those which have the most town inhabitants, the greatest number of hands employed in manufacture, and proportionally the fewest in agriculture; they have fewer men in the army, pay most taxes to the state, and have the largest debt.* Land armies appear to be numerically in inverse ratio to maritime ones: the latter require fewer men, but more expense.

In Europe, with the exception of Russia, nearly the same number of hands are employed in agriculture, and the surplus population turn to manufactures (*industrie*). It then becomes necessary to change the nature of the products by exportation; and the country which has the most manufactures is generally that which has the most exports. Manufactures are always and every where of more importance than agriculture, and those who pursue them possess the greatest riches and pay the most to the state; but since the revenues from manufactures are more uncertain, their wealth is less secure: we also see that the public debt rises immensely in value, and every thing which tends to confine the scope of trade, and to diminish the exchange of produce, will cause a considerable mortality.

It is to be regretted that, at the present time, we do not possess, for different countries, exact accounts of the prices of manual labour, of ground, of lodgings, of the food necessary to the life of an individual, of the carriage of letters, and the means of communication for travellers and merchandise; these accounts would give data for comparing the activity of the inhabitants and the price of time—valuable elements, but of which some people do not yet appear to understand the importance.

I had proposed, at this place, to compare the donations made for the use of the poor, of hospitals, and benevolent institutions in general; but I must omit this investigation, from want of exact documents: I particularly regret that M. Guerry, when considering this subject in France, has only given ratios, and no absolute numbers, nor any of the sources whence he has extracted them.

It appears to be still more difficult to speak on the influence of religious ideas, and the condition of people in this respect.

A very useful addition to moral statistics, would be to point out the dates at which certain practices and customs existed, and also the time when they commenced, and when they ceased. For example, at what period prosecutions for witchcraft were most

* According to M. le Baron de Morogues, states in which the people are most given to agriculture, are those which are the least loaded with pauperism.—*Recherche des Causes de la Richesse et de la Misère des Peuples Civilisés*, p. 335.

numerous, when they began to take place, and when they were discontinued; in what countries men were tortured and put to death for religious opinions, without having disturbed the public peace, at the same time what were the extreme limits of the period, and the epochs of greatest severity; what kind of fanaticism, either political, religious, or otherwise, has prevailed at any period, in any country; what gave rise to it, and what caused its decline; what was its nature, intensity, and results, &c. I shall not stay longer to make such enumerations; these are researches which henceforth must necessarily be considered as pertaining to the history of nations, and will assist us in determining their laws of development. However, I do not think we ought to abandon this subject without giving an example of a particular kind of mania or fanaticism, so to term it, which appears to be making sensible advances every day.

2. Of Suicides and Duels.

The destruction of man by his own hands, although generally repugnant to the notions of modern society, has nevertheless found panegyrists, and those who have proclaimed its advantages. Suicide, among some nations, continues to be branded with infamy by the public. The ancients were not entirely of this opinion: it was often practised by the most illustrious men, and has been mentioned with admiration by their gravest historians. We are naturally excited by the death of Cato, who wished not to survive the liberty of his country; by the death of Lucretia, who wished not to survive her dishonour; or even by the death of the criminal, who seeks to spare his family the shame of seeing his head fall on the scaffold.

The destruction of one man by another, excites horror; yet this dreadful crime may also, in our manners and modern institutions, present the appearance of a virtue under certain circumstances. We can only comprehend these apparent contradictions, by admitting that the crime consists, not in the action, but in the intention of him who commits it; so that, if the intention was noble or generous, the action may also be considered of the same character. This is the only manner in which we can explain the diversity of opinions on duelling especially, which was unknown to the ancients, and which had its rise in the middle ages.

We possess few data on the number of suicides; and what information we have on the number of duels, is so incomplete or inaccurate, that we cannot make use of it. From the table of M. Balbi, entitled *La Monarchie Française Comparée aux Principaux Etats du Globe*, suicides appear to take place in the following proportions:—

France (1827), - -	1 suicide to 20,740 inhabitants.
Prussian monarchy, - -	.. 14,404 ..
Austrian empire, -	.. 20,900 ..
Russian empire, - -	.. 49,182 ..
United States—New York,	.. 7,797 ..
.. Boston, -	.. 12,500 ..
.. Baltimore,	.. 13,636 ..
.. Philadelphia,	.. 15,875 ..

According to Casper, who has paid much attention to this subject,* the number of suicides is particularly great in towns; indeed, we annually enumerate as follows:—

	To 100,000 Inhabitants	1 Suicide to
At Copenhagen, -	100 suicides	1000 inhabitants.
.. Paris, - - -	49 ..	2040 ..
.. Hamburg, -	45 ..	2222 ..
.. Berlin, - -	34 ..	2941 ..
.. London, - -	20 ..	5000 ..
.. Elberfeld, - -	20 ..	5000 ..

The General Records of the criminal courts of France, present, from 1827, annual accounts, not only of suicides but also of accidental deaths and duels which have come to the knowledge of the public magistrate. According to these accounts, we find—

Years.	Accidental Deaths.	Suicides.	Duels. followed by Death.	Duels. not followed by Death.
1827, - -	4,744	1542	19	51
1828, - -	4,855	1754	29	57
1829, - -	5,048	1904	13	40
1830, - -	4,478	1756	20	21
1831, - -	5,045	2084	25	36
Total, -	24,170	9040	106	205

This table gives 4834 accidental deaths, and 1808 suicides, as the annual average; which, to a population of 32,000,000 souls, gives one accidental death to 7000, and 1 suicide to 18,000 inhabitants; as to the number of duels, it may be supposed that the values in the table are too low.

A very great number of suicides takes place in the department of the Seine. They have been committed in the following manner, during the years from 1817 to 1825 inclusive:—

Years.	Total.	Submersion.	Fire-arms.	Asphyxia.	Voluntary Falls.	Strangulation.	Cutting Instruments.	Poisoning.
1817, -	332	109	46	35	39	36	23	13
1818, - -	330	131	48	35	40	27	28	21
1819, -	376	148	59	46	39	44	20	20
1820, - -	325	129	46	39	37	32	28	14
1821, -	348	127	60	42	33	38	25	23
1822, - -	317	120	48	49	33	21	31	15
1823, -	390	114	56	61	43	48	47	21
1824, - -	371	115	42	61	47	38	40	28
1825, -	396	134	56	59	49	40	38	29
Total, -	3305	1178	461	427	360	324	290	175

The average number of suicides, therefore, in the department of the Seine, annually reaches 356; which, for a population of 860,000 souls, gives 1 suicide to 2400 inhabitants; Geneva gives the ratio of 1 to 3900, for the years between 1820 and 1826 inclusive.* The following are the modes of destruction, according to 95 observations:—36 individuals perished in water; 34 blew out their brains; 6 hanged themselves; 5 were poisoned; 2 died from wounds; 2 cast themselves from an eminence. Thus, with regard to the preference shown for particular modes, these numbers are almost the same as at Paris.

The means of destruction are not every where the same: thus, at Berlin, according to Casper, 535 suicides have taken place in the following manner:—234 by strangulation, 163 by fire-arms, 60 by submersion, 27 by cutting the throat, 20 by cutting instruments, &c., 19 by voluntary falls, 10 by poisoning, and 2 by opening veins.†

In all the preceding numbers, one may perceive an alarming concordance between the results of the different years, as they succeed each other. This regularity, in an act which appears so intimately connected with volition, will soon appear before us again in a striking manner, as connected with crime. However, society in a country may undergo modifications, and

* Beitrage, &c., 1 vol. 12mo. Berlin: 1825.

* Hertha, August 1828; and Bulletin de M. de Férussac, May 1829.

† Studying the circumstances connected with suicides, duels, and certain kinds of crimes, we may be disposed to think that man is frequently actuated by a propensity to imitation. M. Chevreul, in a letter addressed to M. Ampère (*Sur une Classe Particulière de Mouvemens Musculaires*), has brought forward some philosophical considerations of great interest, and which show how much human nature deserves to be studied more deeply, in some relations which have been perhaps too much neglected.

thus produce an alteration in what at first presented a remarkable constancy for a short time. According to Casper,* at Berlin, between 1788 and 1797, only 62 suicides took place; and 128 between 1797 and 1808, and 546 between 1813 and 1822. It has been remarked, that suicides have become more numerous; this conjecture would be very probable, if it be true that they are a result of civilisation, and if we consider that legislation endeavours to repress them in some countries. It is to be doubted, however, whether there are not some errors in the numbers, depending on the circumstance that statistical researches were made with much less care formerly than at present.

M. Casper, in his researches on the subject, has attentively discussed the influence of states of the atmosphere on suicide, and also the influence of seasons, which, despite the few observations we possess, is manifested in a remarkable manner, as may be seen in the following table, where the suicides occurring during each season are noted:—

Months.	Berlin: 1812-1822.	Hamburg: † 1816-1822.	Westminster: ‡ 1812-1821.	Paris: § Six Years.
Jan., Feb., & March,	109	39	67	42
April, May, & June,	155	31	55	58
July, Aug., & Sept.,	173	41	60	61
Oct., Nov., & Dec.,	145	38	46	31

Here, again, summer appears to exercise a greater influence on the number of suicides than the other seasons, as well as on the number of those affected with insanity, and, as we shall soon perceive, also on the number of crimes against person.

M. Casper also finds that, all things being equal, suicides in town and country have been numerically as 14 to 4. With respect to difference of sex, he has observed, for Berlin, that, of 727 suicides, 606 were committed by men, and 121 by women, which gives a ratio of 5 to 1. According to the *Recherches Statistiques sur Paris*, the ratio for this city would be 2 to 1 nearly. At Geneva, the ratio has been 4 to 1 for the seven years from 1820 to 1826.

We scarcely possess any researches on the ages at which suicide takes place. I only know of those published by Casper for Berlin, ‖ and those published for Geneva.¶ M. Guerry has given the number of suicides for Paris;** but only those of men, and which have taken place by suspension or fire-arms. The following table presents a summary of the documents for Berlin and Geneva:—

Ages.	Berlin: 1818-1824.	Geneva: 1820-1826.
Below 10 years, - -	1	
From 10 to 15 years, - -	17	5
" 15 to 20 " - -	32	
" 20 to 25 " - -	30	
" 25 to 30 " - -	25	24
" 30 to 35 " - -	12	
" 35 to 40 " - -	9	
" 40 to 50 " - -	34	45
" 50 to 60 " - -	32	
" 60 to 70 " - -	17	
" 70 to 80 " - -	9	21
" 80 and upwards, - -	2	
Total, - -	220	95

To have a better idea of these numbers, it will be preferable to class them in periods, each of 10 years' duration, and to reduce the number to 1000. At the same time, we may compare them with those of Paris, and with a population of 1000 individuals arranged according to their respective ages.

Ages.	Suicides at Berlin.	Suicides at Paris		Suicides at Geneva.	Population Divided according to Age.
		by Shooting.	by Suspension.		
10 to 20 years,	224	61	68	53	312
20 to 30 "	251	283	51	252	188
30 to 40 "	96	182	94		160
40 to 50 "	156	150	188	474	136
50 to 60 "	146	161	256		100
60 to 70 "	77	126	235	221	68
70 to 80 "	41	35	108		30
80 and upwards,	9	2	0		6
Total, -	1000	1000	1000	1000	1000

The number of suicides between 10 and 30 years of age, is extremely high at Berlin; it would further appear, that between 30 and 40 years of age, the minimum number occurs, or at least that the number of suicides, which was very great between the 10th and 30th years, then diminishes, to regain fresh intensity towards the end of life. Will not the circumstance have some influence, that a father separates himself from his family with more difficulty when his children are young than when they can already provide for their own necessities? It would be very interesting to have more documents on the motives which lead to the commission of suicide.

It is sufficiently evident, that some particular cause exists at Berlin, which induces such a great number of young persons between 16 and 20 to destroy themselves. Removing the effects of this agency, the results agree sufficiently with those of Paris and Geneva, and tend to show that the number of suicides increases with age, though we must take care to bear in mind the number of individuals of each age who are found in a population.* This tendency, in its first development, almost progresses in the same ratio as the development of intelligence and mental alienation.

It would also appear that the hours of the day have some influence on suicide by suspension. M. Guerry has given the following numbers in the *Annales d'Hygiène* for January 1831:—

	Suicides.
From midnight to 2 in the morning, - -	77
" 2 to 4 o'clock, - -	45
" 4 to 6 " - -	58
" 6 to 8 " - -	135
" 8 to 10 " - -	110
" 10 to 12 " - -	123
" 12 to 2 " - -	32
" 2 to 4 " - -	84
" 4 to 6 " - -	104
" 6 to 8 " - -	77
" 8 to 10 " - -	84
" 10 to 12 " - -	71
	1000

MM. Benzenberg and Casper have compared the number of suicides with the number of homicides and mortal blows, to infer thence the probability that an individual found dead has perished by one or the other.† The towns of Prussia give the following numbers:—

	Suicides.	Homicides.
1818, - - - - -	339	27
1819, - - - - -	452	24
1820, - - - - -	475	40
1821, - - - - -	456	40
1822, - - - - -	442	45
	2164	176

* Beitrage zur Medicinischen Statistik, &c. 8vo. Berlin: 1825. See also the researches of Dr Heyfelder, entitled Der Selbsmord, &c. 8vo. Berlin: 1828.

† Grohmann in Hufel, Journal, 1 c. ‡ Falret, 1 c.

§ Esquirol, 1 c. ‖ Beitrage, p. 53.

¶ Beitrage, and Bulletin de M. de Férussac, Mai 1829.

** Annales d'Hygiène, Janvier 1831.

* In the *An. d'Hygiène*, Oct. 1829, there are two very remarkable Memoirs by M. Devergie, one on the mode of ascertaining how long a person has been drowned, the other containing some researches on those who have been hanged.

† Beitrage, &c., p. 94.

This ratio is about 1 homicide to 12 suicides. M. Hermann has found that, in Russia, the number of suicides is almost equal to that of homicides, and that this ratio does not vary much in the different parts of the empire, although the number of suicides and homicides are far from preserving the same comparative value to the population.* In France, the suicides are to the population as 1 to 20,000 nearly, and the homicides as 1 to 48,000: this ratio of suicides to homicides is therefore nearly as 5 to 3.

In concluding this chapter, I shall lay before the reader the principal conclusions contained in the work of M. Falret on suicides, from the report of M. Serres to the Institute of France, which gives the only results hitherto published. "Suicides present, in both sexes, a very remarkable contrariety, according to the results furnished by tables. Thus, the month of April, attended with the greatest number of suicides among men, is only so in the fifth degree among women; with the latter, the month of August occupies the same rank as April does for men.

The social position of the parties presents a no less remarkable contrast. Of the men, it is bachelors who form the largest number; and of the women, we find the greatest number among those engaged in the bonds of matrimony. We cannot omit to observe here the difference between women and men, as respects the influence of concubinage on the production of voluntary death: this influence, for women, is almost treble.

We observe still more striking differences, if such can be, between the two sexes, as respects the influence of age. In men, it is from 35 to 45 that the greatest number of suicides take place; in women it is from 25 to 35. The next period for men is 45 to 55; whilst in women this only holds the fifth rank: but, by a singular compensation, we observe twice as many suicides among young girls as among boys who have not reached their fifteenth year.

If we inquire into the mode of self-destruction which is practised, we shall see that men give a decided preference to cutting instruments and fire-arms, while women destroy themselves by poison, falls from a great height, or asphyxiate themselves by means of burning charcoal."

CHAPTER III.

OF THE DEVELOPMENT OF THE PROPENSITY TO CRIME.

1. Of Crimes in General, and of the Repression of them.

SUPPOSING men to be placed in similar circumstances, I call the greater or less probability of committing crime, the *propensity to crime*. My object is more especially to investigate the influence of season, climate, sex, and age, on this propensity.

I have said that the circumstances in which men are placed ought to be similar, that is to say, equally favourable, both in the existence of objects likely to excite the propensity and in the facility of committing the crime. It is not enough that a man may merely have the intention to do evil, he must also have the opportunity and the means. Thus the propensity to crime may be the same in France as in England, without, on that account, the *morality* of the nations being the same. I think this distinction of importance.†

There is still another important distinction to be made; namely, that two individuals may have the same propensity to crime, without being equally *criminal*, if one, for example, were inclined to theft, and the other to assassination.*

Lastly, this is also the place to examine a difficulty which has not escaped M. Alphonse de Candolle in the work above mentioned: it is this, that our observations can only refer to *a certain number of known and tried offences, out of the unknown sum total of crimes committed.* Since this sum total of crimes committed will probably ever continue unknown, all the reasoning of which it is the basis will be more or less defective. I do not hesitate to say, that all the knowledge which we possess on the statistics of crimes and offences will be of no utility whatever, unless we admit without question that *there is a ratio, nearly invariably the same, between known and tried offences and the unknown sum total of crimes committed.* This ratio is necessary, and if it did not really exist, every thing which, until the present time, has been said on the statistical documents of crime, would be false and absurd. We are aware, then, how important it is to legitimate such a ratio, and we may be astonished that this has not been done before now. The ratio of which we speak necessarily varies according to the nature and seriousness of the crimes: in a well-organised society, where the police is active and justice is rightly administered, this ratio, for murders and assassinations, will be nearly equal to unity; that is to say, no individual will disappear from the society by murder or assassination, without its being known: this will not be precisely the case with poisonings. When we look to thefts and offences of smaller importance, the ratio will become very small, and a great number of offences will remain unknown, either because those against whom they are committed do not perceive them, or do not wish to prosecute the perpetrators, or because justice itself has not sufficient evidence to act upon. Thus, the greatness of this ratio, which will generally be different for different crimes and offences, will chiefly depend on the activity of justice in reaching the guilty, on the care with which the latter conceal themselves, on the repugnance which the individuals injured may have to complain, or perhaps on their not knowing that any injury has been committed against them. Now, if all the causes which influence the magnitude of the ratio remain the same, we may also assert that the effects will remain invariable. This result is confirmed in a curious manner by induction, and observing the surprising constancy with which the numbers of the statistics of crime are reproduced annually—a constancy which, no doubt, will be also reproduced in the numbers at which we cannot arrive: thus, although we do not know the criminals who escape justice, we very well know that every year between 7000 and 7300 persons are brought before the criminal courts, and that 61 are regularly condemned out of every 100; that 170,000 nearly are brought before courts of correction, and that 85 out of 100 are condemned; and that, if we pass to details, we find a no less alarming regularity; thus we find that between 100 and 150 individuals are annually

* Mémoires de l'Académie de Pétersbourg, 1830; and Bulletin de M. de Férussac, Nov. 1831.

† This has been very clearly established by M. Alphonse de Candolle, in an article entitled *Considérations sur la Statistique des Délits*, inserted in the *Bibliothèque Universelle de Genève*, Feb. 1830. The author regards the propensity of individuals to crime as depending on their morality, the temptation to which they are exposed, and the greater or less facility they may find to commit offences. Of these three causes, the first belongs more especially to the man; the other two are, properly speaking, external to him. As it is with man that I am occupied, I have endeavoured, in the course of my researches, that the causes external to him might be constantly nearly equal, so that they might be left out of the computation. I have necessarily been obliged to take into account natural influencing causes, such as climate, seasons, sex, and age.

* In an article on *Hygiène Morale*, M. Villermé has fully shown how fatal the *regime* of prisons may become to the unfortunate person who is often confined for slight offences, and cast into the midst of a collection of wicked wretches, who corrupt him. "I have been told," says he, "by a person who accompanied Napoleon to the Isle of Elba, that, in the particular and at that time philosophical conversations of the ex-emperor, he has several times been heard to say, that under whatever relation we may view man, *he is as much the result of his physical and moral atmosphere as of his own organisation.* And the idea, now advanced by many others, which is contained in this phrase, is the most general as well as the most just that can be formed on the subject before us.—*Annales d'Hygiène Publique*, Oct. 1830.

condemned to death,* 280 condemned to perpetual hard labour, 1050 to hard labour for a time, 1220 to solitary confinement (*à la réclusion*), &c.; so that this budget of the scaffold and the prisons is discharged by the French nation, with much greater regularity, no doubt, than the financial budget; and we might say, that what annually escapes the minister of justice is a more regular sum than the deficiency of revenue to the treasury.

I shall commence by considering, in a general manner, the propensity to crime in France, availing myself of the excellent documents contained in the *Comptes Généraux de l'Administration de la Justice* of this country; I shall afterwards endeavour to establish some comparisons with other countries, but with all the care and reserve which such comparisons require.

During the four years preceding 1830, 28,686 accused persons were set down as appearing before the courts of assize, that is to say, 7171 individuals annually nearly; which gives 1 accused person to 4463 inhabitants, taking the population at 32,000,000 souls. Moreover, of 100 accused, 61 persons have been condemned to punishments of greater or less severity. From the remarks made above with respect to the crimes which remain unknown or unpunished, and from mistakes which justice may make, we conceive that these numbers, although they furnish us with curious data for the past, do not give us any thing exact on the propensity to crime. However, if we consider that the two ratios which we have calculated have not sensibly varied from year to year, we shall be led to believe that they will not vary in a sensible manner for the succeeding years; and the probability that this variation will not take place is so much the greater, according as, all things being equal, the mean results of each year do not differ much from the general average, and these results have been taken from a great number of years. After these remarks, it becomes very probable that, for a Frenchman, there is 1 against 4462 chances that he will be an accused person during the course of the year; moreover, there are 61 to 39 chances, very nearly, that he will be condemned at the time that he is accused. These results are justified by the numbers of the following table:—

Years.	Accused Persons present.†	Condemned Persons.	Inhabitants to one accused Person.	Condemned in 100 accused Persons.	Accused of Crimes against		Ratio between the Numbers of the two kinds of Crime.
					Persons.	Property.	
1826,	6,988	4,348	4,557	62	1,907	5,081	2·7
1827,	6,929	4,236	4,593	61	1,911	5,018	2·6
1828,	7,396	4,551	4,307	61	1,844	5,552	3·0
1829,	7,373	4,475	4,321	61	1,791	5,582	3·1
Total,	28,686	17,610	4,463	61	7,453	21,233	2·8

Thus, although we do not yet know the statistical documents for 1830, it is very probable that we shall again have 1 accused person in 4463 very nearly, and 61 condemned in 100 accused persons; this probability is somewhat diminished for the year 1831, and still more for the succeeding years. We may, therefore, by the results of the past, estimate what will be realised in the future. This possibility of assigning beforehand the number of accused and condemned persons which any country will present, must give rise to serious reflections, since it concerns the fate of several thousand men, who are driven, as it were, in an irresistible manner, towards the tribunals, and the condemnations which await them.

These conclusions are deduced from the principle, already called in so frequently in this work, that effects are proportionate to their causes, and that the effects remain the same, if the causes which have produced them do not vary. If France, then, in the year 1830, had not undergone any apparent change, and if, contrary to my expectation, I found a sensible difference between the two ratios calculated beforehand for this year and the real ratios observed, I should conclude that some alteration had taken place in the causes, which had escaped my attention. On the other hand, if the state of France has changed, and if, consequently, the causes which influence the propensity to crime have also undergone some change, I ought to expect to find an alteration in the two ratios which until that time remained nearly the same.*

It is proper to observe, that the preceding numbers only show, strictly speaking, the probability of being accused and afterwards condemned, without rendering us able to determine any thing very precise on the degree of the propensity to crime; at least unless we admit, what is very likely, that justice preserves the same activity, and the number of guilty persons who escape it preserves the same proportion from year to year.†

In the latter columns of the preceding table, is first made the distinction between crimes against persons

* The number of persons condemned to death has, however, diminished from year to year; is this owing to the increasing repugnance which tribunals feel to apply this punishment, for the abolition of which we have so many petitioners at the present day?

† The number of accused persons absent was—

In 1826,	1827,	1828,	1829,
603	845	776	746

I have taken the documents of 1826, 27, 28, and 29 only, because the volume for 1825 did not contain the distinction of age or sex, of which I make use further on. Moreover, in 1825 the number of accused was 1 to 4211 inhabitants, and 61 in 100 were condemned.

* After the preceding paragraphs were written, two new volumes of the *Comptes Rendus* have appeared. As the results which they contain show how far my anticipations were just, I thought it unnecessary to change the text, and shall merely give in a note the numbers corresponding to those I availed myself of before.

Years.	Accused Persons present.	Condemned Persons.	Inhabitants to one accused Person.	Condemned in 100 accused Persons.	Accused of Crimes against		Ratio between the Numbers of the two Classes of Criminals.
					Persons.	Property.	
1830,	6,962	4,139	4,576	59	1,696	5,296	3·2
1831,	7,697	4,098	4,231	54	2,046	5,360	2·7
Aver.	7,234	4,114	4,392	56	1,856	5,428	2·9

Thus, notwithstanding the changes of government, and the alterations in consequence of it, the number of accused persons has not sensibly varied: "the slight increase observed in 1831, may principally be attributed to the circumstance, that in consequence of renovations in the criminal court arrangements, the operation of the judiciary police was necessarily abated in the latter months of 1830; so that many cases belonging to this period were not tried until 1831, which has increased the figure for this year."—*Report to the king.* The number of acquittals is rather greater than in the preceding years; and the same remark will be made further on in the case of Belgium, the government of which country was also changed.

The number of accused persons absent in 1830 was 787, and in 1831, 672; thus, the results of this year again agree with those of the preceding years.

† If the letters A, A^1, A^2, &c., represent the numbers of individuals annually committed for crimes, and a, a^1, a^2, &c., the corresponding numbers of individuals annually condemned; if we suppose, also, that the ratios $\frac{A}{a}$, $\frac{A^1}{a^1}$, $\frac{A^2}{a^2}$, &c., are sensibly equal to each other, that is to say, if $\frac{A}{a} = \frac{A^1}{a^1}$, we shall also have $\frac{A}{A^1} = \frac{a}{a^1}$. So that, if the number of the condemned A and A^1 is annually nearly the same, it will be the same with the number of those who are guilty; that is to say, the propensity to crime will preserve the same value. It is thus that the almost unchangeableness of the annual ratio of the accused to the condemned, allows us to substitute for the ratio of the condemned of any two years the ratio of the accused for the same two years.

and crimes against property: it will be remarked, no doubt, that the number of the former has diminished, whilst the latter has increased; however, these variations are so small, that they do not sensibly affect the annual ratio; and we see that we ought to reckon that three persons are accused of crimes against property to one for crimes against person.

Beside the preceding numbers I shall place those which correspond to them in the Low Countries, whilst the French code was still in force.

Years.	Accused Persons present.	Condemned Persons.	Inhabitants to one accused Person.	Condemned in 100 accused Persons.	Accused of Crimes against		Ratio.
					Persons.	Property.	
1826,	1389	1106	4392	84	304	1085	3·5
1827,	1483	1264	4100	85	314	1174	3·7

Thus, the probability of being before a court of justice was almost the same for France and for the inhabitants of the Low Countries; at the same time the number of crimes against persons was fewer among the latter, but the repression of them was also greater, since 85 individuals were condemned out of 100 accused, which may be owing to the absence of a jury, their duties being fulfilled by the judges. This modification made in the French code should be taken into consideration. Indeed, it causes a very notable difference in the degree of repression; for when once accused, the Belgian had only 16 chances against 84, or 1 to 5, of being acquitted; whilst the Frenchman, in the same circumstances, had 39 chances to 61, or nearly 3 to 5, that is to say, thrice as many. This unfavourable position in which the accused person was placed with us, might be owing to the circumstance, that the judges before whom he appeared were indeed more severe than a jury, or perhaps that they were more circumspect in acquitting a person in the Low Countries. I shall not determine which of these was the case, but simply observe, that in courts of correction the French judges are even more severe than ours, and the same is the case in courts of police.

Thus, during the four years before 1830, in France, the reports gave 679,413 arraigned persons, or 1 to 188 inhabitants. Moreover, of this number, 103,032 individuals only were acquitted, or 15 in the 100 of those arraigned. There was then 1 chance against 187 that the Frenchman would be brought before a court of correction in the course of one year, and 85 chances to 15 that when there he would be condemned.

During the years 1826 and 1827, there were 61,670 persons arraigned, in the Low Countries, before courts of correction, of whom 13,499 were acquitted; and there was one arraigned person to 198 inhabitants. Therefore, the probability of a Frenchman being before a court is rather greater than for an inhabitant of the Low Countries, as also is the probability of his being subsequently condemned.

Setting aside the northern provinces of the ancient kingdom of the Low Countries from those which at the present time form the kingdom of Belgium, and which are more intimately connected with France, we find, for the latter provinces, during the years previous to 1831:—

Years.	Accused Persons present.	Condemned Persons.	Inhabitants to one accused Person.	Condemned in 100 accused Persons.	Accused of Crimes against		Ratio.
					Persons.	Property.	
1826,	725	611	5211	84	189	536	2·8
1827,	800	682	4776	85	220	580	2·6
1828,	814	677	4741	83	230	584	2·5
1829,	753	612	5187	81	203	550	2·7
1830,	741	541	5274	73	100	531	3·6
Aver.,	767	625	5031	82	200	566	2·8

Each year, then, in Belgium, we have had, as an average, 1 person accused to 5031 inhabitants; and in France, 1 to 4400 inhabitants nearly. It is remarkable, that although these numbers do not differ much, yet the particular values for each year have not once given as great a number of accused persons for Belgium as for France.

We may observe, that in Belgium, as in France, there was a slight diminution in the number of accused persons in 1830, which originated in the same cause, namely, the closing of the tribunals for a certain period, in consequence of the revolution.

We see also that the repression of crime has sensibly diminished. This, no doubt, is thus accounted for: after revolutions men are more circumspect in their condemnations, since they are not always screened from personal danger, even in the judgments which they pronounce.

The jury has been established in Belgium since 1831; we shall soon be enabled to judge what influence this has had on the repression of crime, and what are its most remarkable consequences.

2. Of the Influence of Knowledge, of Professions, and of Climate, on the Propensity to Crime.

It may be interesting to examine the influence of the intellectual state of the accused on the nature of crimes: the French documents on this subject are such, that I am enabled to form the following table for the years 1828 and 1829;* to this table I have annexed the results of the years 1830 and 1831, which were not known when the reflections which succeed were written down.

Intellectual state of the Persons Accused.	1828-1829: Accused of Crimes against		Ratio of Crimes against Property to Crimes against Persons.	1830-1831: Accused of Crimes against		Ratio of Crimes against Property to Crimes against Persons.
	Persons.	Property.		Persons.	Property.	
Could not read or write, -	2072	6,617	3·2	2134	6,785	3·1
Could read and write but imperfectly, -	1001	2,804	2·8	1033	2,840	2·8
Could read and write well,	400	1,109	2·8	408	1,047	2·6
Had received a superior education to this 1st degree,	80	206	2·6	135†	184	1·4
	3553	10,736	3·0 aver.	3710	10,856	2·9 aver.

Thus, all things being equal, the number of crimes against persons, *compared with the number of crimes against property*, during the years 1828 and 1829, was greater according as the intellectual state of the accused was more highly developed; and this difference bore especially on murders, rapes, assassinations, blows, wounds, and other severe crimes. Must we thence conclude that knowledge is injurious to society? I am far from thinking so. To establish such an assertion, it would be necessary to commence by ascertaining how many individuals of the French nation belong to each of the four divisions which we have made above,‡ and to find out if, proportion being considered, the individuals of that one of the divisions commit as many crimes as those of the others. If this were really the case, I should not hesitate to say

* The intellectual state of 474 accused persons for the year 1828 has not been noted, as also 4 for the year 1829, and 2 for 1831.

† The number of the accused of this class is increased in consequence of political events, and crimes against the safety of the state.

‡ See the *Tableaux Sommaires faisant connaitre l'Etat et les Besoins de l'Instruction Primaire dans le Departement de la Seine.* Paris: L. Colas; a pamphlet in 8vo, 1828, anonymous, but probably by M. Jomard. See also the *Rapport General sur la Situation et les Progres de l'Enseignement Primaire en France et à l'Etranger*, by the same person. 8vo. Paris: L. Colas. 1832.

that, since the most enlightened individuals commit as many crimes as those who have had less education, and since their crimes are more serious, they are necessarily more criminal; but from the little we know of the diffusion of knowledge in France, we cannot state any thing decisively on this point. Indeed, it may so happen, that individuals of the enlightened part of society, while committing fewer murders, assassinations, and other severe crimes, than individuals who have received no education, also commit much fewer crimes against property, and this would explain what we have remarked in the preceding numbers. This conjecture even becomes probable, when we consider that the enlightened classes are presupposed to possess more affluence, and consequently are less frequently under the necessity of having recourse to the different modes of theft, of which crimes against property almost entirely consist; whilst affluence and knowledge have not an equal power in subduing the fire of the passions and sentiments of hatred and vengeance. It must be remarked, on the other hand, that the results contained in the preceding table only belong to two years, and consequently present a smaller probability of expressing what really is the case, especially those results connected with the most enlightened class, and which are based on very small numbers. It seems to me, then, that at the most we can only say that the ratio of the number of crimes against persons to the number of crimes against property varies with the degree of knowledge; and generally, for 100 crimes against persons, we may reckon fewer crimes against property, according as the individuals belong to a class of greater or less enlightenment. In seeking the relative annual proportion, we find the following numbers for France, to which I annex those furnished by the prisons in Belgium in 1833, according to the report of the inspector-general of prisons:—

Intellectual state of the Accused.	Absolute Number.			Relative Number.		
	Accused in France:		Condemned in Belgium: 1833.	Accused in France:		Condemned in Belgium: 1833.
	1828-29.	1830-31.		1828-29.	1830-31.	
Could not read or write,	8,689	8,919	1072	61	61	19
Could read and write imperfectly,	3,905	3,873	472	27	27	15
Could read and write well,	1,500	1,455	776	10	10	24
Had received a superior education to the 1st degree,	286	319		2	2	
Total,	14,289	14,566	3220	100	100	100

Thus, the results of the years 1828 and 1829 are again reproduced identically in 1830 and 1831, in France. Sixty-one out of one hundred persons accused could neither read nor write, which is exactly the same ratio as the Belgic prisons presented. The other numbers would also be probably the same, if the second class in Belgium took in, with the individuals *able to read only*, those who could write imperfectly.

The following details, which I extract from the *Rapport au Roi* for the year 1829, will serve to illustrate what I advance:—

"The new table, which points out the professions of the accused, divides them into nine principal classes, comprising,

The *first*, individuals who work on the land, in vineyards, forests, mines, &c., 2453.

The *second*, workmen engaged with wood, leather, iron, cotton, &c., 1932.

The *third*, bakers, butchers, brewers, millers, &c., 253.

The *fourth*, hatters, hairdressers, tailors, upholsterers, &c., 327.

The *fifth*, bankers, agents, wholesale and retail merchants, hawkers, &c., 467.

The *sixth*, contractors, porters, seamen, waggoners, &c., 289.

The *seventh*, innkeepers, lemonade-sellers, servants, &c., 830.

The *eighth*, artists, students, clerks, bailiffs, notaries, advocates, priests, physicians, soldiers, annuitants, &c., 449.

The *ninth*, beggars, smugglers, strumpets, &c., 373.

Women who had no profession have been classed in those which their husbands pursued.

Comparing those who are included in each class with the total number of the accused, we see that the first furnishes 33 out of 100; the second, 26; the third, 4; the fourth, 5; the fifth, 6; the sixth, 4; the seventh, 11; the eighth, 6; the ninth, 5.

If, after that, we point out the accused in each class, according to the nature of their imputed crimes, and compare them with each other, we find the following proportions:—

In the first class, 32 of the 100 accused were tried for crimes against persons, and 68 for crimes against property. These numbers are 21 and 79 for the second class; 22 and 78 for the third; 15 and 85 for the fourth and fifth; 26 and 74 for the sixth; 16 and 84 for the seventh; 37 and 63 for the eighth; 13 and 87 for the ninth.

Thus, the accused of the eighth class, who all exercised liberal professions, or enjoyed a fortune which presupposes some education, are those who, relatively, have committed the greatest number of crimes against persons; whilst 87-hundredths of the accused of the ninth class, composed of people without character, have scarcely attacked any thing but property." *

These results, which confirm the remark made before, deserve to be taken into consideration. I shall observe that, when we divide individuals into two classes, the one of liberal professions, and the other composed of journeymen, workmen, and servants, the difference is rendered still more conspicuous.

The following table will assist us in arriving at the *influence of climate* on the propensity to crime;† it is

* See the *Comptes Generaux*, p. 9, 1830. The *Comptes Generaux* for 1830 and 1831 present the following results for each of the classes given in the text; here again we find the same constancy of numbers:—

	For 1829.	For 1830.	For 1831.
1st,	2453	2240	2517
2d,	1932	1813	1965
3d,	253	225	272
4th,	327	309	309
5th,	467	455	425
6th,	289	310	327
7th,	830	848	320
8th,	447	374	391
9th,	373	383	469
Total,	7373	6962	7000

† It has seemed to me that these numbers might give us a satisfactory idea of the state of knowledge in each department, especially of the lower classes, among whom the greatest number of crimes take place. This method, by which we take for each department some hundred individuals whose intellectual state we can determine, appears to me to be more certain than that of M. Dupin, which is, to judge of the education of the province by the number of children sent to school. It may be that there is generally very little knowledge in those places where schools have been but recently established, and have not as yet been able to produce any appreciable effects. In order to render the results obtained by this method more comprehensible, I have constructed a small map of France (*Plate 5*), which, by the varying depths of shade, points out the intellectual state of the different parts of this kingdom. Allowing that this map differs a little from that which M. Dupin has given, we shall, however, easily see from both maps, that Northern France, especially near Belgium and the Rhine, is the most enlightened, whilst we find the greatest darkness along a line which traverses France diagonally from Cape Finisterre to the department of the Var. With this dark line is connected a second one, which leaves the centre of France, passing to the base of the Pyrenees. Thus, the results, obtained

formed from the documents of the *Comptes Généraux de l'Administration de la Justice* in France, for the five years previous to 1830. The second and the third columns give the numbers of those condemned for crimes against persons and property; the two following columns show the ratio of these numbers to the respective population of each department in 1827; a sixth column gives the ratio of crimes against property to crimes against persons; and the last column shows how many in 100 accused were unable to read or write; the numbers which are given there only relate to the years 1828 and 1829.

Departments.	Condemned for Crimes against		Inhabitants to one Person Condemned for Crime against		Crimes against Property to one Crime against Persons.	Accused Persons in the 100 who could neither Read nor Write.
	Persons.	Property.	Persons.	Property.		
Corse,	287	107	3224	8649	0·36	50
Haut-Rhin,	144	295	14,192	6928	2·05	33
Lot,	96	110	14,312	12,751	1·12	80
Ariége,	82	78	15,118	15,893	0·95	83
Ardèche,	108	99	15,205	16,587	0·92	67
Aveyron,	99	160	17,677	10,938	1·62	69
Pyrenees-Orient,	41	55	18,460	13,761	1·34	76
Seine-et-Oise,	112	377	20,034	5953	3·36	56
Vaucluse,	58	118	20,090	9875	2·03	65
Moselle,	95	274	21,534	7866	2·68	49
Lozère,	31	53	22,304	13,092	1·71	47
Var,	67	117	23,216	13,295	1·75	71
Bas-Rhin,	111	341	24,120	7851	3·07	31
Seine,	197	2496	25,720	2030	12·67	34
Bouches-du-Rhin,	63	208	25,897	7844	3·25	56
Eure,	80	296	26,354	7123	3·70	63
Doubs,	48	146	26,491	8909	3·04	35
Marne,	61	244	26,643	6661	4·00	54
Tarne,	59	169	27,767	9694	2·86	75
Seine-Inférieure,	123	350	27,993	4049	6·91	59
Drôme,	49	133	29,163	10,744	2·71	71
Calvados,	84	304	29,819	6357	4·69	52
Hautes-Alpes,	21	47	29,849	13,333	2·24	42
Landes,	44	153	30,149	8690	3·48	86
Basses-Alpes,	25	62	30,613	12,344	2·48	66
Vosges,	62	132	30,632	14,388	2·13	45
Gard,	53	129	32,788	13,471	2·43	67
Loiret,	46	215	33,069	7075	4·67	70
Vienne,	40	170	33,459	7873	4·25	81
Ille-et-Vilaine,	82	318	33,747	8702	3·88	66
Hérault,	50	92	33,956	18,454	1·84	62
Aude,	30	75	34,102	17,733	2·42	72
Rhone,	61	302	34,146	6895	4·95	51
France,	4662	17,543	34,168	9089	3·76	69
Puy-de-Dome,	82	157	34,547	18,044	1·91	75
Loire-Inférieure,	66	160	34,628	14,284	2·42	76
Aube,	34	206	35,553	5868	6·06	54
Isère,	73	220	36,026	11,958	3·01	62
Dordogne,	64	149	36,256	15,573	2·33	76
Jura,	33	123	37,344	12,613	2·96	50
Haute-Marne,	32	94	38,254	13,023	2·93	46
Indre-et-Loire,	37	131	39,211	11,075	3·54	79
Charente,	45	92	39,295	19,220	2·05	60
Haute-Loire,	36	35	39,677	40,810	0·97	75
Allier,	35	124	40,757	11,504	3·54	91
Pas-de-Calais,	76	563	41,751	5960	7·38	65
Basses-Pyrenees,	47	142	43,330	14,524	3·02	73
Gers,	35	91	43,943	16,901	2·60	70
Corrèze,	32	56	44,513	25,430	1·75	77
Orne,	48	183	45,248	11,993	3·81	66
Seine-et-Marne,	35	167	45,459	9527	4·77	58
Maine-et-Loire,	50	197	45,967	11,641	3·94	81
Haute-Vienne,	30	120	46,058	11,515	4·00	79
Hautes-Pyrenees,	24	64	46,263	17,349	2·67	71
Eure-et-Loire,	30	231	46,592	6013	7·70	63
Ain,	36	84	47,448	20,335	2·33	60
Deux-Sèvres,	30	124	48,043	11,623	4·13	61

by two different modes, nevertheless agree with each other in a very satisfactory manner. We may say that we find the greatest enlightenment where there is the greatest freedom of communication, and in the course of large rivers, such as the Rhine, the Seine, the Meuse, &c. In Southern France, the trading sea-coasts, and the banks of the Rhone, are also less obscure, whilst the absence of enlightenment is perceived chiefly in those parts of France which are not traversed by great commercial roads. We naturally look for instruction in those places where the need of it is greatest.

(*Table continued.*)

Departments.	Condemned for Crimes against		Inhabitants to one Person Condemned for Crime against		Crimes against Property to one Crime against Persons.	Accused Persons in the 100 who could neither Read nor Write.
	Persons.	Property.	Persons.	Property.		
Charente-Inférieure,	44	257	48,199	8252	5·84	66
Meurthe,	52	249	48,788	10,189	4·79	42
Sarthe,	45	177	49,613	12,614	3·93	87
Haute-Garonne,	41	190	49,636	10,711	4·63	71
Haute-Saône,	33	134	49,643	12,225	4·06	43
Mayenne,	35	146	50,591	12,126	4·17	82
Morbihan,	41	163	52,129	11,679	4·46	78
Cantal,	25	75	52,403	17,468	3·00	61
Loir-et-Cher,	22	142	52,424	8122	6·45	68
Nord,	91	548	52,893	8783	6·02	71
Loire,	34	104	55,232	18,063	3·06	54
Côte-d'Or,	35	160	55,992	11,592	4·57	48
Nièvre,	24	109	56,620	12,467	4·54	65
Saone-et-Loire,	45	168	57,308	15,350	3·73	74
Vendée,	28	106	57,648	15,228	3·62	77
Lot-et-Garonne,	29	111	58,684	15,181	3·83	68
Meuse,	26	105	58,911	14,583	4·04	39
Yonne,	29	140	58,986	12,219	4·83	45
Cher,	21	98	59,188	12,683	4·67	86
Finistère,	42	252	59,863	9077	6·00	79
Manche,	51	247	59,922	12,373	4·94	62
Tarn-et-Garonne,	29	89	60,397	13,572	4·45	88
Côtes-du-Nord,	47	292	61,891	9960	6·21	90
Gironde,	41	267	65,628	12,909	5·05	67
Aisne,	36	239	67,995	9451	7·20	62
Oise,	23	163	83,723	11,814	7·09	52
Somme,	31	257	84,934	10,230	8·29	64
Ardennes,	15	92	93,875	15,306	6·13	37
Indre,	12	96	99,012	12,377	8·00	77
Creuse,	6	40	210,777	31,617	6·67	90

To the preceding documents I shall join those concerning the ancient kingdom of the Low Countries* and the dutchy of the Lower Rhine, where the French code is still in force, and allows comparisons to be still established:—

Provinces.	Condemned for Crimes against		Inhabitants to one Person Condemned for Crimes against		Crimes against Property to one Crime against Persons.	Inhabitants to one Pupil at School.
	Persons.	Property.	Persons.	Property.		
Brabant, Southern,	61	168	16,336	5932	2·75	13
Flanders, Eastern,	82	154	17,100	9104	1·88	14
Limbourg,	32	120	20,384	5436	3·75	15
Overyssel,	16	42	20,385	7766	2·62	7
Brabant, Northern,	30	66	22,031	10,014	2·20	9
Anvers,	29	113	22,562	5900	3·90	12
Groningen and Drenthe,	18	98	23,611	4296	5·44	7
Liege,	26	82	25,107	7961	3·15	15
Flanders, Western,	46	142	25,222	8171	3·09	15
Namur,	14	66	27,433	5819	4·71	9
Gueldres,	21	114	27,633	5990	2·20	9
Holland, Southern,	28	216	32,000	4148	7·71	11
Holland, Northern, and Utrecht,	28	263	37,560	4000	9·42	10
Luxembourg,	14	47	42,206	12,572	3·34	8
Hainault,	21	76	52,712	14,565	3·62	10
Zealand,	5	86	53,450	3108	17·20	10
Friesland,	3	103	132,248	3822	34·33	8
Low Countries,	474	1956	25,747	6239	4·13	10
Low Countries (crimes),	424	1691	23,783	7217	4·09	10
Dutchy of the Lower Rhine,	226	994	33,784	10,060	3·36	13
France,	7100	20,338	21,648	7632	2·84	27

* The numbers for the Low Countries embrace the years 1826-27, and for the dutchy of the Lower Rhine the years from 1822 to 1826, according to the *Revue Encyclopedique* for the month of August 1830. Since this summary gives us the number of crimes and not of the condemned, I have thought proper to give the number of crimes for France and the Low Countries, in order to render the results comparable.

As it would be very difficult to form an idea of the whole of the results contained in the preceding tables, and as at the same time it would be impossible to embrace the whole at one glance, I have endeavoured to render them perceptible by shades of greater or less depth, placed on a map of France and the Low Countries, according to the greater or less number of crimes against persons or property, in proportion to the population (*See plate* 6). The first figurative map belongs to crimes against persons; it shows us at first, by the darkness of the shades, that the greatest number of crimes are committed in Corsica, in the South of France, and particularly in Languedoc and Provence, as well as Alsace and the Valley of the Seine. The southern part of the Low Countries, with the exception of Hainault and Luxembourg, present also rather deep tints. However, it is proper to observe, that the shades are perhaps more obscure than they ought to be, if we consider that they represent the number of condemned people, and that in general, in the Low Countries, the repression has been much stronger than in France, since in the latter country only 61 individuals are condemned in every 100 accused, whilst in the Low Countries, 85 is the proportion. On the contrary, Central France, Brittany, Maine, Picardy, as well as Zealand and Friesland, present much more satisfactory shades. If we compare this map with that which indicates the state of instruction, we shall be disposed to believe, at first, that crimes are in a measure in inverse ratio to the degree of knowledge. The figurative map of crimes against persons and those of crimes against property presents more analogy. In like manner, the departments which show themselves advantageously or disadvantageously on either side, may be arranged in the following manner, making three principal classes:—

First Class.—*Departments where the number of those condemned for crimes against persons and property exceeds the average of France.*

Corse, Landes, Rhône, Bouches-du-Rhône, Doubs, Haut-Rhin, Bas-Rhin, Moselle, Seine-Inférieure, Calvados, Eure, Seine-et-Oise, Seine, Marne, Loiret, Vienne, Ille-et-Vilaine—17 departments.

Second Class.—*Departments where the number of those condemned for crimes against property and persons has been less than the average of France.*

Creuse, Indre, Cher, Nièvre, Saône-et-Loire, Jura, Ain, Isère, Loire, Haut-Loire, Cantal, Puy-de-Dôme, Allier, Corrèze, Haut-Vienne, Basses-Pyrénées, Hautes-Pyrénées, Haute-Garonne, Gers, Tarn-et-Garonne, Lot-et-Garonne, Gironde, Dordogne, Charente, Deux-Sèvres, Vendée, Loire-Inférieure, Maine-et-Loire, Sarthe, Orne, Mayenne, Manche, Finistère, Morbihan, Côtes-du-Nord, Somme, Oise, Aisne, Ardennes, Meuse, Meurthe, Haute-Saône, Haute-Marne, Côte-d'Or, Yonne, Seine-et-Marne—47 departments.

Third Class.—*Departments where the number of those condemned for crimes against persons only, or against property only, has been less than the average of France.*

Var, Hautes-Alpes, Basses-Alpes, Drôme, Vaucluse, Gard, Ardèche, Lozère, Aveyron, Lot, Tarn, Hérault, Aude, Pyrénées-Orientales, Ariége, Charente-Inferieure, Loir-et-Cher, Eure-et-Loire, Nord, Pas-de-Calais, Aube, Vosges—22 departments.

In making the same distinction with regard to the provinces of the Low Countries,* we find—

First Class—Southern Brabant, Anvers, Limbourg, Groningen, and Drenthe—5 provinces.

Second Class—Hainault, Luxembourg—2 provinces.

Third Class—Namur, Liege, Western Flanders, Eastern Flanders, Zealand, Northern Brabant, Southern Holland, Northern Holland, Utrecht, Guelderland, Overyssel, Friesland—12 provinces.

Before endeavouring to deduce conclusions from the preceding calculations, I shall remark that certain ratios cannot be rigorously compared, on account of the defective valuation (or census) of the population, or from an unequal degree of repression in the different courts of justice. It will be difficult enough to find out the errors arising from the first cause, as we have only, for the elements of verification, the relative numbers of births and deaths; as to the unequal degree of repression, such is not exactly the case, for, besides that we are led to believe that the activity of justice in finding out the authors of crimes is not every where the same, we see that acquittals are not always in the same ratio. Thus, according to the documents from 1825 to 1829, 61 individuals out of every 100 accused have been condemned in France, yet the degree of repression has generally been stronger in the northern than in the southern part of the country. The Court of Justice of Rouen has condemned the greatest number, and it has condemned 71 individuals out of 100 accused at the least; the courts of Dijon, Anjou, Douai, Nanci, Orleans, Caen, Paris, Rennes, have also exceeded the average; the courts of Metz, Colmar, Amiens, Bordeaux, Bourges, Besançon, Grenoble, Lyons, and La Corse, have presented nearly the same average as France; whilst the acquittals have been more numerous in the southern courts, such as Toulouse, Poitiers, Nismes, Aix, Riom, Pau, Argen, Limoges, and Montpellier—the two last courts having condemned, at an average, only 52 individuals of 100 accused. It yet remains for examination, whether these decisive inequalities in the number of acquittals in the north and south of France are owing to a greater facility in bringing forward accusations, or to indulgence to the accused. It appears to me probable, that it may be in part owing to crimes against persons being more common, all things being equal, in the south, and crimes against property in the north; we know, also, that more acquittals take place in the first class of crimes than in the second. However the case may be, I think it will be proper not to lose sight of this double cause of error which I have just pointed out.

If we now cast our eyes over the departments of France which have exceeded the average of crimes against persons as well as of crimes against property, we shall first find Corsica and Landes to be, from their manners and customs, in peculiar circumstances, and which will scarcely permit of their being compared with the rest of France.

The Corsicans, indeed, impelled by cruel prejudices, and warmly embracing feelings of revenge, which are frequently transmitted from generation to generation, almost make a virtue of homicide, and commit the crime to excess. Offences against property are not frequent, and yet their number exceeds the average of France. We cannot attribute this state of things to want of instruction, since the number of accused who could neither read nor write was comparatively less than in France. This is not the case in Landes, where almost nine-tenths of the accused were in a state of complete ignorance. This department, where a poor and weak population live dispersed, as it were, in the midst of fogs, is one where civilisation has made the least progress. Although Landes is found in the most unfavourable class as regards crimes, it is nevertheless proper to say that it does not differ much from the average of France: we may make the same observations on the departments of Vienne and Ille-et-Vilaine. As to the other departments, we may observe that they are generally the most populous in France, in which we find four of the most important cities, Paris, Lyons, Marseilles, and Rouen; and that they also are the most industrious—those which present the great-

* See, for the most ample accounts, *La Statistique des Tribunaux de la Belgique, pendant les Années* 1826, 1827, 1828, 1829, and 1830, published by MM. Quetelet and Smits. 4to. Brussels: 1832.

est changes and intercourse with strangers. We may be surprised not to find with them the departments of the Gironde and Loire-Inferieure, which seem to be almost in the same circumstances as the departments of Bouches-du-Rhône and Seine-Inférieure, especially if we consider that, with respect to knowledge, they seem less favoured than these last, and the repression of crime also has generally been effective. This remark is particularly applicable to the department of the Gironde, for the Loire-Inférieure does not differ so much from the average of France. I shall not hesitate to attribute these differences to a greater morality in one part than the other. And this conjecture becomes more probable, if we observe that the whole of the departments of the south of France, which are on the shores of the sea from the Basses-Pyrénées to La Manche, except Landes and Ille-et-Vilaine which have already been mentioned, fall below the average of France for crimes against persons; and that, on the contrary, all the departments, without exception, which are on the shores of the Mediterranean, as well as the ones adjacent to them, exceed this average. We may also remark, that the shores of the Atlantic, from Basses-Pyrénées to La Manche, generally fall below the average for crime against property.

The third class presents us with fifteen departments, on the border of the Mediterranean, and which all exceed the average of France in crimes against persons and are below the average in crimes against property. The districts on the Mediterranean appear, then, to have a very strong propensity to the first kind of crimes. Of seven other departments of the same class, one only exceeds the average for crimes against person, and that is Vosges in Alsace; the others exceed the average of crimes against property.

The departments of the second class, where the fewest condemnations for crimes against persons and property take place, are generally situated in the centre of France, on the shores of the Atlantic, from the Basses-Pyrénées to La Manche, and in the valleys watered by the Somme, the Oise, and the Meuse.

The following is a summary of what has been said:—

1. The greatest number of crimes against persons and property take place in the departments which are crossed by or near to the Rhone, the Rhine, and the Seine, at least in their navigable portions.

2. The fewest crimes against persons and property are committed in the departments in the centre of France, in those which are situated in the west towards the Atlantic, from the Basses-Pyrénées to La Manche, and in those towards the north, which are traversed by the Somme, the Oise, and the Meuse.

3. The shores of the Mediterranean and the adjacent departments show, all things being equal, a stronger propensity to crimes against persons, and the northern parts of France to crimes against property.

After having established these facts, if we seek to go back to the causes which produce them, we are immediately stopped by numerous obstacles. And, indeed, the causes influencing crimes are so numerous and different, that it becomes almost impossible to assign to each its degree of importance. It also frequently happens, that causes which appear very influential, disappear before others of which we had scarcely thought at first, and this is what I have especially found in actual researches: and I confess that I have been probably too much occupied with the influence which we assign to education in abating the propensity to crime; it seems to me that this common error especially proceeds from our expecting to find fewer crimes in a country, because we find more children in it who attend school, and because there is in general a greater number of persons able to read and write. We ought rather to take notice of the degree of moral instruction; for very often the education received at school only facilitates the commission of crime.* We also consider poverty as generally conducing to crime; yet the department of Creuse, one of the poorest in France, is that which in every respect presents the greatest morality. Likewise, in the Low Countries, the most moral province is Luxembourg, where there is the greatest degree of poverty. It is proper, however, that we come to a right understanding of the meaning of the word poverty, which is here employed in an acceptation which may be considered improper. A province, indeed, is not poor because it possesses fewer riches than another, if its inhabitants, as in Luxembourg, are sober and active; if, by their labour, they can certainly obtain the means of relieving their wants, and gratifying tastes which are proportionally moderate; according as the inequality of fortune is less felt, and does not so much excite temptation: we should say, with more reason, that this province enjoys a moderate affluence. Poverty is felt the most in provinces where great riches have been amassed, as in Flanders, Holland, the department of the Seine, &c., and above all, in the manufacturing countries, where, by the least political commotion, by the least obstruction to the outlets of merchandise, thousands of individuals pass suddenly from a state of comfort to one of misery. These rapid changes from one state to another give rise to crime, particularly if those who suffer are surrounded by materials of temptation, and are irritated by the continual aspect of luxury and of the inequality of fortune, which renders them desperate.

It seems to me that one of the first distinctions to be made in our present inquiry, regards the different races of mankind who inhabit the countries which we are considering; as we shall shortly see, this point is of the greatest importance, although not the first which presents itself to the mind. "The population of France belongs to three different races—the *Celtic race*, which forms nearly three-fifths of its inhabitants; the *German race*, which comprehends those of the late provinces of Flanders, Alsace, and part of Lorraine; and the *Pelasgian race*, scattered along the shores of the Mediterranean and in Corsica. The changes of manners," adds Malte-Brun, "to which this division is exposed, may alter the character of a people, but cannot change it entirely." † If we cast our eyes over the figurative map of crimes against persons, this distinction of people is perceived in a remarkable manner. We shall see that the Pelasgian race, *scattered over the shores of the Mediterranean and in Corsica*, is particularly addicted to crimes against persons; among the Germanic race, which extends over Alsace, the dutchy of the Lower Rhine, a part of Lorraine, and the Low Countries, where the greater proportion of persons and of property gives rise to more occasions of committing crime, and where the frequent use of strong drinks leads more often to excesses, we have generally a great many crimes against property and persons. The Batavians and Frieslanders, who also belong to the Germanic race, are more especially prone to crimes against property. Lastly, the Celtic race appears the most moral of the three which we have considered, especially as regards crimes against persons; they occupy the greatest part of France and the Wallone of Belgium (*et la partie Wallone de la Belgique*). It would appear, moreover, that frontier countries, where the races are most crossed with each other, and where there is generally the most disturbance, and where the customhouses are established, are the most exposed to demoralisation.

After having admitted this distinction, based upon

* M. Guerry has arrived at conclusions similar to mine, and almost at the same time, in his *Essai sur la Statistique Morale de la France*, p. 51, and has expressed them almost in the same terms; the same results have also been obtained in England, Germany, and the United States.

† Précis de la Géographie Universelle, livre 130.

the differences of races, it remains to be examined what are the local anomalies which influence the morality of the people and modify their character.

The most remarkable anomaly which the Celtic race seems to present, is observed in the department of the valley of the Seine, especially below Paris; many causes contribute to this. We first observe that these departments, from their extent, contain the greatest proportion of persons and property, and consequently present more occasions for committing crimes; it is there that there are the greatest changes in the people, and the greatest influx of people from all countries without character, in a manner which must even have altered the primitive race more than any where else; lastly, it is there also where the greatest number of industrial establishments are found; and, as we have already had occasion to observe, these establishments maintain a dense population, whose means of subsistence are more precarious than in any other profession. The same remark is applicable to the valley of the Rhone, and with the more reason, as the Pelagian race has been able, in ascending this river, to penetrate farther into the interior of the country than any where else.

The commercial and industrious provinces of the Low Countries are likewise those in which the greatest number of crimes are committed.

As to the greater number of crimes against property to be observed as we advance towards the north, I think we may attribute it, in a great measure, to the inequality between riches and wants. The great cities, and the capitals especially, present an unfavourable subject, because they possess more allurements to passions of every kind, and because they attract people of bad character, who hope to mingle with impunity in the crowd.

It is remarkable that several of the poorest departments of France, and at the same time the least educated, such as Creuse, Indre, Cher, Haute-Vienne, Allier, &c., are at the same time the most moral, whilst the contrary is the case in most of the departments which have the greatest wealth and instruction. These apparent singularities are, I think, explained by the observations which have been made above. Morality increases with the degree of education in the late kingdom of the Low Countries, which would lead us to believe that the course of education was better.

The influence of climate is not very sensible here, as we may see by comparing Guienne and Gascoigne with Provence and Languedoc, and the inhabitants of the Hautes and Basses Pyrénées to the inhabitants of the Hautes and Basses Alpes, which, notwithstanding, are under the same latitudes. We may also say that the influence of knowledge and of climate partly disappears before more energetic influences; and that they are moreover far from effacing the moral character of the three races of men who inhabit the country which we are considering. Nevertheless, we cannot but allow, when bringing the ratios of the sixth column of our table together, that the number of crimes against property, in proportion to the number of crimes against persons, is increased considerably in advancing towards the north.

It is to be regretted that the documents of the courts of justice of other countries cannot be compared with those of France and the Low Countries. The difference in laws and the classifications of crime render direct comparisons impossible. Yet the countries of some extent, and which give the distinction of crimes against persons and crimes against property, allow at least of our drawing a comparison between their different provinces under this head. It perhaps will not be without some interest to our inquiry to compare the different parts of Prussia and Austria with one another. The data of criminal justice in Austria are extracted from the *Bulletin des Sciences* of M. de Férussac, for November 1829, and relate to the five years from 1819 to 1823; those of Prussia are extracted from the *Revue Encyclopédique* for August 1830, and relate to the three years from 1824 to 1826 inclusive. I have followed the same form of table as the above: nevertheless, I regret that I could not give the number of children in the schools of the different parts of Austria. For Prussia, I have taken the number of children in 1000 of those who attend the schools, according to the statement of the *Revue Encyclopédique*.

Arrondissements.	Crimes against		Inhabitants to one Crime against		Crimes against Property to one Crime against Persons.	Inhabitants to one Scholar.
	Persons.	Property.	Persons.	Property.		
AUSTRIA.						
Dalmatia, -	2986	2,540	535	625	0·85	?
Gallicia & Bukovina, -	5234	14,105	3,955	1470	2·70	?
Tyrol, - -	638	2,516	5,707	1492	3·82	?
Moravia & Silesia,	753	3,545	12,602	2689	4·71	13
Gratz-Leibach & Trietz, or Internal Austria,	589	*2,479	13,311	3188	4·21	10
Lower Austria (or, Cotes de l'Ens),	573	7,099	17,130	1382	12·37	10
Bohemia, -	737	*7,221	18,437	1881	9·99	9
						Scholars in 1000 Children.
PRUSSIA.						
Prussia, - -	249	8,875	22,741	639	35·65	451
Saxony, - -	147	5,815	27,588	697	39·56	491
Posen, - -	97	3,481	31,440	875	35·88	490
Silesia, - -	228	7,077	33,714	1066	31·04	584
Westphalia, -	92	3,333	38,436	1045	36·77	525
Brandenburg, -	112	5,431	39,486	633	57·42	468
Pomerania, -	27	1,622	92,131	1533	60·11	940

It would be very difficult to point out the various races of men who have peopled the countries mentioned in the preceding table, because they are so much mixed in certain parts, that their primitive character is almost lost. The German race predominates in the Prussian states, and is mixed with the northern Sclavonians, particularly along the shores of the Baltic and ancient Prussia, and with the western Sclavonians in the Grand-Dutchy of Posen and Silesia. In the Austrian states, and especially in the northern and eastern parts, the Sclavonian race is again mixed with the German; Malte-Brun even thinks that in Moravia the Sclavonians are three times as numerous as the Germans:† they are divided into several tribes, of which the most remarkable is the Wallachians; "they are brave in war, tolerant in religion, and scrupulously honest in their habits." The Tyrolese, formed of the ancient Rhœti, would be, according to Pliny (book iii. chap. 19), originally from Etruria; the Dalmatians, of Sclavonic origin, are also mingled with Italians.

It will appear, then, also, from the table which has just been given, that crimes are more numerous in Dalmatia, where the blood of the south is mixed with the blood of the people of the north. Among the Tyrolese, we find also the traces of more energetic passions than among the other people under the Austrian dominion, excepting, however, the inhabitants of Gallicia, descendants of the Rosniacks, who proceeded, together with the Croatians and Dalmatians, from the Eastern Sclavonians.‡ Classing the people according to the degree of crime, it would appear that they are in the following order:—Etruscans or Italians, Sclavonians, and Germans.§ It would also appear

* The numbers for Bohemia and Internal Austria only relate to the four years 1819, 1820, 1822, and 1823.

† Précis de Géographie Universelle, livre 145. ‡ Ibid. l. 116.

§ The western Sclavonians are composed, according to Malte-Brun, of Poles, Bohemians or *Tcheches*, of the *Slovaques* of Hungary, the Serbes in Lusatia.—*Livre* 116. "The distinctions

that the eastern Sclavonians have a greater propensity to crime than the northern and western ones, who are more mixed with the Germans, and are in a more advanced state of civilisation. We see from the preceding table, that the state of instruction in Prussia is in a direct ratio to the number of crimes; it appears to be nearly the same in the countries under the Austrian dominion.

3. On the Influence of Seasons on the Propensity to Crime.

The seasons have a well-marked influence in augmenting and diminishing the number of crimes. We may form some idea from the following table, which contains the number of crimes committed in France against persons and property, during each month, for three years, as well as the ratio of these numbers. We can also compare the numbers of this table with those which I have given to show the influence of seasons on the development of mental alienation, and we shall find the most remarkable coincidences, especially for crimes against persons, which would appear to be most usually dependent on failures of the reasoning powers:*—

Months.	Crimes against		Ratio: 1827-28.	Crimes against		Ratio: 1830-31.
	Persons.	Property.		Persons.	Property.	
January, - -	282	1,095	3·89	189	636	3·52
February, - -	272	910	3·35	194	563	2·90
March, - -	335	968	2·89	205	602	2·94
April, - - -	314	841	2·68	197	548	2·78
May, - - -	381	844	2·22	213	569	2·67
June, - - -	414	850	2·05	208	602	2·90
July, - - -	379	828	2·18	188	501	2·66
August, - - -	392	934	2·44	247	596	2·41
September, -	355	896	2·52	176	584	3·32
October, - -	285	926	3·25	207	586	2·83
November, -	301	961	3·20	223	651	2·95
December, - -	347	1,152	3·33	181	691	3·82
Total, - - -	3847	11,305	2·77	2428	7159	2·94

First, the epoch of maximum (June) in respect to the number of crimes against persons, coincides pretty nearly with the epoch of minimum in respect to crimes against property, and this takes place in summer; whilst, on the contrary, the minimum of the number of crimes against persons, and the maximum of the number of crimes against property, takes place in winter. Comparing these two kinds of crimes, we find that in the month of January nearly four crimes take place against property to one against persons, and in the month of June only two to three. These differences are readily explained by considering that during winter misery and want are more especially felt, and cause an increase of the number of crimes against property, whilst the violence of the passions predominating in summer, excites to more frequent personal collisions.

The periods of maxima and minima also coincide with those of the maxima and minima of births and deaths, as we have already shown.

The *Comptes Généraux* of France also contain data on the hours at which crimes have been committed, but only for thefts in Paris and the neighbourhood. These data are hitherto too few to draw any satisfactory conclusions from them.

4. On the Influence of Sex on the Propensity to Crime.

We have already been considering the influence which climate, the degree of education, differences of the human race, seasons, &c., have on the propensity to crime; we shall now investigate the influence of sex.

At the commencement, we may observe that, out of 28,686 accused, who have appeared before the courts in France, during the four years before 1830, there were found 5416 women, and 23,270 men, that is to say, 23 women to 100 men. Thus, the propensity to crime in general gives the ratio of 23 to 100 for the sexes. This estimate supposes that justice exercises its duties as actively with regard to women as to men; and this is rendered probable by the fact, that the severity of repression is nearly the same in the case of both sexes; in other words, that women are treated with much the same severity as men.

We have just seen that, in general, the propensity to crime in men is about four times as great as in women, in France; but it will be important to examine further, if men are four times as criminal, which will be supposing that the crimes committed by the sexes are equally serious. We shall commence by making a distinction between crimes against property and crimes against persons. At the same time, we shall take the numbers obtained for each year, that we may see the limits in which they are comprised:—

Years.	Crimes against Persons.			Crimes against Property.		
	Men.	Women.	Ratio.	Men.	Women.	Ratio.
1826, -	1639	268	0·16	4073	1008	0·25
1827, - -	1637	274	0·17	4020	998	0·25
1828, -	1576	270	0·17	4326	1156	0·26
1829, - -	1552	239	0·15	4379	1203	0·27
Averages,	1601	263	0·16	4217	1091	0·26
1830, -	1412	254	0·18	4196	1100	0·26
1831, - -	1813	233	0·13	4567	993	0·22
Averages,	1612	243	0·15	4381	1046	0·24

Although the number of crimes against persons may have diminished slightly, whilst crimes against property have become rather more numerous, yet we see that the variations are not very great; they have but little modified the ratios between the numbers of the accused of the two sexes. We have 26 women to 100 men in the accusations for crimes against property, and for crimes against persons the ratio has been only 16 to 100.* In general, crimes against persons are of a more serious nature than those against property, so that our distinction is favourable to the women, and we may affirm that men, in France, are four times as criminal as women. It must be observed, that the ratio 16 to 26 is nearly the same as that of the strength of the two sexes. However, it is proper to examine things more narrowly, and especially to take notice of individual crimes, at least of those which are committed in so great a number, that the inferences drawn from them may possess some degree of probability. For this purpose, in the following table I have col-

between the Sclave (Sclavonian) and the German are, the care which the former takes of his property, and his constant desire to acquire more; he is not so industrious, not so capable of attachment and fidelity in his affections, and more disposed to seek for society and dissipation. He prides himself on greater prudence, and is generally distrustful, especially in his dealings with Germans, whom he always regards as a kind of enemy."—*Livre* 114. Malte-Brun also makes a distinction of Germans of the north and Germans of the south. "The Thuringerwald divides Germany into two regions—the north and the south. The German of the north, living on potatoes, butter, and cheese, deprived of beer and spirits, is the most robust, frugal, and intelligent: it is also with him that Protestantism has the most proselytes. Delicate in his mode of life, accustomed to wine, sometimes even given to drunkenness, the German of the south is more sprightly but also more superstitious."—*Livre* 148.

* The observations which we possess are neither so numerous nor so carefully compiled as to enable us to affirm that any direct ratio exists between the propensity to crimes against persons and the tendency to mental alienation; yet the existence of this ratio becomes more probable if we consider that we find again the same coincidence regarding the influence of age.

* These conclusions only refer to the results of the four years before 1830. The numbers of the following years, which have been since added to the table, give almost the same ratios.

lected the numbers relating to the four years before 1830, and calculated the different ratios; the crimes are classed according to the degree of magnitude of this ratio. I have also grouped crimes nearly of the same nature together, such as issuing false money, counterfeits, falsehoods in statements or in commercial transactions, &c.

Nature of Crimes.	Men.	Women.	Women to 100 Men.
Infanticide,	30	426	1320
Miscarriage,	15	39	260
Poisoning,	77	73	91
House robbery (*vol domestique*),	2643	1602	60
Parricide,	44	22	50
Incendiarism of buildings and other things,	279	94	34
Robbery of churches,	176	47	27
Wounding of parents (*blessures envers ascendans*),	292	63	22
Theft,	10,677	2249	21
False evidence and suborning,	307	51	17
Fraudulent bankruptcy,	353	57	16
Assassination,	947	111	12
False coining (*fausse monnaie*), counterfeit making, false affirmations in deeds, &c.	1669	177	11
Rebellion,	612	60	10
Highway robbery,	648	54	8
Wounds and blows,	1447	78	5
Murder,	1112	44	4
Violation and seduction,	685	7	1
Violation on persons under 15 years of age,	535	5	1

As we have already observed, to the commission of crime the three following conditions are essential—the will, which depends on the person's morality, the opportunity, and the facility of effecting it. Now, the reason why females have less propensity to crime than males, is accounted for by their being more under the influence of sentiments of shame and modesty, as far as morals are concerned; their dependent state, and retired habits, as far as occasion or opportunity is concerned; and their physical weakness, so far as the facility of acting is concerned. I think we may attribute the differences observed in the degree of criminality to these three principal causes. Sometimes the whole three concur at the same time: we ought, on such occasions, to expect to find their influence very marked, as in rapes and seductions; thus, we have only 1 woman to 100 men in crimes of this nature. In poisoning, on the contrary, the number of accusations for either sex is nearly equal. When force becomes necessary for the destruction of a person, the number of women who are accused becomes much fewer; and their numbers diminish in proportion, according to the necessity of the greater publicity before the crime can be perpetrated: the following crimes also take place in the order in which they are stated—infanticide, miscarriage, parricide, wounding of parents, assassinations, wounds and blows, murder.

With respect to infanticide, woman has not only many more opportunities of committing it than man, but she is in some measure impelled to it, frequently by misery, and almost always from the desire of concealing a fault, and avoiding the shame or scorn of society, which, in such cases, thinks less unfavourably of man. Such is not the case with other crimes involving the destruction of an individual: it is not the degree of the crime which keeps a woman back, since, in the series which we have given, parricides and wounding of parents are more numerous than assassinations, which again are more frequent than murder, and wounds and blows generally; it is not simply weakness, for then the ratio for parricide and wounding of parents should be the same as for murder and wounding of strangers. These differences are more especially owing to the habits and sedentary life of females; they can only conceive and execute guilty projects on individuals with whom they are in the greatest intimacy: thus, compared with man, her assassinations are more often in her family than out of it; and in society she commits assassination rather than murder, which often takes place after excess of drink, and the quarrels to which women are less exposed.

If we now consider the different kinds of theft, we shall find that the ratios of the propensity to crime are arranged in a similar series: thus, we have successively house robbery, robbery in churches, robberies in general, and, lastly, highway robbery, for which strength and audacity are necessary. The less conspicuous propensity to cheating in general, and to fraudulent bankruptcy, again depend on the more secluded life of females, their separation from trade, and that, in some cases, they are less capable than men—for example, in coining false money and issuing counterfeits.

If we attempt to analyse facts, it seems to me that the difference of morality in man and woman is not so great as is generally supposed, excepting only as regards modesty; I do not speak of the timidity arising from this last sentiment, in like manner as it does from the physical weakness and seclusion of females. As to these habits themselves, I think we may form a tolerable estimate of their influence by the ratios which exist between the sexes in crimes of different kinds, where neither strength has to be taken into consideration, nor modesty—as in theft, false witnessing, fraudulent bankruptcy, &c.; these ratios are about 100 to 21 or 17, that is to say, about 5 or 6 to 1. As to other modes of cheating, the difference is a little greater, from the reasons already stated. If we try to give a numerical expression of the intensity of the causes by which women are influenced, as, for example, the influence of strength, we may estimate it as being in proportion to the degree of strength itself, or as 1 to 2 nearly; and this is the ratio of the number of parricides for each sex. For crimes where both physical weakness and the retired life of females must be taken into account, as in assassinations and highway robberies, following the same plan in our calculations, it will be necessary to multiply the ratio of power or strength $\frac{1}{2}$ by the degree of dependence 1-5, which gives 1-10, a quantity which really falls between the values 12-100 and 8-100, the ratios given in the table. With respect to murder, and blows and wounds, these crimes depend not merely on strength and a more or less sedentary life, but still more on being in the habit of using strong drinks and quarrelling. The influence of this latter cause might almost be considered as 1 to 3 for the sexes. It may be thought that the estimates which I have here pointed out, cannot be of an exact nature, from the impossibility of assigning the share of influence which the greater modesty of woman, her physical weakness, her dependence, or rather her more retired life, and her feebler passions, which are also less frequently excited by liquors, may have respectively on any crime in particular. Yet, if such were the characters in which the sexes more particularly differ from each other, we might, by analyses like those now given, assign their respective influence with some probability of truth, especially if the observations were very numerous. I do not speak of modes of justice, of legislation in general, of the state of knowledge, of means of providing for physical wants, &c., which may powerfully contribute to increase or diminish the number of crimes, but whose influence is generally not very evident as regards the ratio of the accused of each sex.

Perhaps it may be said, that if it be true that the morality of woman is not greater than that of man, house robbery should be as frequent for the one as for the other. This observation would be just, if it were proved that the class of individuals by whom house robberies are committed, were equally composed of men and women; but there are no data on this subject. All that can be laid down is, that men and

women who live in a domestic state, rather commit crimes against property than against persons, which very materially confirms the observations made above, on the influence of retired life and sedentary habits. The *Compte Général de l'Administration de la Justice in* 1829, for the first time, gives the professions of the accused; and in the article *Domestiques*, we find 318 men and 147 women employed as farm-servants; and 149 men and 175 women as personal domestics: the total number of men is greater than that of women. Now, of these numbers, there were 99 accused of crimes against persons, and 590 of crimes against property: the ratio of these numbers is 1 to 6 nearly, and it has preserved exactly the same value in the years 1830 and 1831. But we have had occasion to see that this ratio for the mass of society is 1 to 3, when particular circumstances are not taken into consideration; and it would be only as 263 to 1091, or 1 to 4 nearly, if society were composed of women alone: thus, in all the cases, I think it has been sufficiently shown that men and women, when in the state of servants, commit crimes against property in preference to others.

As to capital crimes, we may arrange them in the following manner:—

Apparent Motives: 1826-1829 inclusive.	Accused for				Total.
	Poisoning.	Murder.	Assassination.	Incendiarism.	
Cupidity, theft,	20	39	237	66	362
Adultery, -	43	9	76	..	133
Domestic dissensions, -	43	120	131	34	333
Debauchery, jealousy, - -	10	58	115	37	220
Hatred, revenge, & divers motives,	23	903	460	229	1615
Total, - -	149	1129	1019	366	2663

Adultery, domestic quarrels, and jealousy, cause almost an equal number of poisonings in both sexes; but the number of assassinations, and especially of murders, of women by their husbands, is greater than that of husbands by their wives. The circumstances bearing on this subject have been stated already.

Of 903 murders which have taken place from hatred, revenge, and other motives, 446 have been committed in consequence of quarrels and contentions at taverns; thus, more than one-third of the total number of murders have taken place under circumstances in which women are not usually involved.

The four last volumes of the *Comptes Généraux*, contain some interesting details on the intellectual state of the accused of both sexes: they may be stated as follows:—

Intellectual State.	Men.	Women.	Ratio: 1828-29.	Men.	Women.	Ratio: 1830-31.
Unable to read or write, - -	6,537	2152	3·0	6,877	2042	3·3
Able to read and write imperfectly, - -	3,308	497	6·6	3,422	451	7·6
Could read and write well, -	1,339	110	12·7	1,373	82	16·7
Had received an excellent education to the 1st degree, - -	283	5	56·6	314	5	62·8
Intellectual state not mentioned,	374	104	3·6	2	..	..
	11,901	2963	4·2	11,988	2580	4·6

These numbers give us no information on the population, since we do not know what is the degree of knowledge diffused in France; but we see, at least, that there is a great difference in the sexes. I think we might explain these results by saying, that in the lower orders, where there is scarcely any education, the habits of the women approach those of the men; and the more we ascend in the classes of society, and consequently in the degrees of education, the life of woman becomes more and more private, and she has less opportunity of committing crime, all other things being equal. These ratios differ so much from each other, that we cannot but feel how much influence our habits and social position have on crime.

It is to be regretted that the documents of justice for the Low Countries do not contain any thing on the distinction of the sexes; we only see (according to the returns of the prisons and the houses of correction and detention, in the *Recueil Official*), that on the 1st of January 1827, the number of men was 5162, that of women 1193, which gives 100 women to 433 men. Making use of the documents which have been disclosed to me by M. le Baron de Keverberg, I found that in 1825 this ratio was 100 to 314.

According to the report of M. Ducpétiaux, on the state of prisons in Belgium, we enumerated 2231 men and 550 women, as prisoners on the 1st of January 1833, which gives a ratio of 405 to 100: among these prisoners were found 1364 men and 326 women who could not read or write; so that the intellectual state of the prisoners of both sexes was nearly the same; the ratio of the whole population to those who could neither read nor write, was as 100 to 61 among the men, and 100 to 60 among the women. To the number of prisoners just mentioned, may be added 419 individuals confined in the central military prison, of whom 282 could neither read nor write; this gives a ratio of 67 in 100.*

If we examine the accounts of the correctional (or minor) tribunals of France, we find the ratio between the accused of both sexes to be 529,848 to 149,565, or 28 females to 100 males. Thus, with respect to less serious offences, which are judged by the correctional tribunals, the women have there been rather more numerous compared with the men than in the case of weightier crimes.

5. Of the Influence of Age on the Propensity to Crime.

Of all the causes which influence the development of the propensity to crime, or which diminish that propensity, age is unquestionably the most energetic. Indeed, it is through age that the physical powers and passions of man are developed, and their energy afterwards decreases with age. Reason is developed with age, and continues to acquire power even when strength and passion have passed their greatest vigour. Considering only these three elements, strength, passion, and judgment† (or reason), we may almost say, *à priori*, what will be the degree of the propensity to crime at different ages. Indeed, the propensity must be almost nothing at the two extremes of life; since, on the one hand, strength and passion, two powerful instruments of crime, have scarcely begun to exist, and, on the other hand, their energy, nearly extinguished, is still further deadened by the influence of reason. On the contrary, the propensity to crime should be at its maximum at the age when strength and passion have attained their maximum, and when reason has not acquired sufficient power to govern their combined influence. Therefore, considering only physical causes, the propensity to crime at different ages will be a property and sequence of the three

* According to the statistical tables of France, of young persons inscribed for military service in 1827, we enumerate (Bulletin de M. Férussac, Nov. 1829, p. 271)—

	Absolute No.	Relative No.
Young persons able to read, - -	13,794	5
.. .. read and write,	100,787	37
.. not able to read or write,	157,510	58
	272,091	100

This ratio of 58 in 100 is a little less unfavourable than that of prisons, which is 60 in 100.

† I am not speaking of the intellectual state, of religious sentiments, of fear, shame, punishment, &c., because these qualities depend more or less directly on reason.

quantities we have just named, and might be determined by them, if they were sufficiently known.* But since these elements are not yet determined, we must confine ourselves to seeking for the degrees of the propensity to crime in an experimental manner; we shall find the means of so doing in the *Comptes Généraux de la Justice*. The following table will show the number of crimes against persons and against property, which have been committed in France by each sex during the years 1826, 27, 28, and 29, as well as the ratio of these numbers; the fourth column points out how a population of 10,000 souls is divided in France, according to age; and the last column gives the ratio of the total number of crimes to the corresponding number of the preceding column; thus there is no longer an inequality of number of the individuals of different ages.

Individuals' Age.	Crimes against		Crimes against Property in 100.	Population according to Age.	Degrees of the Propensity to Crime.
	Persons.	Property.			
Less than 16 years,	80	440	85	3304	161
16 to 21 years, -	904	3723	80	887	5217
21 to 25 " - - - -	1278	3329	72	673	6846
25 to 30 " - - -	1575	3702	70	791	6671
30 to 35 " - - - -	1153	2883	71	732	5514
35 to 40 " - - -	650	2076	76	672	4057
40 to 45 " - - - -	575	1724	75	612	3757
45 to 50 " - - -	445	1275	74	549	3133
50 to 55 " - - - -	288	811	74	482	2280
55 to 60 " - - -	168	500	75	410	1629
60 to 65 " - - - -	157	385	71	330	1642
65 to 70 " - - -	91	184	70	247	1113
70 to 80 " - - - -	64	137	68	255	788
80 and upwards, -	5	14	74	55	345

This table gives us results conformable to those which I have given in my *Recherches Statistique* for the years 1826 and 1827. Since the value obtained for 80 years of age and upwards is based on very small numbers, it is not entitled to much confidence. Moreover, we see that man begins to exercise his propensity to crimes against property at a period antecedent to his pursuit of other crimes. Between his 25th and 30th year, when his powers are developed, he inclines more to crimes against persons. It is near the age of 25 years that the propensity to crime reaches its maximum; but before passing to other considerations, let us examine what difference there is between the sexes. The latter columns of the following table show the degrees of propensity to crime,† reference being had to population, and the greatest number of each column being taken as unity:—

Individuals' Age.	Accused.		Women to 1000 Men.	Degrees of the Propensity to Crime.			
	Men.	Women.		In General.	Men.	Women.	Calculated.
Under 16 years,	438	82	187	0·02	0·02	0·02	0·02
16 to 21 "	3,901	726	186	0·76	0·79	0·64	0·66
21 to 25 "	3,762	845	225	1·00	1·00	0·98	1·00
25 to 30 "	4,260	1017	239	0·97	0·96	1·00	0·92
30 to 35 "	3,254	782	240	0·81	0·80	0·83	0·81
35 to 40 "	2,165	621	295	0·59	0·56	0·75	0·71
40 to 45 "	1,831	468	256	0·55	0·54	0·60	0·60
45 to 50 "	1,357	363	267	0·46	0·44	0·51	0·51
50 to 55 "	896	203	227	0·33	0·33	0·33	0·42
55 to 60 "	555	113	204	0·24	0·24	0·22	0·34
60 to 65 "	445	97	218	0·24	0·24	0·23	0·27
65 to 70 "	230	45	196	0·16	0·17	0·14	0·21
70 to 80 "	163	38	233	0·12	0·12	0·12	0·12
80 & upwards,	18	1	56	0·05	0·06	0·01	0·04
All ages, -	23,270	5416	233	0·41	"	"	"

Women, compared to men, are rather later in entering on the career of crime, and also sooner come to the close of it. The maximum for men takes place about the 25th year, and about the 30th for women; the numbers on which our conclusions are founded are still very few; yet we see that the two lines which represent the relative value for each sex are almost parallel. The latter column contains results calculated by the following very simple formula:—

$$y = (1 - \text{sin. } x)\,\frac{1}{1+m}, \text{ supposing } m = \frac{1}{2x - 1^{s}}.$$

In this manner the degree of the propensity to crime is expressed according to age (*en fonction de l'âge*) x. We must take, as we see, for the axis of the abscissæ, one-fourth of the corrected circumference (*circonférence rectifiée*), and divided into decimal parts. The results of this formula generally agree better with the results obtained for women. I have endeavoured to render them sensible by the construction of a curve, the greater or less divergences of which from the axis AB (see *plate* 4) indicates the degree of the propensity to crime. The equation becomes a sinusoide—

$$y = 1 - \text{sin. } x,$$

for ages above 30 years, because m evidently is equal to unity. It is not to be expected that we should find mathematical precision, for several reasons, of which the principal are—

1. The numbers obtained for four years are not so great that we may adopt their results with perfect confidence.

2. To calculate the propensity to crime, we must combine these numbers with those which the tables of population have furnished; and it is pretty generally agreed that the table of the *Annuaire* does not give the state of the population of France with sufficient accuracy.

3. The propensity to crime can only be calculated from the whole of the individuals who compose the population; and as those who occupy the prisons are generally persons of more than 25 years of age, and who, from their state of captivity, cannot enter into the ratio for persons above 25 years of age, there must necessarily be a void (*lacune*). If, instead of taking crimes collectively, we examine each in particular in proportion to age, we shall have a new proof that the maximum of crimes of different kinds takes place between the 20th and 30th years, and that it is really about that period that the most vicious disposition is manifested. Only the period of maximum will be hastened or retarded some years for some crimes, according to the quicker or slower development of certain qualities of man which are proportioned to those crimes. These results are too curious to be omitted here; I have presented them in the following table, according to the documents of France, from 1826 to 1829 inclusively, classing them according

* Here we are more especially considering crimes against persons; for crimes against property, it will be necessary to take notice of the wants and privations of man.

† To give a new proof of the almost identity of results of each year, I have thought proper to present here the numbers collected between 1830 and 1831; we may compare them with those of the preceding tables, which are nearly exactly double, because they refer to four years:—

Individuals' Age.	Crimes against		Crimes against Property in 100 Crimes.	Accused.		Women to 100 Men.
	Persons.	Property.		Men.	Women.	
Under 16 years,	27	214	88	211	30	14
16 to 21 " -	394	1,883	83	1,911	371	19
21 to 25 " -	643	1,708	72	1,913	438	23
25 to 30 " -	753	1,872	70	2,185	445	20
30 to 35 " -	692	1,741	72	2,004	399	20
35 to 40 " -	376	1,093	74	1,167	297	26
40 to 45 " -	279	725	72	800	204	25
45 to 50 " -	200	643	76	692	151	21
50 to 55 " -	161	426	73	497	100	21
55 to 60 " -	91	245	73	270	66	24
60 to 65 " -	55	147	73	162	40	25
65 to 70 " -	31	100	77	113	18	16
70 to 80 " -	29	58	66	67	20	30
80 and upwards,	6	1	14	6	1	16
All ages, - - -	3712	10,856	74	11,960	2500	22

to the periods of maxima, and taking into account the population of different ages. I have omitted the crimes which are committed in smallest number, because the results from that alone would have been very doubtful.

Nature of the Crimes.	Under 16 Years.	16 to 21.	21 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 65.	65 to 70.	70 to 80.	80 and upwards.
Violations on children under 15 years,	4	120	71	96	73	39	34	45	22	18	26	17	21	2
House robbery,	54	965	845	706	528	351	249	207	112	56	61	34	14	..
Other thefts,	332	2479	2050	2292	1716	1249	1016	707	433	263	190	98	65	10
Violation and seduction,	9	155	156	148	99	38	40	27	9	5	3	1	2	..
Parricide,	6	13	12	13	6	3	2	1	4	2	..	..	..	..
Wounds and blows,	6	189	300	359	219	129	101	95	55	35	23	10	7	1
Murder,	15	139	198	275	172	103	84	49	48	30	25	17	9	..
Infanticide,	1	40	99	134	76	44	30	8	7	1	8	4	2	..
Rebellion,	5	67	129	156	115	51	51	35	29	16	16	5	5	..
Highway robbery,	21	80	111	149	107	60	62	46	22	21	8	6	4	..
Assassination,	10	90	144	203	183	100	104	89	53	32	24	13	15	1
Wounding parents,	2	47	64	73	72	40	30	16	8	2	1	..	..	..
Poisoning,	5	6	17	30	27	15	20	12	6	2	5	4	1	..
False witnessing and suborning,	2	23	46	48	44	42	42	35	23	15	15	11	7	..
Various misdemeanours,	8	85	202	276	312	244	207	185	129	78	75	28	28	2

Thus the propensity to theft, one of the first to show itself, prevails in some measure throughout our whole existence; we might be led to believe it to be inherent to the weakness of man, who falls into it as if by instinct. It is first exercised by the indulgence of confidence which exists in the interior of families, then it manifests itself out of them, and finally on the public highway, where it terminates by having recourse to violence, when the man has then made the sad essay of the fullness of his strength by committing all the different kinds of homicide. This fatal propensity, however, is not so precocious as that which, near adolescence, arises with the fire of the passions and the disorders which accompany it, and which drives man to violation and seduction, seeking its first victims among beings whose weakness opposes the least resistance. To these first excesses of the passions, of cupidity, and of strength, is soon joined reflection, plotting crime; and man, become more self-possessed and hardened, chooses to destroy his victim by assassination or poisoning. Finally, his last stages in the career of crime are marked by address in deception, which in some measure supplies the place of strength. It is in his decline that the vicious man presents the most hideous spectacle; his cupidity, which nothing can extinguish, is rekindled with fresh ardour, and assumes the mask of swindling; if he still uses the little strength which nature has left to him, it is rather to strike his enemy in the shade; finally, if his depraved passions have not been deadened by age, he prefers to gratify them on feeble children. Thus, his first and his last stages in the career of crime have the same character in this last respect: but what a difference! That which was somewhat excusable in the young man, because of his inexperience, of the violence of his passions, and the similarity of ages, in the old man is the result of the deepest immorality and the most accumulated load of depravity.

From the data of the preceding tables, it is scarcely possible not to perceive the great influence which age exercises over the propensity to crime, since each of the individual results tend to prove it. I shall not hesitate to consider the scale of the different degrees of the propensity to crime, at different ages, deserving of as much confidence as those which I have given for the stature, weight, and strength of man, or, finally, those for mortality.

Account has also been taken of the ages of accused persons, who have appeared before the minor or correctional courts of France, but only preserving the three following heads, which refer but to the four years preceding 1830:—

Ages.	Criminal Courts.		Correctional Courts.	
	Men.	Women.	Men.	Women.
Under 16 years,	2	2	5	6
From 16 to 21,	17	13	14	16
More than 21,	81	85	81	78
	100	100	100	100

Thus, the correctional cases are, in early age, all things being equal, more frequent than criminal cases; they are the first steps of crime, and consequently those most easily ascended. In Belgium, only four heads of ages have been made, and the results of correctional and criminal courts have been united, which renders our comparisons more difficult, since, as we have just seen, the numbers in each are not the same; it is also to be regretted that care has not been taken to distinguish the sexes. Be this as it may, by taking the total number of the accused and suspected (*prévenus*) as unity, we obtain the following results:—

Ages.	Suspected (or Committed) and Accused.				
	1826.	1827.	1828.	1829.	Average Number.
Under 16 years,	4	5	5	5	5
From 16 to 21,	13	11	12	11	12
" 21 to 70,	81	82	81	82	81
Above 70 years,	2	2	2	2	2
	100	100	100	100	100

These results are very similar to those of the correctional courts of France, and the latter elements ought certainly to predominate, when we make no distinction between the accused and those merely committed, since the latter are always more numerous than the accused. Yet it would seem that with us there are fewer offences between the ages of 16 and 21 than in France.

We do not find that the number of children brought annually before the courts of Belgium has diminished, either in an absolute sense, or compared with the numbers of other accused and committed persons. The same is nearly the case with France, as we see by the following table, in which I have preferred giving the absolute numbers:—

Years.	Under 16 Years.	16 to 21.	More than 21.	Total.
Accused.				
1826,	124	1,101	5,763	6,988
1827,	136	1,022	5,771	6,930
1828,	143	1,278	5,975	7,396
1829,	117	1,226	6,030	7,373
1830,	114	1,161	5,687	6,962
1831,	127	1,121	6,358	7,606
Committed.				
1826,	5,042	12,739	86,196	104,037
1827,	5,233	13,291	73,588	92,112
1828,	5,228	14,902	71,622	91,752
1829,	5,306	14,431	79,438	99,175
1830,*	2,852	6,452	47,812	57,116
1831,	5,651	17,659	84,433	107,743

We must not, however, conclude from these results that education, which for some time has been diffused

* Those committed for different kinds of offences are not included in these numbers.

with such activity, has been of no effect in diminishing the number of crimes committed by young persons; several years more are necessary before its influence can become apparent, and before it can carry its effects into the bosom of families.

It is a matter of regret, that as yet we possess so few accounts of the ages of criminals, calculated to render appreciable the influence of places and the customs of different nations. In general, we remark, that the number of children in prisons in England is much greater than with us; this would appear to be owing, especially in the metropolis, to children being trained in a manner to theft, while the really guilty act through their intermediation. In the penitentiary of Millbank, in the year 1827, 1250 individuals were registered as under 21 years of age out of a total number of 3020, which gives a ratio of 41 to 100, being more than double that of France and the Low Countries.*

The condemned persons in the jail of Philadelphia in 1822, 1823, and 1824, were proportioned as follows:†—

Ages.	1822.	1823.	1824.	Totals.
Under 21 years, -	52	72	58	182
From 21 to 30 years, -	151	143	122	416
„ 30 to 40 „ -	72	67	79	218
Above 40 years, - -	55	49	28	132

The total for the three years was 948. Taking the ratio of this sum to 1000, we find the following values, opposite to which I have placed those of France:—

	Philadelphia.	France.
Under 21 years, - - -	19	19
From 21 to 30, - - -	44	35
„ 30 to 40, - - -	23	23
Above 40 years, - - -	14	23
	100	100

Thus the prisons of Philadelphia present exactly the same number of criminals as those of France for individuals under 19 and for those between 30 and 40 years of age; they have fewer old men, but more men between 21 and 30, which may be owing to the nature of the population of the two countries.

France, Belgium, and Philadelphia, agree then pretty nearly as to the number of criminals in proportion to the ages; but England differs very sensibly from the average values presented by these countries, and that is owing, no doubt, as I observed before, not so much to the character of the English people as to the modes of eluding the rigour of the laws which the malefactors make use of, acting through the intermedium of children whom they have trained up as instruments of crime.

Conclusions.

In making a summary of the principal observations contained in this chapter, we are led to the following conclusions:—

1st, Age (or the term of life) is undoubtedly the cause which operates with most energy in developing or subduing the propensity to crime.

2d, This fatal propensity appears to be developed in proportion to the intensity of the physical power and passions of man: it attains its maximum about the age of 25 years, the period at which the physical development has almost ceased. The intellectual and moral development, which operates more slowly, subsequently weakens the propensity to crime, which, still later, diminishes from the feeble state of the physical powers and passions.

3d, Although it is near the age of 25 that the maximum in number of crimes of different kinds takes place, yet this maximum advances or recedes some years for certain crimes, according to the quicker or slower development of certain qualities which have a bearing on those crimes. Thus, man, driven by the violence of his passions, at first commits violation and seduction; almost at the same time he enters on the career of theft, which he seems to follow as if by instinct till the end of life; the development of his strength subsequently leads him to commit every act of violence—homicide, rebellion, highway robbery still later, reflection converts murder into assassination and poisoning. Lastly, man, advancing in the career of crime, substitutes a greater degree of cunning for violence, and becomes more of a forger than at any other period of life.

4th, The *difference of sexes* has also a great influence on the propensity to crime: in general, there is only 1 woman before the courts to 4 men.

5th, The propensity to crime increases and decreases nearly in the same degrees in each sex; yet the period of maximum takes place rather later in women, and is near the 30th year.

6th, Woman, undoubtedly from her feeling of weakness, rather commits crimes against property than persons; and when she seeks to destroy her kind, she prefers poison. Moreover, when she commits homicide, she does not appear to be proportionally arrested by the enormity of crimes which, in point of frequency, take place in the following order:—infanticide, miscarriage, parricide, wounding of parents, assassination, wounds and blows, murder: so that we may affirm that the number of the guilty diminishes in proportion as they have to seek their victim more openly. These differences are no doubt owing to the habits and sedentary life of woman; she can only conceive and execute guilty projects on individuals with whom she is in constant relation.

7th, The *seasons*, in their course, exercise a very marked influence on crime: thus, during summer, the greatest number of crimes against persons are committed, and the fewest against property; the contrary takes place during winter.

8th, It must be observed that age and the seasons have almost the same influence in increasing or diminishing the number of mental disorders and crimes against persons.

9th, *Climate* appears to have some influence, especially on the propensity to crimes against persons: this observation is confirmed at least among the races of southern climates, such as the Pelasgian race, scattered over the shores of the Mediterranean and Corsica, on the one hand; and the Italians, mixed with Dalmatians and Tyrolese, on the other. We observe, also, that severe climates, which give rise to the greatest number of wants, also give rise to the greatest number of crimes against property.

10th, The countries where frequent mixture of the people takes place; those in which industry and trade collect many persons and things together, and possess the greatest activity; finally, those where the inequality of fortune is most felt, all things being equal, are those which give rise to the greatest number of crimes.

11th, Professions have great influence on the nature of crimes. Individuals of more independent professions are rather given to crimes against persons; and the labouring and domestic classes to crimes against property. Habits of dependence, sedentary life, and also physical weakness in women, produce the same results.

12th, *Education* is far from having so much influence on the propensity to crime as is generally supposed. Moreover, moral instruction is very often confounded with instruction in reading and writing alone, and which is most frequently an accessory instrument to crime.

13th, It is the same with *poverty*; several of the departments of France, considered to be the poorest, are at the same time the most moral. Man is not driven to crime because he is poor, but more generally

* Bulletin de M. de Férussac, Mai 1828.

† American Review, 1827, No. 12.

because he passes rapidly from a state of comfort to one of misery, and an inadequacy to supply the artificial wants which he has created.

14th, The higher we go in the ranks of society, and consequently in the degrees of education, we find a smaller and smaller proportion of guilty women to men; descending to the lowest orders, the habits of both sexes resemble each other more and more.

15th, Of 1129 murders committed in France, during the space of four years, 446 have been in consequence of quarrels and contentions in taverns; which would tend to show the fatal influence of the use of *strong drinks*.

16th, In France, as in the Low Countries, we enumerate annually 1 accused person to 4300 inhabitants nearly; but in the former country, 39 in 100 are acquitted, and in the second only 15; yet the same code was used in both countries, but in the Low Countries the judges performed the duty of the jury. Before correctional courts and simple police courts, where the committed were tried by judges only, the results were nearly the same for both countries.

17th, In France, crimes against persons were about one-third of the number of crimes against property, but in the Low Countries they were about one-fourth only. It must be remarked, that the first kind of crimes lead to fewer condemnations than the second, perhaps because there is a greater repugnance to apply punishment as the punishment increases in severity.

I cannot conclude this chapter without again expressing my astonishment at the constancy observed in the results which the documents connected with the administration of justice present each year.

"Thus, as I have already had occasion to repeat several times, we pass from one year to another, with the sad perspective of seeing the same crimes reproduced in the same order, and bringing with them the same punishments in the same proportions." All observations tend likewise to confirm the truth of this proposition, which I long ago announced, that *every thing which pertains to the human species considered as a whole, belongs to the order of physical facts:* the greater the number of individuals, the more does the influence of individual will disappear, leaving predominance to a series of general facts, dependent on causes by which society exists and is preserved. These causes we now want to ascertain, and as soon as we are acquainted with them, we shall determine their influence on society, just in the same way as we determine effects by their causes in physical sciences.* It must be confessed, that, distressing as the truth at first appears, if we submit to a well followed out series of observations the physical world and the social system, it would be difficult to decide in respect to which of the two the acting causes produce their effects with most regularity. I am, however, far from concluding that man can do nothing for man's amelioration. I think, as I said at the commencement of this work, that he possesses a moral power capable of modifying the laws which affect him; but this power only acts in the slowest manner, so that the causes influencing the social system cannot undergo any sudden alteration; as they have acted for a series of years, so will they continue to act in time to come, until they can be modified. Also, I cannot repeat too often, to all men who sincerely desire the well-being and honour of their kind, and who would blush to consider a few francs more or less paid to the treasury as equivalent to a few heads more or less submitted to the axe of the executioner, that there is a budget which we pay with a frightful regularity —it is that of prisons, chains, and the scaffold: it is that which, above all, we ought to endeavour to abate.

* M. Guerry comes to the same conclusions from his researches on crimes, *Essai sur la Statistique Morale*, p. 69:—"One of the most general conclusions we can make is, that they all concur to prove that the greater number of facts of a moral nature, considered in the mass, and not individually, are determined by regular causes, the variations of which take place within narrow limits, and which may be submitted, like those of a material nature, to direct and numerical observation." As this idea has continually presented itself to me in all my researches on man, and as I have exactly expressed it in the same terms as those of the text, in my conclusions on the *Recherches sur le Penchant au Crime*, a work which appeared a year before that of M. Guerry, I have thought it necessary to mention the point here, to prevent misunderstanding.

BOOK FOURTH.

OF THE PROPERTIES OF THE AVERAGE MAN, OF THE SOCIAL SYSTEM, AND OF THE FINAL ADVANCEMENT OF THIS STUDY.

CHAPTER I.

PROPERTIES OF THE AVERAGE MAN.

In the three preceding books I have presented the results of my inquiries on the development of the physical and moral system of the average man, and on the modifications which he undergoes from different influences. These results can only be considered as the first essay towards an immense work, which, to be completed, would require long and painful researches, and which would only be really useful by being extremely exact.

This determination of the average man is not merely a matter of speculative curiosity; it may be of the most important service to the science of man and the social system. It ought necessarily to precede every other inquiry into social physics, since it is, as it were, the basis. The average man, indeed, is in a nation what the centre of gravity is in a body; it is by having that central point in view that we arrive at the apprehension of all the phenomena of equilibrium and motion; moreover, when considered abstractly, it presents some remarkable properties, which I am now going to state succinctly.

1. Of the Average Man considered with reference to Literature and the Fine Arts.

The necessity of veracity in faithfully representing the physiognomy, the habits, and the manners of people at different epochs, has at all times led artists and literary men to seize, among the individuals whom they observed, the characteristic traits of the period in which they lived; or, in other words, to come as near the average as possible. I do not wish to be understood as implying that it is necessary to give the same traits, the same tastes, and the same passions, to every individual, whatever may be his age, rank, country, or the period at which he lives; but that the most characteristic marks must be studied, still keeping in view these differences. Thus we should investigate what are the predominating elements in any people or in any age; for example, whether fanaticism, piety, or irreligion—a spirit of servility, independence, or anarchy. No one will hesitate to allow to me that man is more courageous at 20 than at 60, and more prudent at 60 than at 20; or that persons of the south have more liveliness of thought and feature than the inhabitants of the north: these are common observations, which every one admits, and which we should be shocked to find unattended to in works of imagination. But can it be thought wrong to give more precision to these vague ideas?—is it altogether conformable to the actual state of our knowledge, to receive relations which have only been slightly observed, when they may be determined with certain precision? If it had been demanded some years ago at what age a man has the greatest propensity to crime, we should no doubt have been much embarrassed to find the true answer; and perhaps the most erroneous opinions would have been put forth, especially on the influence

of sexes and the intellectual state. Yet who would assert that these researches are useless to philosophers and men of letters, or even to the artist, who only truly deserves this name according as he has studied the human heart deeply? The time is passing away when men were contented with indistinct ideas, and relations determined at a glance; when numerical determinations become applicable, they are especially consulted by the observer and lover of truth.

I am far from pretending, however, that even a profound knowledge of the different faculties of man will be sufficient to obtain success in the fine arts and literature; but I think that, to produce a work truly capable of moving and agitating the passions, we must be acquainted with man, and especially man as it is desired to represent him. Thus, to take but one example, the artist who has only studied the type of the Grecian physiognomies, however admirable this type may appear to us, if he reproduces it in modern subjects, will produce but a chilling effect on the spectator, who, though he admires the art and composition, will never be deeply excited. Grecian figures, however varied they may be according to age, passion, and sex, have notwithstanding a general likeness, which carries us, in spite of ourselves, back to antiquity, and distracts our attention from the subject sought to be represented before us. If such figures are represented in action, the anachronism only becomes more sensible. Artists, at the revival of the fine arts, fully comprehended the necessity of painting what they had before their eyes, and on that account they produced such astonishing effects. The noble and severe figure of Christ has nothing in common with those of the Apollo or the Jupiter of ancient mythology; a Madonna of Raphael has an enchanting grace, which is not surpassed by the finest forms of the antique; and these beauties have a greater influence on the imagination, because they are more similar to the natures around us, and act more directly upon us. Even we ourselves, in more remote situations and circumstances, feel the necessity, when retracing our national facts, of not bringing forward Grecian or Italian figures: in the midst of a battle, where men are found, all nearly of the same age, and all alike dressed in the same kind of armour, our eye seeks to recognise, by the physiognomic traits and expressions, the Frenchman or the Englishman, the German or the Russian. In the French army itself, the soldier of the old guard had an expression which has become classical, and is identified in some measure with the remembrances of the empire.

If the arts have already admitted such imperceptible shades, and have the power of awakening the remembrance of an era by recalling the physiognomic traits which seem to belong to it, what value ought we not to affix to an accurate determination of these traits, if they are capable of being appreciated? Some men of genius have penetrated very far in these researches, and their ideas, which at first were rejected, have since been more favourably judged of, when experience came to their support. Lavater has not hesitated to analyse the human passions by the inspection of the features, and Gall has endeavoured to prove that we may arrive at similar results by inspecting the cranial protuberances. There is an intimate relation between the physical and the moral of man, and the passions leave sensible traces on the instruments they put in continual action; but what are these traces? It is agreed that they do exist; the artist studies and seeks to seize them; yet, by a singular prepossession, we reject the possibility of this being determined with any degree of accuracy, or the utility of the determination. But how comes it that such artist or such poet labours to no purpose, and presents constantly to us the Greek or Italian type, according as he had more especially studied the antique or the Italian school?—how is it that Rubens, despite his genius, when painting the divinities of ancient mythology, gives forms which antiquity would have disavowed? It is because Rubens had also a type, and this type had been chosen from among the moderns.

It is undoubtedly owing to the want of care taken in studying the shades of the moral and physical qualities of man among different people and in different ages, that the greater number of works of imagination have been so monotonous and lifeless. The necessity of studying nature and truth has indeed been felt; but the fact has not been sufficiently attended to, I think, that nature is not invariable. The ancients have represented the physical and moral man with infinite art, such as he then was; and the greater number of the moderns, struck with the perfection of their works, have thought they had nothing to do but servilely to imitate them; they have not understood that the type has been changed; and that, when imitating them for the perfection of art, they had another nature to study. Hence the universal cry, "Who shall deliver us from the Greeks and Romans?" Hence the violent dispute between the classics and romanticists; hence, lastly, the necessity of having a literature which was truly the *expression of society.* This great revolution was accomplished, and furnishes the most irrefragable proof of the variability of the human type, or of the average man, in different men and in different ages.

As for ancient subjects, the artist or the poet who wished to reproduce them might constrain us to admire his art; but we should always feel that he placed a nature before our eyes, which, so to speak, was dead —a type which is extinct. We must undoubtedly make concessions to the fine arts, and give ourselves to their illusions; but we must not let the sacrifices demanded exceed certain limits. We cannot, for a moment, go back several centuries, forget our religion, social institutions, and habits, and feel sympathy for men not having our tastes, manners, or the same traits which we are accustomed to see around us. The ancients themselves never required such sacrifices on the part of the public; and such men as Euripides and Sophocles took good care not to introduce on the stage an Osiris, and the mysterious feasts of the Egyptians, who, nevertheless, had been their patterns.

A few ages are of little moment in the annals of the human race; and we cannot assure ourselves that man will not undergo any modifications—in form, for example—and that a type which once existed may not be completely lost some day. This supposition may appear extraordinary; yet we see that all the elements relating generally to man undergo changes; who, therefore, can assure himself that the type of the Grecian figure shall not be lost, either in the flight of time, or in some great catastrophe involving the destruction of the Caucasian race? Such overthrows are in the nature of possible things. The consequences of such an event might be, that another race—the Mongolian, for instance—which, after much difficulty, might people the earth, and find the remains of the fine arts, would only see in all these fine Grecian figures, which we are accustomed to admire, things entirely artificial and conventional, such as the Egyptian forms appear at present to us. They might admire these antiques as specimens of art; but I doubt if they would prefer the ancient form to their own, if they had to represent their divinity in a human shape. What has just been said, will no doubt be rejected by those who have pre-established ideas regarding a fixed standard of beauty. I shall not discuss that question here; I only publish my views with diffidence, not seeking to impose them on any one.

I think I have sufficiently shown, in what has preceded, that the determination of the average man is not useless, even to the fine arts and literature; and that he who shall arrive at this determination, will have no difficulty in obtaining the attention of artists and men of literature. It would inform them more precisely of things which they now know but vaguely;

it would discover others to them of which they are ignorant, or at least clear their minds of a mass of prejudices. They would receive these notions as a painter learns perspective, which, in geometrical outline, is not very *pittoresque* either. Moreover, artists have received the researches of Gall and Lavater probably with greater eagerness than savants: indeed, it is to their care that painters are indebted in a great measure for the knowledge of the proportions of different parts of the human body, in each sex, at different ages. This knowledge was so important to them, that it was an object of study of the greatest painters at the revival of the arts: we may see, especially, what care the celebrated Albert Durer took in regard to it in his works.

At the same time, I admit that the artist and the literary man can, and even ought, to search out the prominent traits, exaggerate rather than diminish them, and contrast the most different physiognomies and characters; but the truth must always lie between the extremes which they present to our view, and these extremes themselves lie within *limits* defined by nature. Going beyond, we only create fantastic beings and monstrosities; these reveries of a disordered imagination may astonish, and even amuse, but they can never produce those deep sensations and lively emotions which we only feel for beings of our own caste.

To conclude the exposition of my views of the average man, I remark, that it will first be necessary to study, in the most complete manner, the development of his different faculties, and every thing which may influence their development, every other consideration being laid aside. The artist, the man of literature, and the savant, will afterwards choose from among these materials those which are best suited to the subject of their studies, as the painter borrows from optics the few principles bearing on his art.

2. Of the Average Man considered in reference to the Natural and Medical Sciences.

It will not be necessary to insist forcibly, to natural philosophers, on the importance of the investigation of the different laws of the development of man; indeed, without the knowledge of these laws, the science of man cannot be complete or philosophic. I think the utility of the methods of determining them, which I propose, needs not to be explained to them again; several of these have been familiar to them for a long time, and others form a part of their usual modes of proceeding in fathoming the secrets of nature.

In the eyes of the naturalist, the average man is only the type of a people; numerous observations have shown that this type is not unique, and consequently that there are different races of men. But the characters on which these distinctions are established have not been sufficiently defined; indeed, how can we study the modifications which the elements relative to man, as well as their laws of development, undergo in the different races, when we have not settled the point of commencement?

Hence, also, proceeds the difficulty of surmounting the greater number of the most interesting and philosophical questions of natural history. It is frequently asked if the human species has deteriorated, or if it is capable of deteriorating at any time; but this problem, for want of the elements for its solution, remains without a satisfactory answer.

It is also asked if there is a type or standard of the beautiful for the human species, which is proportionate to the development of intelligence. Comparative anatomy has been thought to find an affirmative solution of this question, in the magnitude of the brain and the size of the facial angle, which, according to the delicate researches which have been made, diminishes in proportion to the lowering of intelligence in men and animals; and it has been inferred from this, that the maximum of intelligence will be found in the species which have the facial angle most nearly approaching to a right angle; which would give the pre-eminence to the Caucasian. I do not know if any observations have been made on a somewhat larger scale, having in view the measurement of the degrees of size of the facial angle at different ages, in order to determine if these are at all proportionate to the degrees of the development of intelligence.

Naturalists are also occupied in determining carefully what are the *limits* of the extent of the different elements belonging to man; these *limit values* have always been objects of attention, and ought to be carefully registered in the natural history of man, so that we might know, not only what is, but also what is possible.

The anatomical researches of Gall on the brain tend to show that the development of its different parts is proportionate to the development of certain corresponding faculties, which appear to have their seat there. Without entering into an examination of the doctrine of this learned physiologist, one must regret that his principles have not yet been submitted to more direct observations, and that it has not been examined whether the law of development of our faculties at different ages corresponds to the law of development of the presumed corresponding parts of the brain;* indeed, so far from knowing the relative proportions on these different points, it appears that, up to the present time, we have but very few data on the law of development of the brain itself, or upon its size and weight at different ages, either as regards average value or extreme limits.†

* Since the above was written, M. Broussais, to whom science is indebted for so many useful works, has read a memoir to the Academy of Moral and Political Sciences, on the influence of the physical on the moral, and, in particular, on the actual state of our knowledge on phrenology. M. Edwards has presented some considerations in support of this work, agreeing with it, also, in requiring scientific experiments on this new science. The principal conclusions of this learned physiologist are contained in the following note, for which I am indebted to his friendship:—

"The proofs on which we found our convictions are referred to two principal classes; the first includes proofs which may be called *individual*, and the second those which we shall call *scientific*.

In the first case, we cannot be convinced of the truth of certain relations without verifying them ourselves. Thus it is necessary that every individual who wants to form an opinion, must himself make the proof which others have done. In the second case, on the contrary, when we are considering a *scientific* proof, if it has been properly obtained, it is enough to receive the knowledge to be convinced of the truth. Thus we dispense with the necessity of personally making the proof again.

In general, the kind of proofs on which phrenology rests belong to the first class, or those here called *individual*; because it is always necessary that each *individual* who wishes to know what to maintain should repeat the proof.

This is the condition in which phrenology stands. It is evident that, if the relations pointed out are generally true, any one who has sufficient knowledge may convince himself by a sufficient number of observations; but he could not transmit to another his conviction, unless one could know the extent and measure of his experience.

Now, if that could be expressed in a determinate manner, the proof would be no longer individual but scientific; and not only he who had acquired could communicate his conviction, but the latter would also be able to impress it on others; for it is the peculiarity of scientific proof that it forces general conviction on those who can understand it. Other persons are obliged to admit on hearsay, that is, on the authority of the first class. Now, phrenology, if true, is really capable of scientific proof.

It is by forming a sort of statistics, the plan of which might be readily designed, that the scientific proof of this doctrine is practicable. It is greatly to be desired that phrenologists would do this."

† M. Guerry wrote to me in 1831—"I am now occupied, along with M. le Docteur Esquirol and M. le Docteur Leuret, with the statistics of insanity. We measure the head, in every direction, of every person at Charenton, the Bicêtre, and the Salpêtrière. We

We ought also to state with more care than has yet been done, the capacity of our organs, and the limits they can attain.

If the average man were completely determined, we might, as I have already observed, consider him as the type of perfection; and every thing differing from his proportions or condition, would constitute deformity and disease; every thing found dissimilar, not only as regarded proportion and form, but as exceeding the observed limits, would constitute a monstrosity.

The consideration of the average man is so important in medical science, that it is almost impossible to judge of the state of an individual without comparing it to that of another imagined person, regarded as being in a normal condition, and who is intrinsically no other than the individual we are considering. A physician is called to a sick person, and, having examined him, finds his pulse too quick, and his respiration immoderately frequent, &c. It is very evident, that to form such a decision, we must be aware that the characters observed not only differ from those of an average man, or one in a normal state, but that they even exceed the limits of safety. Every physician, in forming such calculations, refers to the existing documents on the science, or to his own experience; which is only a similar estimate to that which we wish to make on a greater scale and with more accuracy.

Moreover, the data which the average man presents, can themselves only serve to furnish others more important, and which relate to the individual observed. To explain my idea, I shall suppose that every man has the knowledge and prudence necessary to examine himself carefully, and to determine all the elements which compose him, and the limits within which they may vary, in a state of health: he will form a table differing more or less from that of the average man, and which will assist him in recognising whatever is more or less anomalous in his own case, and whatever imperiously demands attention. It would be this table which the physician should consult in the case of illness, in order to estimate the extent of the divergences from the normal state, and what are the organs more especially affected. But as, in the greater number of cases, the sick person can make no satisfactory observations on his own person, nor any elements which are peculiar to him, the physician is obliged to have recourse to the common standard, and compare his patient with the average man; a course which, in fact, seems to present less difficulty and inconvenience, but may also cause serious mistakes in some circumstances. For here, again, we must observe that general laws referring to masses are essentially imperfect when applied to individuals; but we do not mean to say that they can never be consulted with advantage, or that the divergences are always considerable.

A prudent man, who studies and observes his constitution, may prevent many diseases, and scarcely needs to have recourse to professional men, except in severe and extraordinary cases. His habit of observing himself, and the knowledge which he has thus obtained, form, in some measure, a kind of table giving him the elements of his constitution. In general, we only call in the physician when indisposed: I think it would be useful were he also to see us when in a state of health, so that he might obtain a better knowledge of our normal state, and procure elements of comparison necessary for cases of anomaly and indisposition. It is very evident that a physician, called to a patient whom he sees for the first time, and of whose constitution he is absolutely ignorant, will, in certain circumstances, commit errors by submitting him to the common rule.

I shall not pursue these remarks, the truth of which, I venture to think, will be appreciated. The constitution of the average man serves as a type to our kind. Every race has its peculiar constitution, which differs from this more or less, and which is determined by the influence of climate, and the habits which characterise the average man of that peculiar country. Every individual, again, has his particular constitution, which depends also on his organisation and his mode of existence. It is consequently interesting to know each of the elements which concern us individually, and we have a general interest in knowing each of the elements which bear on the average man, who is the type to which we should incessantly have recourse.

3. Of the Average Man considered with respect to Philosophy and Morals (*la Morale*).

Human nature (*humanité*) is modified by necessities of time and place. The development of the different faculties of the average man ought to be closely proportionate to these necessities: this is a condition essential to his existence and continuance. If the average man, at different epochs, had been determined carefully, we might at this day perceive what laws of development have undergone the greatest change: we should possess the most valuable means of analysis; and we should also learn what have been the qualities which have successively predominated and exercised the greatest influence on our social system.

The laws of development of the average man, at such or such a period, must not be confounded with the laws of the development of human nature* (*humanité*). There is but little general conformity betwixt them: thus, I should be much disposed to believe that the laws of development of the average man continue almost the same through successive centuries, and that they only vary in the magnitude of maxima. Now, it is really these maxima, relating to the developed man, which give the measure of the development of human nature in each century. We do not possess any exact documents to guide us in such a research, but it would appear that, physically considered, collective man is scarcely progressing; yet it has been observed that a civilised man is generally stronger than a savage. As to intelligence, his progress cannot be questioned, and his existing state of develop-

also measure the cerebrum and cerebellum of those who die. I have thus been led to undertake the *Histoire du Developpement de la Tete Humaine Moyenne.* I have been led to it entirely from having read your excellent Memoir on the Stature of Man. Fifteen days ago, we noted the state of the pulse of ninety maniacal persons, between five and seven o'clock in the morning, and whilst they were at breakfast. We already have found certain periodic returns in the number of the pulsations; these observations will be continued to the end of the month.

I hope to be able to measure the angles of the head very exactly, so as to obtain the proportions and form of an average maniacal head, of one hallucinated, of an idiotic, imbecile, and epileptic one, &c."—(Notes on my *Recherches sur le Penchant*, &c.) It is to be regretted that this announced work has not yet appeared.

At the end, however, of the work, *De la Frequence du Pouls chez les Alienés*, MM. Leuret and Mitivié give the result of their researches on the specific weight of the brain of the insane, which prove that there is no marked difference in this respect between insane and healthy persons. The specific weight has an average value, represented by 1·031, water at 15° of temperature being considered as unity.

* To render my idea sensible by a figure (see *plate* 4), I suppose that we construct the line indicating the development of the strength of man at any given period; and that on the same axis of the abscissæ we also construct the corresponding similar lines for other periods, so that these lines succeed each other at the distance of a century, for example, proceeding from points whose distance from each other increase as the time; it will happen that the maxima of the ordinates will not correspond to the same ages or have the same magnitude. Now, connecting all the points of maxima by a line, which will evidently be the container (*l'enveloppe*) of all the curves representing the law of individual development in all the modifications which it has undergone in the course of time, we shall have the curve which represents the general law of the development of human nature (*humanité*). By similar processes, we may render equally apparent all the laws of development of the different faculties of the human species.

ment undoubtedly exceeds what it has been at any other time. Also following, with history in our hands, the average type of human nature through different centuries, we see man, at first, in possession of all his strength, blindly taking advantage of it, and attaching to the world of matter a power and a range altogether limitless: the king of nature, he has plants, animals, and even the stars, as tributaries. But, as his reason becomes developed, a new world is unrolled before his eyes, contracting the limits of the former one; the intellectual man gradually supplants the physical one; and it is this continually increasing triumph of the intellectual man, which the history of the arts and sciences presents to us at every page.

I have said that, although the laws of the development of human nature were not generally the same as those of the average man of any one period, yet these laws might, in certain circumstances, be identically the same; and that human nature, under certain relations, might be developed in a manner similar to a single individual. I should be much disposed to believe that this is the case with the collective human mind; indeed, following it in its uncertain and irregular course, we see it endeavour to strengthen itself from the very beginning, reach in due time the highest conceptions, and present almost the same phases as the intellect of the individual man from infancy to maturity. The human mind is at first astonished at the sight of any thing beyond the ordinary course of things, and attributes the most simple occurrences to the caprice of supernatural beings, instead of deducing them from immutable laws, which are alone worthy of a divine intervention. We see it afterwards pursuing a course which is more certain and conformable to reason, observing facts, isolated at first, then classing them, and inferring the consequences. Still later, the mind learns to interrogate nature by experiment, and to reproduce transitory phenomena at will, under the most favourable circumstances for observing them. And when its reasoning powers have reached full maturity, then it studies the nature of causes, seeks to value their reciprocal intensities, and thus raise itself to a knowledge of the attendant phenomena which they must produce. Such is the development which we see the human mind undergoing when we study its progress in the history of the sciences; such, also, is the course which the intellect of man pursues from infancy to maturity.

I have said before, that the average man of any one period represents the type of development of human nature for that period; I have also said that the average man was always such as was conformable to and necessitated by time and place; that his qualities were developed in due proportion, in perfect harmony, alike removed from excess or defect of every kind, so that, in the circumstances in which he is found, he should be considered as the type of all which is beautiful—of all which is good.

If human nature were stationary and not susceptible of amelioration, it is evident that the average man would also continue invariable; and his different qualities, instead of presenting the type of the beautiful and excellent of the period at which he lives, would present the type of the absolutely beautiful and excellent in the most general sense. Thus, when we say that the type of the beautiful, as to the form of man, is absolute, we mean that the average man ought not to differ from this proportion, and that human nature cannot advance further. It is not so with reason: the vast conquests of science, by giving more accurate notions of an infinite multitude of things, and by destroying errors and prejudices, have necessarily furnished our reason with the means of rising to a still greater height, and arriving at a relative degree of perfection, the idea of which could not so much as be conceived some ages ago.

Such should also be our criterion as to morals. Human qualities become virtues, when they are equally removed from all the excesses into which they may be disposed to fall, and confined within due limits, beyond which every thing is vice.* If these limits do not vary in the course of time and among different people, we have strong probabilities for believing that this virtue has an absolute value. Now, this is what we remark generally concerning most moral qualities: they admit a type which we may with great probability consider as absolute, so that human nature, considered in reference to these qualities, will not be progressive. Yet there are qualities the importance of which has varied in the course of time, and which has increased or diminished with the development of reason, on which they depend, at the same time that the physical has yielded preponderance to the intellectual man. Thus courage, which, in the earliest ages, raised a man to the first rank, and, in some manner, assigned to him a place near to divinity, has diminished in importance beside other qualities more in harmony with our manners and present actual necessities. The qualities of a contingent value, if I may so express myself, are in a measure subordinate to the law of development of human nature, and to the different principles of conservation; they generally produce more renown than the others, because men have a more direct influence in encouraging them.

The natural consequence of the ideas which I have just stated, is, that an individual who should comprise in himself (in his own person), at a given period, all the qualities of the average man, would at the same time represent all which is grand, beautiful, and excellent. But such an identity can scarcely be realised, and it is rarely granted to individual men to resemble this type of perfection, except in a greater or less number of points. M. Cousin, setting out from very different considerations to those which are the object of this work, has nevertheless been in some measure led to conclusions similar to those I have just deduced from the theory of the average man. Speaking of the character peculiar to great men, he finds that this character consists in comprising people, periods, all human nature, nature, and universal order.† "Thus," says this learned academician, "all the individuals of which a people is composed, represent the whole mind of this people. But how do they represent it? One people is one in mind; but this is a multitude in its external composition, that is to say, a great multiplicity. Now, what is the law of all multiplicity? It is, to have differences (*d'être diverse*), and, consequently, to be capable of more and less. Apart from absolute unity, every thing comes within the sphere of difference (and has degrees) of greater and of lesser. It is impossible but that, in a given multitude, such as a people, which, as has been shown, has a common type, there should be individuals who represent this type more or less. As there are those who represent it less clearly, more confusedly and imperfectly, so there are also those who represent it more clearly and perfectly, and less confusedly. Hence a line of demarcation between all the individuals of one and the same people. But those who are on the first plane, and represent the entire mind of their people more completely, are nevertheless a multitude, a great number, and are still subject to shades of difference: whence, again, a new selection of individuals who eminently represent the mind of their people. It is impossible for the case to be otherwise. From this we infer two things: first, the necessity of great men; second, their peculiar character (*caractère propre*). The great man is not an arbitrary creature, who may be or may not be. He is not simply one individual, but he has reference to a general idea, which communicates a superior power to him, at the same time that it gives him the determinate and real form of individuality. Too much and too little individuality equally destroy the great

* This is what the ancients thought generally, and in particular, Aristotle—Eth. ad Nic 2, ch. 2.

† Cours de Philosophie, leçon 10.

man. In the one case, the individuality in itself is an element of misery and littleness; for the particularity, the contingent, the finite, incessantly tend to division, to dissolution, to nothingness. On the other hand, every generality being connected to universality and to infinity, tends to unity, and absolute unity: it possesses greatness, but runs a chance of losing itself in chimerical abstraction. The great man is the harmonious union of particularity and generality: it is the possession of this character alone which makes him great—this added representation of the general mind of his people; and it is his relation to this generality which makes him great; and, at the same time, to represent this generality which confers his greatness on him, in person and in a real form, that is to say, in a finite, positive, visible, and determinate form; so that the generality does not encumber the particularity, and the particularity does not destroy generality; so that particularity and generality, infinite and finite, are united in this measure or standard, which is true human greatness.

This measure, which constitutes true greatness, also constitutes true beauty," &c.

The passage which has just been quoted, expresses my ideas better than I could have succeeded in doing myself. A man can have no real influence on masses—he cannot comprehend them and put them in action—except in proportion as he is infused with the spirit which animates them, and shares their passions, sentiments, and necessities, and finally sympathises completely with them. It is in this manner that he is a great man, a great poet, a great artist. It is because he is the best representative of his age, that he is proclaimed to be the greatest genius.

It is never sufficient for a man merely to resemble the average man in many things as much as possible, to enable him to produce great things himself; it is moreover necessary that he has occasion and possibilities for action. Newton, for example, deprived of all the resources of science, would always have had the same strength of intellect; he would always have been a type of several eminent qualities, and, in particular, of correctness of judgment and imagination; but if only a greater or smaller amount of science had been laid within his reach, he would have been Pythagoras, Archimedes, or Kepler; with all the resources which his period possessed, he has, and must have been a Newton. This appears to me incontestible: in the favourable position in which he found himself, it was a matter of necessity for him to put his eminent faculties in action, and to advance as far as circumstances permitted him. Now, the sciences had arrived at such a point, as to render it necessary that the theory of the motion of the celestial bodies should be reduced to correct principles; and Newton was then the only man who combined the necessary conditions to accomplish this work.

It appears to me that science only is truly progressive, and I use this word in its widest sense. All the faculties of man which are not based on science are essentially stationary, and their laws of development are constant. As to the other faculties, their laws of development, as has already been observed, probably remain the same also, or at least each only undergoes changes in the degree of its maximum, which depend on the development which science has attained. The development of science would therefore give the measure of the development of human nature.

Consequently, I participate in the following opinion of M. Cousin, that "entire history, not that of one people or one epoch only, but that of all epochs and all human nature, is represented by the great men. Thus, give me the series of all the known great men, and I will give you the known history of the human race."*

And, indeed, from what we have seen, the great man, in his individuality, is the best representative of the degree of development to which human nature has attained in his times, and his works show the extent in which he himself has aided that development.

We are more convinced of the necessity of great men, and the error we commit in supposing that they spring up accidentally, when we consider the immense time required for a great truth, after it has been shadowed forth, to diffuse itself, and descend to the mass of people, and produce its effects; in general, it is not until centuries after, that we see the man come forward who developes or personifies it and secures its triumph. Thus, the germ of the great revolution, which has marked the close of the last century, was brought forward long ago, and was slowly developed, descending from high intellects to the lower ranks of society; but its course had not escaped the sagacious observer. Great events are, like great men, necessitated; and how can we be surprised at this, when we have seen that even the actions of ordinary individuals are necessitated, and when we have seen that a given social organisation induces a certain number of virtues and crimes as a necessary consequence, and that these crimes are of such or such a kind, and are performed by such and such means? This necessity is found both in good and evil—in the production of good things as well as of evil—in the production of *chefs-d'œuvre* and noble actions which are an honour to a country, as well as in the appearances of scourges which desolate it.

4. Of the Average Man considered with reference to Politics.

Whatever may be the difference of opinion observed in the same people, there must exist, even in the most opposite minds, some common ideas, which in moments of excitement of the passions are unobserved, but which would soon show themselves spontaneously if any one attempted to do violence to them. There are also common necessities; and even between opinions which seem utterly opposed to each other, we sometimes find more relations than at first sight we should suppose.

It is evident that, of all the political systems which any people would incline to adopt, there must be one which would suit best with the ideas and ordinary requirements, and which would most advantageously reconcile the interests of different parties; it is also evident that such a system could not be established by unanimous consent, since, even supposing that it is meditated upon most rationally and calmly, it must necessarily jar against certain passions, and meet opinions which are unfavourable to it. This system must not be confounded with that which would consist in taking a sort of average between two dominant ideas, and which must always be essentially defective in principle, since it is always impossible to conciliate minds, by placing between their opposed opinions another opinion which they equally repel. On the contrary, that which we have in view is based on elements common to all, and on ideas, which, though differed from by some, are still those of the majority.

It will perhaps be objected that, if the generality of men desired unjust or absurd things, it would be unreasonable to apply a political system to them equally unjust or absurd. I begin by declaring, that I do not think such a desire can exist in the generality of men; and, that, in the second place, if this wish could exist, it would even be necessary to gratify it, from the fear of being compelled to do so by some violent crisis.* This naturally leads me to considerations more or less connected with my subject, and which appertain to my mode of viewing the social system.

* *Cours de Philosophie*—Introduction à l'Histoire de la Philosophie, leçon 10.

* See, on the same subject, the work of Sir T. C. Morgan, *Sketches of the Philosophy of Morals*, p. 244. 1 vol. 8vo. London: 1812. We find some very judicious observations in it, and which are deserving of more attention.

Revolutions, even those which have the most happy effects on the future, are never accomplished without certain actual sacrifices; as sudden changes, in a corporeal system, never take place without a certain loss of vital power. Independently of the real losses which bring no advantage to any body, changes of fortune, more or less manifest, take place; and it is in this case almost the same as in gaming, where the moral chances are not the same, that is to say, what is lost on the one side is not compensated by what is gained on the other. The great art of those who conduct revolutions should especially consist in making the transition with the least possible degree of violent change; and in this respect governments themselves are in the position best calculated to effect reforms. As for myself, I think that *the measure of the state of civilisation at which a nation has arrived is found in the mode in which its revolutions are effected.* This principle presupposes another, which is always true where states of equilibrium and motion are possible, in physical phenomena as well as in political facts; it is this—*the action is equal to the reaction.*

This wants some explanation: it will perhaps be asked, how I understand the application of this principle to morals and politics. An example taken from the material world will render this more manifest. When a force acts against a flexible body which yields and bends, each particle of this body successively leaves its primitive position and takes a new one; with respect to the compressing force, it is extinguished by successive and partial reactions, so that the action may be very energetic, without producing any apparent reaction; the only effect produced is a change in the flexible body, which is more or less sensible. If, on the contrary, the power acts against an elastic body, each particle of this body momentarily leaves its primitive state, but with a tendency to return to it immediately; the reaction is then general and instantaneous, it is also very evidently equal to the action. These examples are applicable to a social body. If each one is fully imbued with a knowledge of his rights and duties—if he invariably desires to do that which is just—if he energetically strives to re-enter the course he has traced out as soon as any one attempts to make him swerve from it—and if the reaction be allowed to manifest itself immediately after the action, both will be very *evidently* equal. But this state of irritability, so to say, presents itself with very different degrees of energy in different people, and we may say that the reaction, in its visible results, is generally less than the action.*

Revolutions are only *reactions* exercised by the people, or a part of the people, to correct abuses, real or supposed. They cannot be of a serious character if the apparent provocation has not been so also. Now, among an enlightened people, where the government is necessarily supposed to be wise and far-sighted, abuses cannot accumulate to such a degree as to take an alarming aspect; the more they are seen to increase, the more would the government be accused of want of foresight or evil, and the people who tolerate them of baseness and apathy; possessed of a feeling of their own dignity, they would have reacted against each of the abuses in proportion as they were manifested. When the degree of irritability is less, they yield to abuses, or only react when the number of them has become too great to be endured any longer. The explosion is then the more terrible, because the power has been accumulating. Now, it is this extent or degree of accumulation which gives us, as I said previously, the measure of the state of civilisation of a people.

Frequently the reaction is manifested with symptoms apparently more serious than the action; but this is owing to the real reaction being conjoined with irrelevant causes. Thus in revolutions, amongst those who react under the influence of real abuses which are deeply felt, we almost always find turbulent men mixed with them, who delight themselves with the disorder, or are actuated by interested views. Such a state of things renders the position of a government very critical, and requires so much the more circumspection, in proportion as there is less good faith in the parties who oppose it. Enlightened and conscientious men, who have thoroughly acquainted themselves with causes—and their number is always very small—will certainly support the government by their authority; but, in the midst of a general conflict, such auxiliaries are in general of little use, because they rarely act in person, and only on very serious occasions; they confine themselves to the development of the moral causes, which have always a very remote bearing on action, so that the effects which they produce do not manifest themselves until towards the end of revolutions, and only lead to an ultimate appreciation of morality, and to an insensible return to a state of equilibrium. This was manifested in the first French revolution, when abuses of every kind had accumulated to a deplorable extent, and the reaction was perhaps still more deplorable. The succeeding revolutions have been less serious, because more enlightened and provident governments took greater pains to prevent the causes of reaction, and make them disappear as soon as they assumed an alarming character. In this respect, England is placed in a very happy position; her reforms are accomplished successively and without sudden changes, and yet we cannot look without fear on reactions which may arise in consequence of the inequality of fortunes, and the state of the finances of this kingdom.

Despotism requires to be very powerful, and very able to depend upon its resources, to maintain itself where the people are irritable and prompt to react; it cannot long endure, whatever may be its power, in countries such as ours, where action, when at all serious, is spread with the greatest rapidity. In this respect, the liberty of the press has been of essential service—a service which perhaps has not been duly appreciated—namely, in having singularly contributed to facilitate reaction, and consequently to render great revolutions almost impossible; it possesses this immense advantage, that it does not allow force to accumulate to an alarming degree, causing reaction to manifest itself almost immediately after action, and sometimes even before action has had time to propagate itself. This has been observed during the late revolution in France, which was purely local, and the effects of which were confined within the walls of Paris. Among a people easily acted upon, and where action is readily transmitted, the greatest revolutions take place in parts, and reaction is extinguished by successive efforts, or at least overturns the cause which gave rise to it, without a violent shock.

Governments, like things, have also their states of equilibrium; and this equilibrium may be stable or unstable. This is an important distinction, and one easily understood. The stable equilibrium exists, when, in consequence of action and reaction of every kind, a government constantly regains its normal state; if, on the contrary, under the action of slight causes, a government tends to diverge more and more from its normal state, and if, each year, it change its form and institutions without adequate motives, its downfall is at hand, and it will infallibly sink, unless

* It is remarkable that the principle of the equality of action and reaction is also applicable to morals. Without being entirely destitute of sentiment, we cannot, in fact, withdraw ourselves from the consequences of this principle. The calmest and most moderate man, having made the firmest resolution not to depart from his habitual condition, will forget all his intentions on beholding a feeble person unjustly and brutally oppressed by a stronger one. In proportion to his degree of sensibility, so will he react with greater or less energy according as the offending person commits excesses. However, in similar circumstances he would have protected the aggressing party against the oppressed, if both had changed their relative positions.

it finds assistance in the adjacent governments; but even then its fall cannot be long retarded. Examples are not wanting to support the distinction I have just made.

I have said above that civilisation tends to render the shocks which political revolutions cause in the social system both less violent and less frequent; I ought to add, that it also tends to make wars between nations less frequent. We no longer have the idea that these scourges are necessary things, from which we can never extricate ourselves, but regard them as an evil inevitable, in the absence of those laws which ought to regulate the rights of nations, and of sufficient power to secure the execution of them. In the beginning of communities, the strongest threw himself on the weakest, to wrest from him privileges and wreak vengeance; we find them renewing incessantly the most unjust and bloody contentions, until the time when equitable laws finally regulated the rights of every one, and put a period to such violences. Alas! this deplorable state of early times is still our own, if we look to nations instead of individuals. Indeed, without going far back, have we not seen nations cast themselves on nations, and tear each other for the most frivolous reasons?—the feeble or the least active fell in these cruel struggles, and the injury is still so recent, that we are yet scarcely aware of the extent of it. Far am I from wishing to cast odium on the warrior who exposes himself in defence of his country. His noble zeal deserves all our admiration, and has supplied the place of those protecting laws which ought to have defended him and his. But whilst groaning under a necessary evil, human nature should show the path of justice, in which it ought henceforth to go. Let us allow the same rights to nations which we grant to individuals—let there be laws for one as for the other—and let there be some power great enough and sufficiently enlightened to execute them. We have lately seen a judgment given by neutral nations in the case of a recent difference between two others which had arms in their hands. This judgment has been carried into execution; notification, citation, bodily restraint, none of the ordinary forms of justice, have been neglected. This event, which has not been sufficiently observed, and which has probably saved Europe from another struggle, indeed presents itself under appearances which are not very poetic to our imaginations, still warmed by the recitation of great deeds of arms, but it is not the less a real progress in the career of civilisation.

CHAPTER II.

ON THE ULTIMATE PROGRESS OF OUR KNOWLEDGE OF THE LAWS OF HUMAN DEVELOPMENT.

In this work I have only been able to present an incomplete sketch of the vast labour which still remains to be done; but the difficulties were too numerous, and the materials which I had to work up too defective, for me to venture any farther into a territory almost entirely new. This study, however, has too many attractions—it is connected on too many sides with every branch of science, and all the most interesting questions in philosophy—to be long without zealous observers, who will endeavour to carry it farther and farther, and bring it more and more to the appearance of a science. At the same time, it will be very difficult to proceed on a safe course, before more information and more exact observations than we now possess, have been collected. The solidity of the edifice must depend on the soundness of the material.

In researches of this nature, it will be necessary always to produce original documents with caution, point out their sources, and give all the data which may lead us to appreciate their value. These documents ought to be of such a nature, that we can rigorously deduce the averages and limits between which the particular values lie. I have myself been more than once obliged to deviate from the course which I wish to see pursued by others, because, in order to render my ideas plain, I have been obliged to take the assistance of examples.

It will be equally desirable, whenever numbers are used, and results deduced from them, that we calculate the probable degree of error carefully. It is not enough to possess materials; it is also necessary to know the full value of them. One of the greatest defects of actual statistics is, that in the same line they present all the numbers indistinctly which can be collected, and make them concur to one result, without taking their importance or probable value into account. This confusion must necessarily produce great obstacles to the progress of science, and cause dangerous errors to prevail for a long time.

There is another research which deserves no less attention. It is not sufficient to perceive that an effect depends on several causes; it is extremely important that we be able to assign the proper degree of influence of each of these causes: in bringing this work to a conclusion, I shall now employ myself in demonstrating the possibility of finding a suitable measure for such an appreciation.

In the first place, it is necessary to admit, as a principle, that where variable causes do not exist, the effects produced will constantly be the same; and that the more variable the causes are, the effects will also generally vary within wide limits. Thus, supposing that human volition acts independently of all fixed laws, and in the most varied and irregular manner, we must necessarily find the effects produced presenting the greatest anomalies also, and differences varying within the widest limits. Now, it is these differences which it is desirable to examine and *measure*.

To define our ideas, let it be supposed that we want to examine if any general causes exist which modify the repression of crime; in other words, which modify the severity with which the guilty are punished. We must necessarily have recourse to observations which have been very carefully collected; and, if the annual results are not constantly the same, we shall be obliged to admit that the variations proceed either from errors of observation, from the influence of local causes, or from the influence of moral causes inherent in man. Going deeply into these researches, we really find that these elements vary according to time and place. Now, since the number of probable influential causes may be extremely great, it is proper to investigate them individually: it is in this manner that we are (at) first enabled to separate from our results the influential causes depending on locality, all our observations being taken in the same country; and that we may also eliminate the influential causes depending on periodicity of season, by carrying our researches over the whole year, whence we return to the appreciation of all the influential causes, taken separately.

Uniting the statistical documents of the courts of assize in France for the six years before 1831, we find:—

Years.	Accused.	Condemned.	Repression.
1825, - -	7,234	4594	0·635
1826, - - -	6,988	4348	0·622
1827, - -	6,929	4236	0·610
1828, - - -	7,396	4551	0·615
1829, - -	7,373	4475	0·607
1830, - - -	6,962	4130	0·593
Average, -	7,147	4389	0·6137

This table shows us that the repression of crimes

in general, has been annually decreasing, certainly not very much, but yet manifestly. Now, of the causes influencing repression, some act in a constant and others in a variable manner. By virtue of the former, the number 0·6137, which expresses the repression of crimes in general, should have a constant value from one year to another; by virtue of the action of the variable causes, the same number would undergo greater or less modifications. I shall first be occupied with the measurement of the influence of the constant causes.

To give a better conception of my idea, I suppose an individual labouring under an accusation; as we have just seen, the chance of being condemned will be as 614 to 1000; this probability should be understood in the most general sense, admitting that as yet we know nothing of the nature of the crime, the age, or the sex, of the accused, or of the state of education, or any of the constant causes modifying the repression of crime. But if we learn the fact, that the accusation is for a crime against persons, the probability of being condemned is altered; indeed, experience proves that the repression of crimes against persons is less than that of crimes against property. In France, the average values have been from 0·477 to 0·665, for the six years previous to 1831. Thus the chances are only 477 in 1000 that the individual will be condemned when accused of crime against persons; 655, when the crime is one against property. The principal cause of this inequality appears to be, as has been frequently remarked, that we are averse to apply punishment when it has a certain degree of severity, or appears severe in proportion to the crime; this is especially the case with crimes against persons.*

The sex of the accused has, moreover, a marked influence over the repression of crime: the severity is not so great towards females. All these shades will be more evident on inspecting the following table, which points out the different degrees of probability which exist of an accused person being condemned, according as the causes are favourable or the contrary:—

State of the Accused Person.	Probability of being Condemned.
Possessing a superior education,	0·400
Condemned who has pleaded guilty,	0·476
Accused of crime against person,	0·477
Being able to read and write well,	0·543
Being a female,	0·576
Being more than 30 years old,	0·586
Being able to read and write imperfectly,	0·600
Without any designation,	0·614
Being a male,	0·622
Not being able to read or write,	0·627
Being under 30 years of age,	0·639
Accused of crime against property,	0·655
Condemned in absence, or for non-appearance (*contumax*),	0·960

Experience, therefore, proves that the most influential cause diminishing the repression of crime consists in the appearance of the criminal before the judge with the advantage of a superior education, which supposes a certain degree of affluence, and the ready means of making a defence. The most advantageous position an accused person can possibly be in, is to be more than 30 years of age, a female, to have received a superior education, to appear under an accusation of a crime against person, and to come when cited, previously to being taken into custody; on the contrary, the most disadvantageous state is to be under 30 years of age, unable to read or write, to be a man, and accused of crime against property, and not to be able, as refusing to appear when cited, to produce the means of defence.

The causes which modify the probability of being condemned, according to the state of the accused person, appear to me so evident, as to render it superfluous to insist on them. Such is not the case with the degree of influence of these causes; this estimation is attended with difficulties. Reflecting upon it, it has appeared to me that, of all the numerical elements subject to variation, we might very easily *estimate the importance of the deviations from the average, or the importance of the causes which produce them, by comparing these deviations with the magnitude of the average.* It is almost in this manner that the first geometricians who studied the theory of probabilities as applied to facts bearing upon man (and Buffon, in particular), have estimated the importance of a whole, for one individual, by comparing it with what this individual possessed.

According to this estimation, it will be necessary to take the deviations from each of the ratios calculated above, and compare these with the number 0·614, the measure of the repression in France, when we do not pay attention to any modifying cause; the respective magnitude of the deviations will give this measure of their importance, and consequently that of the causes which produce them, effects being considered as proportional to their causes. Let us suppose, for example, that we seek to ascertain the value of the respective influences which are exercised on the repression of crime in France, by possessing the advantage of a superior education, and being a female; we find the values of the repression are 0·400 and 0·576, and the differences between these numbers and the general average, 0·614, are 0·214 and 0·038. From what has been said, the importance of these differences, or of the causes which produce them, will be $\frac{214}{614}$ and $\frac{38}{614}$, or otherwise, 0·348 and 0·062. From this we perceive that a superior education has five times the influence which being a woman has, in diminishing the repression of crime before the tribunals. The following table presents the degrees of influence of the different causes modifying the repression of crime, and has been calculated upon the same bases:—

State of the Accused.	Relative degree of the influence of the state of the Accused on the Repression of Crime.
Possessing a superior education,	0·348
Appeared to plead after having been declared absent or contumacious,	0·224
Accused of crime against persons,	0·223
Being able to read and write well,	0·115
Being a female,	0·062
Being more than 30 years of age,	0·045
Being able to read and write imperfectly,	0·023
Without any designation,	0·000
Being a man,	0·013
Being unable to read or write,	0·022
Being under 30 years of age,	0·025
Accused of crime against property,	0·067
Having withdrawn from justice, or for non-appearance when cited (*contumax*),	0·363

Thus, as I have already observed, there is not any cause which has more influence in varying the repression of crime, than the reluctance or non-appearance of the accused to answer charges. The preceding table does not merely possess the advantage of showing this clearly, but also shows the degree of influence of the cause producing it.

And here there is a question of another kind, viz., how far those causes may be regarded as constant which have now been pointed out. For, before one can say that they are absolutely constant, it must be shown that the results which they produce continue the same from year to year. Now, this is what does

* [Here, as in other places, M. Quetelet gives his important sanction to the principle upon which the amenders of the criminal laws of England chiefly found their arguments for reform. The severity of the punishment leads to the escape of the criminal.]

not take place: the deviations from the average, which we have taken as constant quantities, annually undergo slight modifications, which we have attributed to *variable* causes: these modifications are in general very small, when we only take a small number of years into account; but still it is necessary to notice them. The repression of crime in general, for example, has not been constantly of the value 0·614 during the six years which have furnished the elements of our calculations; small annual differences have been observed, and the repression, in its greatest deviations from the average, more and less, has been 0·635 and 0·593; the deviations are consequently 0·021 and 0·021; and consequently their ordinary value is $\frac{21}{64}$, or 0·034. Thus the variable causes which have produced alterations of the degree of repression, have had, in their maximum and minimum of energy, influences which have equalled or even surpassed the influences of some causes which we have been considering as constant. To have a juster idea of the variable causes, it will be proper to examine the effects which they have annually produced on each of the elements considered above. The following tables will supply us with data on this subject:—

Years.	Repression of Crimes		Repression.	
	against Persons.	against Property.	Men.	Women.
1825, - -	0·46	0·66	..	..
1826, - -	0·51	0·67	0·63	0·69
1827, - -	0·50	0·65	0·62	0·60
1828, - -	0·47	0·66	0·63	0·57
1829, - -	0·46	0·65	0·62	0·57
1830, - -	0·46	0·64	0·61	0·54
Average, -	0·477	0·655	0·722	0·576

Years.	Repression in Individuals		Repression.	
	under 30 Years.	above 30 Years.	Not Appearing.	Appeared to stand Trial.
1826, - -	0·64	0·69	0·93	0·49
1827, - -	0·64	0·58	0·97	0·45
1828, - -	0·64	0·53	0·97	0·46
1829, - -	0·62	0·59	0·97	0·50
1830, - -	0·61	0·58	0·96	0·48
Average, -	0·63	0·586	0·96	0·479

Years.	Repression in Individuals			
	unable to Read or Write.	able to Read and Write imperfectly.	able to Read and Write well.	who had a Superior Education.
1828, - -	0·63	0·62	0·56	0·35
1829, - -	0·63	0·60	0·55	0·48
1830, - -	0·62	0·58	0·52	0·37
Average, -	0·627	0·60	0·543	0·40

These different tables teach us that the greatest variations which any of the constant causes modifying the repression of crime have undergone, have scarcely exceeded the value of the intensity even of these causes: or, in other terms, that in the very circumstances most unfavourable to observation, the effects of constant causes have been but little effaced by the effects of variable and accidental causes. We shall be enabled to judge better on this point by the following table, which discriminates for us the importance of the greatest deviations which the causes modifying repression have presented in each of the cases above enumerated:—

Causes which Modify Repression.	Difference from the Average.	
	Less.	Greater.
The accused has a superior education, - -	0·209	0·125
.. .. appears to answer charge, -	0·059	0·056
.. .. is prosecuted for crime against person, - - - -	0·069	0·035
.. .. is able to read and write well,	0·031	0·042
.. .. is a female, - - - - -	0·042	0·062
.. .. is upwards of 30 years of age,	0·024	0·027
.. .. is able to read and write imperfectly, - - - - -	0·033	0·033
.. .. *is without any designation*, -	0·034	0·034
.. .. is a male, - - - - -	0·013	0·019
.. .. is unable to read or write, -	0·005	0·011
.. .. is under 30 years of age, -	0·016	0·032
.. .. is prosecuted for crime against property, - - - -	0·039	0·018
.. .. does not appear when cited, -	0·010	0·031

I have always reasoned on the hypothesis that our results were founded on so great a number of observations, that nothing fortuitous could affect the value of the averages: but this is not the case here. Some results are deduced from observations which are yet small in number, and we know that, all things being equal, *the precision of results increases as the square root of the number of observations.* This is especially applicable to any thing concerning the repression (punishment) of the accused persons who have received a superior education. The values obtained are deduced from a small number of observations, and the deviations from the average of them have consequently been greater: now, by employing the method of the smallest squares, I have found that the accuracy of the numbers 0·400 and 0·6137, previously obtained for repression in general, and for repression exercised in particular against the accused who have received a superior education, is in the ratio of 0·0870 to 0·0075, or as 11 to 1.

In separating, pursuant to the preceding observations, what is purely fortuitous in the deviations from the averages, so that we may only consider the causes which have had a greater or lesser regularity of influence on the repression of crime, I think that we may pretty nearly represent their influence by 0·034. These deviations are such that it is easy to perceive that the repression of crime has gradually diminished. Now, this progressive diminution must have its causes; and one of them, undoubtedly the most influential, is pointed out in the *Compte Général de l'Administration de la Justice Criminelle en France pendant l'Année* 1830:—"Six years have passed away since the *Comptes Généraux* of the administration of criminal justice have been published. During the former half of this period (1825, 1826, and 1827), the lists of the jury were formed according to the rules laid down in the code of criminal instruction (*instruction criminelle*); during the second half (1828, 1829, and 1830), these lists have been made according to the law of the 2d of May 1827, which has changed the basis of juries, and called a greater number of citizens to fulfil its duties. By taking the totality of the results of the accusations during the entire period of six years, as well as during each part of it, and by comparing these different results, we find that the only difference betwixt juries formed according to the code of criminal advice, and those which the legislature has subsequently made, is this, that the latter class appear to have a slight tendency to look upon accusations less severely. The proof of this assertion is found in the following table:—

Years.	Totality of Accusations.		
	Acquitted.	Condemned to Punishments.	
		Ignominious.	Correctional.
1825, 1826, 1827, 1828, 1829, and 1830,	0·39	0·38	0·23
1825, 1826, and 1827,	0·38	0·41	0·21
1828, 1829, and 1830,	0·39	0·36	0·26

In a few years we shall be enabled to compare these conclusions with those resulting from the declarations of the present juries, whose constituent elements have been further enlarged by the reduction of the electoral franchise, and who at present only pronounce condemnation with a majority of seven voices."

Thus the preceding table shows us that not only the number of acquittals has diminished, but even the punishments awarded have been less severe: there have been fewer ignominious and more correctional ones.

This observation on the tendency to value accusations more leniently, presents itself with a still greater degree of probability when we examine the nature of the crimes in detail: it is there, especially, that we can see if they have recoiled more readily from the application of punishments, on account of their severity. We find, in effect, that condemnations to death have diminished very manifestly. The same observations recur when we make the distinction between crimes against persons and property; a proof of which, also, is found in the following table:—

Years.	Accused of Crimes against Persons.			Accused of Crimes against Property.		
	Acquitted.	Condemned to Punishment.		Acquitted.	Condemned to Punishment.	
		Ignominious.	Correctional.		Ignominious.	Correctional.
1825, 26, 27, 28, 29, 30,	0·32	0·28	0·20	0·34	0·42	0·24
1825, 26, 27,	0·30	0·30	0·20	0·33	0·45	0·22
1828, 29, 30,	0·53	0·26	0·21	0·35	0·39	0·26

On both hands we see fewer condemnations, and the condemnations are less severe.* It appears, therefore, to be probable, that some causes exist, whatever may be their nature, which have had an influence in France in slightly diminishing the repression of crime: time will show us better if we are to seek for one of the causes of this in the introduction of that law which has changed the constitution of the jury, and also if this cause is single. However the case may be, it is very evident that the causes which from year to year have modified the repression of crime in general, have had a weaker influence than the constant causes which modify it according to the nature of the crimes: for, still preserving the two established periods, we find that the first-mentioned causes have had the effect of producing, on an average, only two or three additional acquittals out of 100 accusations, taken promiscuously; while the second causes have almost invariably produced eighteen acquittals more for accusations of crimes against persons than for those against property. This indeed has been already seen, when comparing the two tables given above.

I have hinted that the change introduced in the formation of juries was perhaps not the sole cause which had modified the repression of crime: and, indeed, I think that the events of 1830 have not been without some influence on this matter. The repression, for crime in general, is at that period much less than during the other years, and this conjecture gains still more weight when we enter into the consideration of details. Thus, out of the twelve modifying causes which have been pointed out, the repression for this year has presented nine minima, and the three other values approach their minima very nearly. Indeed, it is natural to suppose, that, to those causes which might then predispose to indulgence, there would also be added apprehensions of individual safety, fears of reaction, and other causes which are developed in the heart of man in the midst of political agitation. Generally speaking, a revolution ought to produce a greater or less modification of each element of the social system, and especially in what relates to crime.

I shall here observe, that analogous effects have also been observed in Belgium, where a revolution took place at the same period. The results of the repression of crime for this country are sufficiently interesting to find a place here.

Years.	Crimes in General.		
	Accused.	Condemned.	Repression.
1826, - -	725	611	0·843
1827, - - -	810	682	0·852
1828, - -	814	677	0·832
1829, - - -	753	612	0·811
1830, - -	643	483	0·739
Average. - -	747	613	0·821

This table shows us that the degree of repression in 1830 was weaker than during the other years; the difference is here even more sensible, for the measure of its importance is 0·075, whilst in France it was 0·034; but our revolution was also less local than that of France, and the provisional government lasted longer.

Another observation which must strike us on examining this table is, that the repression has in general been much higher in Belgium than in France; the respective values have been on an average 0·821 and 0·614, nearly as 4 to 3. This great disproportion is owing to the circumstance, that, up to that time, the jury had not been instituted in Belgium, although the people were governed by similar criminal laws; and these numbers may, to a certain degree, give us the measure of the influence exercised on the fate of an accused person, in case of his appearing before judges or before a jury. Now that the institution of jury is established in Belgium, we shall be still better enabled to appreciate its influence, from the modifications which it may produce in the repression of crime.

I have presented the circumstances bearing on repression with some detail, that I may give a better idea of the light in which I view the possibility of measuring the influence of causes. I shall now offer the results of the calculations which I have obtained for other elements of the social system, and their approximation will lead us to very remarkable conclusions. I have been careful to point out the years in which the maxima and minima of the deviations have occurred, by the side of the degree of importance of these deviations.

Belgium.	Importance of the Difference.		Epochs.	
	More.	Less.	Of Max.	Of Min.
Stature of the Militia—Town, -	0·003	0·005	1825	1827
" " " Country,	0·001	0·003	1826	1827
Repression of crime in general,	0·038	0·075	1827	1830
Condemnations in general,* -	0·112	0·212	1827	1830
Births in town, - - - -	0·034	0·120	1825	1827
" in country, - -	0·083	0·139	1826	1827
Deaths in town, - - - -	0·158	0·047	1825	1816
" in country, -	0·170	0·071	1826	1824
Marriages,† - - - -	0·135	0·212	1815	1817
Receipts of the treasury, -	0·188	0·036	1826	1830
Expenditure of the treasury, -	0·143	0·133	1826	1830
Price of wheat, - - -	1·134	0·447	1816	1824
" of rye, - - - -	1·374	0·500	1816	1824

* See the *Comptes Généraux*, for the repression of each crime in particular.

* The importance of the deviations, and especially of the maximum deviation of the lesser, is sensibly greater for Belgium than for France: this arises from the circumstance that, during the year 1830, there were much fewer condemnations than in the preceding years, the operation of the tribunals having been suspended during a longer or shorter time. This year is a complete anomaly, and perhaps ought not to have been included in our calculations, except we took the time only during which the courts were open.

† These ratios have been taken from the numbers found in the whole of the ancient kingdom of the Low Countries.

(Table continued.)

France. *	Importance of the Difference.		Epochs.	
	More.	Less.	Of Max.	Of Min.
Repression of crime in general,	0·034	0·034	1825	1830
Condemnations in general, -	0·047	0·057	1825	1830
Condemnations for crimes against property, - - -	0·056	0·056	1828	1827
Condemnations for crimes against person, - - - -	0·153	0·144	1825	1830
Births, - - - - - -	0·021	0.054	1819	1818
Deaths, - - - - -	0·071	0·049	1828	1823
Marriages, - - - -	0·117	0·125	1823	1817

The two preceding tables demonstrate clearly different facts, which I shall successively examine.

In the first place, by only regarding the facts themselves, and without having regard to the influence of causes taken individually, we see that, among the elements observed, the least variable are the stature of man and the repression of crime (or the severity which the tribunals display in punishments); we afterwards see, in the adjoining lines, the facility which man shows to commit crime, and the facility with which he reproduces his kind, or dies. Thus, whatever be the determining motives of his actions, in point of fact, they modify no more the number of deaths than the number of births, or even the number of crimes which annually scourge society.† Marriages also take place with regularity, but their number varies at the same time within wider limits than the preceding elements; the same has been the case with the receipts and expenses of the Belgic treasury; but no element has undergone greater variations than the price of rye and wheat.

In passing, we shall observe, that the prices of grain have a very close (*étroite*) relation to every thing bearing on the other elements. Thus, in the years 1816 and 1817, the prices of grain were very high, and marriages numerous; on the other hand, it was the same with births. It would appear as if the maximum of deaths should also have taken place in this year, in place of the minimum, which we observe in the towns, in 1816. Examining the numbers for 1817 attentively, we really find that they will form maxima for town and country, if we consider the increase of the population, another influential cause, which it is easy to calculate. The minimum would then be carried to 1824, which is the period when grains were at the lowest price, and which year was followed by a year of very great fruitfulness of women both in town and country.

Taking notice of the annual increase of the population, which has been considerable in Belgium, we find values which closely resemble those furnished by France; we find, moreover, that the year 1817 presents the minimum of marriages and births, both for town and country, and, at the same time, the maximum of deaths, both for town and country.

It is to be observed, that the maximum of the number of marriages has taken place in 1815, notwithstanding the increase of the population in subsequent years. This year, which brought the wars and disasters of the empire to a close, allowed a great number of young men to return home; and, being attended by peace, gave rise to many new establishments in life.

* See the *Comptes Généraux*, &c., and the *Annuaire du Bureau des Longitudes de France*, 1832, for what relates to the movement of the population from 1817 to 1829.

† It may be objected, that the observations on crime only refer to five years, whilst those on births and deaths extend to twelve years; and that we ought, in the same manner, to expect to find smaller differences between the extreme values of the effects produced by variable causes: but I shall reply, on the other hand, that births and deaths being annually much more numerous than crimes, what is casual leaves fewer traces behind it, and must have a less sensible influence in modifying regular causes.

We may further see, from the preceding numbers, that a residence in town or country has not manifested a well-marked influence in varying the elements we have now been considering.

Until now, I have omitted the influence of season and time of the day; yet it may be interesting to know the respective influences of annual and diurnal periods, which I have eliminated to the extent of my present materials, carrying my observations to annual average results.

To ascertain the influence of an annual period, I shall compare the average results obtained for each month, and, as hitherto, I shall value the importance of the maximum deviation from the average, whether on the side of surplus or the reverse. This calculation gives the following results. Those for births and deaths relate to Belgium, the others are calculated for France:—

	Periods of		Importance of the Difference.	
	Min.	Max.	Min.	Max.
Births in town,* -	July,	Feb.	0·107	0·122
" country, -	..	..	0·162	0·177
Deaths in town, - -	..	January,	0·126	0·158
" country, -	..	..	0·191	0·212
Crimes against property,	..	Dec.	0·113	0·233
" " person,	January,	June,	0·121	0·289
Mental alienation, -	..	..	0·293	0·346

What must strike us at first is, that the influence of season only has more effect in causing the elements relating to man to vary (those at least which I have considered), than all the united influences of nature and of men have had in causing variations of the average annual results during the same period. These monthly variations take place, moreover, in the most regular manner, as I have elsewhere shown. To form an idea of the influence of the seasons, compared with the combined influences of all the causes operating to modify the annual results, I shall take the same elements and compare the extremes within which the greatest deviations to one side or another have been comprised, and I shall assume as unity the sum of the differences of each annual average. It will be understood that here the conclusions are deduced from the same observations, classed either according to years or months:—

	Sums of the Differences of Max. and Min.		Ratio.
	Annual.	Monthly.	
Births in town, - -	0·204	0·229	1·13
" country, -	0·222	0·339	1·53
Deaths in town, - -	0·205	0·284	1·39
" country, -	0·241	0·403	1·67
Crimes against property, -	0·112	0·346	3·09
" " person, -	0·297	0·410	1·38
Mental alienation, - -	?	0·634	?

Thus, the results taking place in different years have varied less than those produced by seasons, and the respective influences of the causes which give rise to them, as concerns the movement of population, are more dissimilar in the country than in town. We may remark, in general, that the country is, physically speaking, more easily acted upon than towns, and that the deviations from the average there have greater values, undoubtedly because more hold is given to modifying causes of different kinds.

The epochs at which the maxima and minima take place have also very singular relations. Thus, deaths and crimes against property are more numerous in

* M. L'Avocat Guerry has given, in the *Annales d'Hygiène* for April 1829, some drawings (*dessins*) representing the influence of the seasons on physiological phenomena: it is to be greatly regretted that these designs are not accompanied by the numbers according to which they have been made.

winter, in consequence of the rigours of the season and the privations to which man is subjected. Crimes against person are more frequent at periods when the passions are most in force, and when mental alienation manifests itself with the greatest intensity.

As to the diurnal period, it is to be regretted that calculations are still wanting to enable us to appreciate its decided influence on the human species. From the numbers which I have obtained for Brussels, births appear to be more numerous during night than in the day time. The deviation from the average both on the side of surplus and the reverse, amounts to 0·114.* M. Buck has since arrived at the same results for the city of Hamburg, and found the ratio to be 0·136. M. Villermé himself, at the Hospice de la Maternité in Paris, has obtained similar results. The deviations are more important when we compare the different hours of the day separately. M. Guerry, in the *Annales d'Hygiène* for January 1831, has presented some researches on the influence of the different parts of the day on suicide by suspension; and he has found, during a period of 14 years, that the greatest number of cases have taken place between the hours of 6 and 8 o'clock in the morning, and the fewest number between 12 at noon and 2 in the afternoon. The deviations, more and less, have been in relative importance as the numbers 0·625 and 0·614: these deviations are considerable, compared with those hitherto observed.

It is sufficiently apparent, that the smallest period, that of the day, has still greater influence than the monthly period (which depends on the succession of seasons), and consequently more influence than the totality of the causes, which produce variations betwixt the average results of one year and another—always supposing it to be understood, that these average results are not deduced from too large a number of years, during which the men observed may have completely changed, so as in a manner to present a different social condition.

If we now sum up what has been said, we may deduce the following conclusions:—

1st, The regular and *periodic* causes, which depend either on the annual or diurnal period, produce effects on society which are more sensible, and which vary within wider limits, than the combined *non-periodic* effects annually produced by the concurrence of all the other causes operating on society; in other terms, the social system, in its present state, appears to be more dissimilar to itself in the course of one year, or even in the space of one day, than during two consecutive years, if we have reference to the increase of the population.

2d, The *diurnal* period seems to exercise a somewhat stronger influence than the *annual* period, at least so far as births are concerned.

3d, The annual period produces more sensible effects in the country than in town; and this appears to be the case with those causes in general which tend to modify the facts relating to man.

4th, The price of grain has a very marked influence on the elements of the social system; and although we still want sufficient data to appreciate the comparative values of this influence, yet we may very safely range it among the causes operating most energetically.

5th, If we wished to class, according to our observations, the elements relating to man in an order which should indicate the degree of variation to which they are subject, we should find the succession as follows, commencing with the *least variable*:—The stature of man; the repression of crime, or the degree of severity with which it is punished; the births; the propensity to crime, or the facility with which it is committed; deaths; marriages; receipts and expenses of the treasury; and, finally, the prices of grain.

* See my *Recherches sur la Population, &c., dans le Royaume des Pays-Bas*, p. 21.

Thus man commits crime with at least as much regularity as is observed in births, deaths, or marriages, and with more regularity than the receipts and expenses of the treasury take place. But none of the elements which concern him, and which have been calculated in our table, vary within wider limits than the prices of grain.

From what has been said, we may draw the two following principal conclusions:—

Since the price of grain is one of the most influential causes operating on the mortality and reproduction of the human species, and since, at the present day, this price may vary within the widest limits, it is the province of the foresight of governments to diminish as much as possible all the causes which induce these great variations in prices, and consequently in the elements of the social system.

On the other hand, since the crimes which are annually committed seem to be a necessary result of our social organisation, and since the number of them cannot diminish without the causes which induce them undergoing previous modification, it is the province of legislators to ascertain these causes, and to remove them as far as possible: they have the power of determining the budget of crime, as well as the receipts and expenses of the treasury. Indeed, experience proves as clearly as possible the truth of this opinion, which at first may appear paradoxical, viz., that *society prepares crime, and the guilty are only the instruments by which it is executed.* Hence it happens that the unfortunate person who loses his head on the scaffold, or who ends his life in prison, is in some manner an expiatory victim for society. His crime is the result of the circumstances in which he is found placed: the severity of his chastisement is perhaps another result of it. However, when matters have come to this point, the punishment is no less a necessary evil, were it only as a preventive mean: it would only be desirable that the other means of prevention might afterwards become sufficiently efficacious for us not to be obliged to have recourse to the former severe means.

I shall conclude this chapter by a final observation, which is as it were a consequence of all the preceding, viz., *that one of the principal facts of civilisation is, that it more and more contracts the limits within which the different elements relating to man oscillate.* The more knowledge is diffused, so much the more do the deviations from the average disappear; and the more, consequently, do we tend to approach that which is beautiful, that which is good. The perfectibility of the human species results as a necessary consequence from all our researches. Defects and monstrosities disappear more and more from the physical world; the frequency and the severity of diseases are combated with more advantage by the progress of medical science; the moral qualities of man experience not less sensible improvements; and the farther we advance, the less are great politic overthrows and wars (the scourges of humanity) to be feared, either in their immediate effects or in their ultimate consequences.

It would seem at first sight that the fine arts and literature must suffer from this state of things. For if it be true that individual peculiarities tend to disappear more and more, and that nations assume a greater resemblance to each other, whatever is most picturesque in society and in the aspect of different parts of the globe, ought insensibly to disappear. Even during the last half century, and within the limits of Europe alone, we see how great the tendency is for people to lose their national character and be amalgamated in one common type: yet nature will always be so prodigiously varied, that the talented man will never have to fear lest the source of the picturesque be exhausted; on the contrary, he every day finds for himself new sources from which his imagination may take the noblest and most elevated inspiration, and bring out treasures unknown to his predecessors.

APPENDICES.

APPENDIX—CONTAINING THE ADDITIONS MADE BY THE AUTHOR (M. QUETELET) TO THE GERMAN TRANSLATION OF HIS WORK, PUBLISHED AT STUTTGART IN 1838, BY DR V. A. RIECKE.

No. I.

ADDITION TO THE INTRODUCTION.

Extracts from the Bulletin de l'Académie Royale des Sciences et Belles Lettres de Bruxelles: 1835. *No.* 8.

M. QUETELET communicated the other day to the academy several statistical notices published by the French government, confirming more and more the ideas expressed by him regarding the constant return of the same phenomena in every thing having a reference to the physical and moral man, provided society undergoes no violent change:—First, It may be seen from documents which refer to the recruiting of the French army, that annually nearly the same number of young men liable to serve as conscripts must be exempted on account of a deficiency in fingers and in teeth; on account of deafness, goitres, lameness, diseases of the bones, weak constitution, insufficient size of body; or on account of being the first-born, or of being orphans, or sons of widows, blind people, &c. Just as constant appear the numbers of young people who are able to read and write, and those who have received no instruction; the number of those self-mutilated in order to avoid military service, &c. From the following table, it will be more evident in what degree conditions which appear to depend on entirely accidental causes have a constant recurrence. It is an accurate extract from a Report to the King, lately published in France, regarding the recruitment of the army:*—

Number of Young Men in France who have been excused Military Service on account of Bodily Infirmities.

Causes of Unfitness.	1831.	1832.	1833.
Wanting fingers,	752	647	743
— teeth,	1,304	1,243	1,302
Deafness and dumbness,	830	736	725
Loss of other limbs or organs,	1,605	1,530	1,589
Goitres,	1,125	1,231	1,298
Lameness,	949	912	1,049
Other deformities,	8,007	7,630	8,494
Diseases of bones,	702	617	667
Short-sighted,	948	891	920
Other affections of the eyes,	1,736	1,714	1,839
Itch, (?)	11	10	10
Scald head,	749	800	794
Leprosy,	57	19	29
Other cutaneous diseases,	907	963	895
Scrofulous affections,	1,730	1,539	1,272
Affections of chest,	561	423	359
Hernia,	4,044	3,579	4,222
Epilepsy (falling sickness),	463	367	342
Different other diseases,	9,163	9,058	10,286
Weakness of constitution,	11,783	9,979	11,259
Insufficient size of body,	15,935	14,962	15,078
Amount of whole class of certain age,	295,978	277,477	285,805

M. Quetelet further mentions, that he knows, from sources to be depended on, that not only the number of letters delivered at the post-office of Paris remains nearly the same every year, but that also every year nearly the same number of letters are found, which have been forgotten to be sealed, or which could not be delivered in consequence of illegible handwriting, or insufficient addresses, &c. &c. For a long time he had endeavoured to prove, that society pays a fearful budget to crime, which perhaps shows a greater regularity than the financial budget: and in a work which he lately published—"An Attempt at the Natural Philosophy of Society"—he felt himself entitled to say, that if the statistical details published by the government were also to make mention of those crimes the perpetrators of which have remained unknown, their occurrence would not be less regular. This supposition has actually found a complete confirmation in our country, in the reports made to the minister of justice, and which will be published forthwith. There exists too strict a connexion between the phenomena presented by society, and between the causes of which they are the effects, to be neglected any longer by the philosopher and statesman; and, without doubt, the science which has this study for its object, will occupy, in course of time, a high rank in the scale of human knowledge.

* *Compte rendu au Roi*, p. 128 and 129. Similar examinations take place in the kingdom of Wirtemburg, and, as in the above case, the results form a source of valuable materials for medical statistics.

No. II.

ADDITION TO THE SECOND DIVISION OF THE FIRST BOOK.

Influence of the Seasons upon Births.

M. Ramon de la Sagra, in his History of the Island of Cuba,* has given a comparative view of the number of births of the white and coloured population in Havanna, according to the months of the year. From the ciphers we reprint here, it will be seen how much geographical latitude modifies the results which we have observed in our climates, although the place mentioned is situated in the northern hemisphere. The following ciphers include the observations of five years, from 1825 to 1829:—

Months.	Births.		
	Among the White Population.	Coloured Population.	Total.
January,	624	703	1,327
February,	573	596	1,169
March,	600	627	1,227
April,	636	638	1,274
May,	634	651	1,285
June,	659	620	1,279
July,	661	698	1,359
August,	694	741	1,435
September,	736	760	1,496
October,	772	736	1,508
November,	713	706	1,419
December,	709	774	1,474
Total,	8002	8250	16,252

* Historia Economico-Politica y Estadistica de la Isla de Cuba, p. 35. Havanna: 1831. 4to.

According to this table, the greatest number of births in Havannah occurs in October, and the fewest between February and May. This is nearly the opposite of that distribution of births for the seasons observed in Europe.

No. III.

ADDITION TO THE THIRD SECTION OF THE FIRST BOOK.

Mortality of Lying-in Women.

M. Casper communicates, in his excellent work on the Relations of Mortality (*Die Wahrscheinliche Lebensdauer des Menschen*, &c.), "The probable Duration of Human Life," p. 51, the following results relative to the mortality of women at child-birth in the Prussian monarchy. There were—

	Born.	Died in Child-Bed.
In the years 1817 till 1826 (inclusive),	4,955,672	44,772
" 1826 " 1828 "	499,507	4,539
" 1828 " 1829 "	495,483	4,615
" 1829 " 1830 "	497,241	4,441
" 1830 " 1831 "	490,524	4,710
" 1831 " 1832 "	481,959	4,677
Total, - - - - -	7,420,386	67,754

If from this number of births the regular recurring number of twins and triplets, amounting to about 94,000, are deducted, it follows that of 108 women in child-bed, one died. According to Lubbock, there died in the ten years, from 1818 to 1827, only one woman in child-bed of 117.

No. IV.

ADDITION TO THE FIFTH SECTION OF THE FIRST BOOK.

Extract from the Bulletin de l'Académie Royale des Sciences de Bruxelles: 1835. No. 1, p. 129.

M. Quetelet communicated, in consequence of a paper transmitted by M. Villermé on the population of Great Britain, the following accounts regarding the mortality in Belgium:—"Science has of late been enriched by several important works* on the statistics of Britain, especially on the relations of mortality in that country. The different documents they contain have confirmed most distinctly a fact which I have for some time believed to exist, and which ought to have been pointed out by MM. Villermé and François d'Ivernois—the fact, namely, that the population of Britain has not so great a claim as commonly supposed to a much smaller mortality than the other states of Europe.

I have already observed, in a paper which was read to the Royal Academy of Sciences at Paris,† that in Britain, for every two children there are only to be found three individuals above fifteen years of age, and in the United States even fewer; whilst in France, Sweden, and Belgium, at least four are to be found. Indeed, this disproportion principally arises from the rapid increase of population, as it subsisted of late in Britain and the United States. Most of the children who are the fruit of this great development of fertility not yet being far advanced in the career of life, the number of adult individuals resulting from them must be proportionally small. M. Villermé, our correspondent, as member of the French Institute, has considered the question under another point of view. This gentleman has, in a paper on the population of Great Britain,‡ compared Rickman's tables of mortality for England, those of Duvillard for France, and those I have published for Belgium (the one in my *Annuaire de l'Observatoire*, the other in a manuscript paper read at a meeting of the Academy for Moral and Political Science at Paris): it results from this comparison, that the 'probable duration of the life of children at their birth, is in Great Britain about two years longer than in Belgium.' With individuals of 1 to 30 years of age, the case is the reverse. We may wager 100 to 100 that a person may live in Belgium from 1 to 3 years longer than individuals of the same age born and brought up in Britain. Further, the probability of the duration of life with individuals from 30 to 40 years of age is in both countries precisely the same; and only at the age of 45 the probable duration of life is somewhat more in favour of the English than of the Belgians; but the difference amounts at most to only one year. In the face of these facts, from which it is evident that the mortality in Britain is not lower than in Belgium, it appears very probable that life, at the moment of birth, in the former is the safer possession than in the latter, where, with the child of one year old, the probable duration of life is at least for a year and a half longer than in England; and that on the other side of the channel there dies every year 1 in 49, whilst in Belgium, according to the results of the years from 1825 to 1829, the proportion of deaths in relation to the population is about 1 to 43 years, because every where, one annual death for 40 or 41 inhabitants is a low mortality, at least when the country in question is of a pretty large size. Herein, also, are to be found new reasons to consider the list of mortality for England, more especially regarding those for young children as incomplete.

To facilitate forming an opinion on this subject, M. Villermé has compared the tables of population for England and Belgium,† concluding from his table that there is a marked advantage in favour of Belgium, which proportionally has fewer children, but keeps them better, and has proportionally more grown-up individuals. It will be, moreover, advisable, as I have already observed, to pay attention to the rapidly increasing population in England, which contributes to place that country in a less favourable position than ours. According to Duvillard, the ciphers of France are on the whole less favourable than those of Belgium and England.

MM. Hayer and Lombard have of late also compared the mortality of Geneva with that of Belgium and France:‡ it results from their investigations that in the two latter countries the number of deaths in the first year of life are far more numerous than in Geneva. The following are the principal results of the comparison which they have made regarding the probable duration of life between the three countries, proceeding on the base of their tables of mortality, and on those of Duvillard and my own for cities:—

	Probable Duration of Life.		
	In France.	In Belgium.	In Geneva.
At Birth, -	20½ years.	25 years.	47½ years.
At 5 years of age,	45½ "	50 "	52½ "
" 30 "	29⅝ "	34 "	34 "
" 50 "	16⅞ "	19⅛ "	18½ "

From this comparison, the advantage in the early period of life is on the side of Geneva; but at the age of 30, the probable duration of life is not longer than

* The principal works are:—

Abstracts of the Answers and Returns, &c. By Rickman. 3 vols. 4to. 1831.

Tables of the Revenue, Population, Commerce, &c. By Porter. 2 vols. folio. 1833.

A Digest of all the Accounts, &c. By Marshall. 1833.

On the Natural and Mathematical Laws concerning Population, &c. By Francis Corbaux. 1 vol. 8vo. 1833.

† 8th September 1834. See the journal *L'Institut*, No. 71, 20th September 1834; and *Le Temps*, 18th September 1834.

* Annales d'Hygiène, tome xii. partie 2.

† Annuaire de l'Observatoire de Bruxelles.

‡ Recherches Statistiques sur la Mortalité de la Ville de Genève, and Bibliothèque Universelle. August 1834.

in Belgium, and it even then diminishes. The scientific men of Geneva observed, that if 90 years were to be taken as the extreme old age, the proportion of individuals of this age to the number of births would be the standard for longevity. Thus, we shall find—in Geneva, 0·0063 for males, 0·0113 for females; average, 0·0089: in Belgium, 0·0068: in England, from the official tables from 1813 to 1830, only 0·0065. It follows, from the preceding comparisons, that Belgium, with regard to its mortality, does not labour under any disadvantage when compared with England and Geneva—two countries which have hitherto been considered the most favoured—excepting, perhaps, in regard to the mortality of children.

No. V.

ON THE MORTALITY (NATURAL AND ACCIDENTAL DEATHS INCLUDED) OF THE EUROPEAN TROOPS OF THE ENGLISH ARMY IN THE EAST INDIES, IN A PERIOD OF FIVE YEARS, FROM 1826 TO 1830.

On the whole, we possess few notices on the mortality of Europeans who have lived within degrees of latitude differing much from their natural climate. The following documents, therefore, which I owe to the kindness of A. M'Culloch, Esq., of the War-Office, must be acceptable to the reader. This able statistician, to whom we owe very interesting investigations, observes, that hitherto it has been possible to arrive at results only somewhat correct regarding children and females:—

Place.	1826.	1827.	1828.	1829.	1830.	Mean.
PRESIDENCY OF BOMBAY.						
Number of troops, -	2793	3135	3175	3632	3876	3322
Cases of death, - -	305	162	204	107	147	185
Usual number of patients,	481	347	368	358	383	367
PRESIDENCY OF BENGAL.						
Number of troops, -	7976	8761	8916	8630	9520	8770
Cases of death, - -	774	522	549	575	362	556
Usual number of patients,	846	888	832	879	721	843
PRESIDENCY OF MADRAS.						
Number of troops, -	6626	6336	7986	8084	8774	7630
Cases of death, - -	614	509	396	266	199	395
Usual number of patients not given under this head.						

From these ciphers, the following proportions result:—

	Per 1000 Men.		
	Bombay.	Bengal.	Madras.
Cases of deaths, - -	55	63	52
Sick, - - - - -	116	96	(?)

This gives an average of about 57 cases of deaths per 1000 men, or 1 death for 17·5.

In respect to the kinds of diseases producing these deaths, they may be arranged as follows:—

Names of Diseases.	Cases of Deaths.			Annual Number per 1000.		
	Bombay.	Bengal.	Madras.	Bombay.	Bengal.	Madras.
Fever, - - -	267	735	405	15·9	16·6	11·0
Affections of the lungs, -	43	100	82	2·5	2·2	2·2
— of the liver, -	80	180	170	4·2	4·1	4·5
— of the stomach and bowels, - -	272	872	819	16·2	19·7	21·2
Cholera morbus, -	173	623	306	10·0	14·2	8·0
Affections of the brain,	21	98	27	1·2	2·1	0·6
Dropsy, - - - -	12	25	28	0·7	0·5	0·7
Other cases of deaths, -	57	149	141	4·3	3·4	3·8
Total, - - -	925	2782	1978	53·0	63·0	52·0

The mean mortality (expressed in per cents.), shows, amongst the European officers of the Indian army, the following results:—

Rank.	Bombay.	Bengal.	Madras.
Colonels, - -	5·74	5·94	5·40
Lieutenant-colonels, -	5·45	4·84	6·11
Majors, - -	3·77	4·10	5·42
Captains, - - -	3·78	3·45	5·02
Lieutenants, - -	3·96	2·75	4·17
Ensigns, - - -	3·15	2·34	3·80

The general mean of all ranks, including surgeons and assistant-surgeons, was 3·85.

During the last 20 years, there died of the army of Bengal 1184 officers, or 59·2 annually of the average number of 1897 individuals: this gives 3·12 per cent.

The mean duration of life of the deceased was, in

81	Colonels, - - - - -	61 years.
97	Lieutenant-colonels, - - - -	51 "
78	Majors, - - - - -	40 "
277	Captains, - - - - - -	36 "

We add to the comparative view another, pointing out the mortality of civilians in the India Company's service in Bengal, during the years from 1792 to 1836, according to their several ages and number of years of service:—

Number of Years of Service.	Age.	Number of Civilians.	Cases of Deaths.	Retired from the Service.
1	20	975	19	2
2	21	933½	22	3
3	22	906½	18	7
4	23	874½	19	5
5	24	835½	12	7
6	25	790½	10	
7	26	754	17	4
8	27	694½	17	3
9	28	633	20	4
10	29	577½	8	3
11	30	545	6	2
12	31	519½	14	1
13	32	489	8	2
14	33	468	5	6
15	34	448	8	2
16	35	424	6	6
17	36	403	9	2
18	37	376½	11	7
19	38	351	10	2
20	39	324½	8	7
21	40	293½	11	9
22	41	270	10	6
23	42	239	10	6
24	43	216	5	2
25	44	196	7	10
26	45	167½	7	9
27	46	148	7	8
28	47	129	3	8
29	48	114½	4	1
30	49	101½	3	5
30 to 45	50 to 64			

If we put together these ciphers in periods, we arrive at the following comparative view:—

Number of Years of Service.	Age.	Number of Civilians.	Cases of Deaths.	Cases of Deaths per 10,000.	Retired from the Service.
1 to 5	20 to 24	4525	90	199	26
6 to 10	25 to 29	3454½	72	208	21
11 to 15*	30 to 34	2469½	41	166	13
16 to 20	35 to 39	1879	44	204	24
21 to 25†	40 to 44	1214½	43	354	33
26 to 30	45 to 49	660½	24	364	31
30 to 45	50 to 64			496	

In the *United Service Journal*, we find several notices by Mr M'Culloch on the mortality of officers of the British army.

* After ten years of service in India, every officer may return for three years to England. Many avail themselves of this permission, which evidently contributes to the decrease of mortality.

† After twenty years' service, many officers return to Britain, which likewise contributes to the decrease of the mortality.

No. VI.

EXTRACT FROM THE "BULLETIN DE L'ACADEMIE ROYALE DES SCIENCES DE BRUXELLES": 1835. No. 10. CONCERNING THE MORTALITY AT BRUSSELS.

M. Quetelet communicated to the academy the results of the late census, according to which the number of inhabitants of Brussels amounts to 102,702, the garrison not included, which consists of from 2000 to 3000 men. According to the tables of population, there took place in the year 1834—

4230 Births,	Consequently, 1 to	26 inhabitants.
3362 Deaths,	" 1 to	29 "
1092 Marriages,	" 1 to	100 "
8 Divorces.		

Before the census, the number of inhabitants for Brussels was calculated at 94,000. M. Quetelet thinks that even the present cipher is still too low; and, in the preceding calculation, he believes he is entitled to estimate it at 110,000, the garrison included. He supports his supposition, by considering the number of births, deaths, and marriages, according to which, Brussels would present less favourable conditions than most of the great cities of Europe, as he has already shown in his *Essay on the Natural Philosophy of Society*. However, we must not lose sight of the circumstance, that the number of deaths in a great city is always augmented by the number of diseased strangers who swell up the tables of mortality in the hospitals, or by those who go there to receive efficient assistance in their sufferings.

No. VII.

REMARKS ON THE MORTALITY IN EPIDEMICS.

Epidemics modify the mortality in a very remarkable manner, and the importance of the phenomena of disease in individuals bears by no means a proper ratio to the general result of the tables of mortality. If the study of epidemics had been properly followed, we should have tables as interesting for science as useful to mankind. Several instances might be adduced to prove this. I shall here content myself with citing one: the cholera morbus and influenza are diseases which differ greatly from each other; the one is a dreadful scourge, which manifests itself in the most fearful manner; the other, in its ordinary external appearance, resembles a catarrh or common cold; and yet the tables of mortality prove that, although the latter disease is not so deadly, it nevertheless, in consequence of its universality, and in consequence of the sufferings it causes, produces results nearly as extensively fatal as cholera. Facts, serving to confirm this opinion, may be found in the excellent work published by Dr Gluge on the History of Influenza.* They show, moreover, that mortality in epidemics is principally confined to childhood and to old age—those periods which, in the common course of things, have the smaller probability of life.

No. VIII.

INFLUENCE OF SEASONS UPON MORTALITY.

In the work of M. Ramond de la Sagra, may be found several interesting notices regarding the mortality in Havannah. The following ciphers are the results of five years, namely, from 1825 to 1829 :—

* Die Influenza oder Grippe u. s. w. Minden: 1837. 8vo.

Months.	Cases of Deaths.		
	White Population.	Coloured Population.	Total.
January,	545	938	1483
February,	536	831	1367
March,	597	900	1497
April,	487	760	1247
May,	535	731	1266
June,	501	668	1169
July,	539	793	1332
August,	550	736	1286
September,	492	689	1181
October,	548	752	1300
November,	416	709	1125
December,	508	756	1264
Total,	6304	9263	15,567

The mortality in the hospital, amongst strangers, does not exhibit quite the same proportion. The following table gives a view of the mortality in the Hospitals of San Ambrosio and San Juan de Dios, in the years 1825 to 1829, and the mortality of strangers during the years 1820 to 1824 :—

Months.	San Ambrosio.	San Juan.	Strangers.
January,	76	162	44
February,	65	133	65
March,	92	184	91
April,	103	145	84
May,	146	149	169
June,	167	195	179
July,	158	203	169
August,	132	198	149
September,	128	247	118
October,	123	240	73
November,	93	196	50
December,	97	277	56
Total,	1830	2329	1229

As far as the first ciphers are concerned, it will be seen that the winter months, and the months of July, August, and October, exhibit the greatest mortality; but the unfortunate individuals received into the hospitals, and the strangers, are especially subject to the deleterious influence of the summer heat. If we compare, in respect to strangers, the mortality of the month of December with that of June and July, we find an increase in the latter nearly fourfold. However, we ought to know, in order to arrive at a correct opinion, what the average number of strangers may be in Havannah during the seasons thus contrasted.

We owe to the kindness of Mr M'Culloch, information regarding the mortality in the island of Malta, during 14 years, in a population oscillating between 96,000 and 103,000 inhabitants; thus giving an average of 100,000 souls. They are as follows :—

Months.	Cases of Deaths.
January,	2990
February,	2773
March,	2786
April,	2404
May,	2292
June,	2368
July,	3075
August,	2919
September,	2675
October,	3061
November,	3013
December,	2995
Months unknown,	992
Total,	34,303

We observe here again, as in the ciphers of Havannah, a tendency to a maximum of deaths during summer, as a consequence of heat.

Here follow a few notices regarding the mortality of tropical climates, to be found in the work of Mr A. S. Thomson, on the influence of climate on health.*

* *Observations on the Influence of Climate on Health and Mortality.* 8vo. Edinburgh: 1837. See also the work by Dr Annesley, *On the Climate of India*. London: 1825. Also the *Medical Almanac*, by Farre, for 1837.

The first numbers inform us of the relative monthly mortality of the English troops in the Windward and Leeward Islands. The others refer to 3149 individuals of the native troops in the Presidency of Madras, and 3017 of the English troops, who were received during 1815 into the hospitals.

Months.	Mortality in the Windward and Leeward Islands.	Presidency of Madras—Sick.	
		Native Troops.	English Troops.
January, - -	65	125	74
February, - -	48	63	64
March, - -	42	60	70
April, - - -	57	48	74
May, - -	59	54	84
June, - - -	69	85	87
July, - -	87	104	109
August, - -	119	93	81
September, -	114	74	73
October, - -	133	113	105
November, -	109	94	82
December, - -	97	87	97
Total, -	1000	1000	1000

Also here we observe, in the time of the great summer heat, and in consequence of it, a greater mortality and more numerous cases of sickness. We may therefore be well assured, that extremes of cold and heat are equally deleterious to our species.

No. IX.

ADDITION TO THE SEVENTH SECTION OF THE FIRST BOOK.

On the Law of the Increase of Population.

Since the publication of my work, M. Verhulst, of the Military Academy of Brussels, has submitted to analysis my hypothesis on the law of the increase of population. This hypothesis rests on the supposition of an analogy between the movement of the population, under the difficulties which oppose the increase, and between a moveable body which falls through a resisting medium. The results of this comparison agree very well with the data furnished by statistics, and with those derived from calculation, if we suppose an infinitely increasing density in the different layers of the resisting medium. The formulas on which the calculations and the results regarding the population of Belgium, France, and Prussia, are based, may be found in the second part of the series of the *Correspondance Mathématique de l'Observatoire de Bruxelles.* (See p. 113, and following.) We may say that the statistical data have not yet been collected in so comprehensive a manner as accurately to permit us to reduce from our hypothesis, by calculation, all the consequences to be derived from it regarding the intensity of the difficulties met with by the population in its increase.

No. X.

ADDITIONS TO THE THREE FIRST SECTIONS OF THE SECOND BOOK.

On the Results of Experiments made on the Weight, Height, and Strength of above 800 individuals. By JAMES D. FORBES, *Esq., F.R.S.S. L. & E., Professor of Natural Philosophy in the University of Edinburgh.**

The interesting and remarkable experiments published by M. Quetelet, of Brussels, on various points of physical development in man, under a variety of circumstances, as to climate, station, age, and sex, induced me to take the opportunity which my professional position presented of obtaining the measure of physical development as to the weight, height, and strength of natives of Scotland, between the ages of 14 and 25, students in our university.

In the prosecution of this plan, separate lists were kept of persons not born in Scotland, and of these the English and Irish lists have likewise been subjected to calculation. Though of these the numbers are comparatively small, the results present some pretty decisive characters. These experiments were continued during two winters (1834–5, 1835–6): every experiment was made by myself, and noted down by myself. The weights were ascertained by Marriot's spring-balance, which was verified from time to time, and found to have undergone no change in its elasticity. The weight of clothes is included.* The heights are in English inches, shoes included. For the measure of strength, Regnier's dynamometer was employed, and these experiments were somewhat less satisfactory than the others. The error of the instrument had been ascertained before the commencement of the experiments, and was found to be pretty constant throughout the scale. But after the experiments were finished, this was by no means the case, the error having become variable, owing to the interfering action of a small spring employed to bring the index to zero. As this, however, only affects the absolute results (or, at least, its relative influence is trifling), I have contented myself with applying an interpolated correction deduced from the mean of the errors before and after, which cannot differ much from the truth. But the instrumental errors are not the only ones to be contended with. To avoid errors in the *use* of the dynamometer, requires vigilant superintendence on the part of the observer; and as the first pull is generally (though not always) greater than the second or third, this also must be allowed for. I have invariably repeated the experiment three times, and often much more frequently. When extraordinary cases have occurred, I have taken the precaution of observing at distinct intervals of time.

In ascertaining the mean results, the following method has been adopted:—The natives of each country were separated, and each class divided, according to age, into twelve sets, from 14 to 25, the greatest number being of the age of 18 years. The mean weight, height, and strength for each year was computed, and the result projected upon ruled paper. Curves were drawn through the points thus projected, in such a way as to represent most satisfactorily the whole observations. These curves, with the determining points, are now exhibited to the society. It is proper to add, that the ages registered being the ages *at last birthday*, the weight, &c., registered, is not that due to the age noted, but at a mean to an age half a year later. Thus, all the persons who were 20 last birthday, are *between* the ages of 20 and 21, or 20½ at a mean. This has been attended to in making the projections.

Besides the English, Scotch, and Irish curves, I have exhibited those of the Belgian development, from M. Quetelet's experiments, reduced to English measures. The thickness of the shoes not being included in these experiments, half an inch (perhaps too little) has been added to make them comparable with the others. It is important to add, that M. Quetelet's experiments here quoted, as well as my own, were made upon persons in the higher ranks of life—in both cases, in fact, upon persons having the benefit of academical instruction.

The number of persons examined by me in the two winters before stated, was thus divided:—Scotchmen, 523; Englishmen, 178; Irishmen, 72; from the colonies, &c., 56; total, 829. I was careful to obtain a fair average of persons of all degrees of height and

* Read to the Royal Society of Edinburgh, and communicated by the author.

* According to Quetelet, this amounts to one-eighteenth of the weight.

strength, in which respect the Scotch average is more unexceptionable than the others. There is always a tendency in such cases to get too high a development, because diminutive persons are the least likely voluntarily to come forward. An example of this is found in the mean height obtained by M. Quetelet, from a register of 80 individuals at Cambridge, between the ages of 18 and 23, giving a mean of 69·6 inches, instead of 68·7, as my experiments indicate.

The numerical results derived from the graphical process before described, are given at the close of the paper, and seem to warrant the following conclusions:—

1. That in respect of weight, height, and strength, there is a general coincidence in the form of the curves with those of M. Quetelet.

2. The British curves seem to have more curvature for the earlier years (14 to 17), or the progress to maturity is then more rapid, and somewhat slower afterwards. If we may depend upon the English curves, this is more strikingly the case in natives of that country than of Scotland, at least in point of weight and strength.

3. The tables incontestibly prove the superior development of natives of this country over the Belgians. The difference is greatest in strength (one-fifth of the whole), and least in weight.

4. In comparing natives of England, Scotland, and Ireland, more doubt arises, owing to the difference in the number of experiments; those for Ireland are confessedly most imperfect. Yet I conceive that the coincident results in the three tables, entitle us to conclude that the Irish are more developed than the Scotch at a given age, and the English less. Some qualification is, however, due, in consequence of the remark (2); for in the earlier years (14–17), it would even appear that the English so far get the start of the Scotch, as not only relatively, but also absolutely, to surpass them (in strength and weight); but between 17 and 19 they lose this advantage. I am disposed to think that this appearance of a result is not accidental.

5. The maximum height seems scarcely to be attained even at the age of 25. This agrees with M. Quetelet's observations. Both strength and weight are rapidly increasing at that age.

6. In the given period of life (14–26) all the developments continue to increase; and all move slowly from the commencement to the end of that period. Hence the curves are convex upwards. [This is not the case below the age of 14, for weight and strength. —*Quetelet.*]

Weights in Pounds (including clothes).

Age.	English.	Scotch.	Irish.	Belgians.
15 years, -	114·5	112	..	102
16 „ - -	127	125·5	129	117·5
17 „ - -	133·5	133·5	136	127
18 „ - -	138	139	141·5	134
19 „ - -	141	143	145·5	139·5
20 „ - -	144	146·5	148	143
21 „ - -	146	148·5	151	145·5
22 „ - -	147·5	150	153	147
23 „ - -	149	151	154	148·5
24 „ - -	150	152	155	149·5
25 „ - -	151	152·5	155	150

Heights in Inches. Full Dimensions (with shoes).

Age.	English.	Scotch.	Irish.	Belgians.
15 years, -	64·4	64·7	..	61·8
16 „ - -	66·5	66·8	..	64·2
17 „ - -	67·5	67·9	..	66·1
18 „ - -	68·1	68·5	68·7	67·2
19 „ - -	68·5	68·9	69·4	67·7
20 „ - -	68·7	69·1	69·8	67·9
21 „ - -	68·8	69·2	70·0	68·0
22 „ - -	68·9	69·2	70·1	68·1
23 „ - -	68·9	69·3	70·2	68·2
24 „ - -	68·9	69·3	70·2	68·2
25 „ - -	68·9	69·3	70·2	68·3

Strength in Pounds.

Age.	English.	Scotch.	Irish.	Belgians.
15 years, -	..	230	..	204
16 „ - -	336	314	..	236
17 „ - -	352	340	369	269
18 „ - -	364	360	389	289
19 „ - -	378	378	404	296
20 „ - -	385	392	416	310
21 „ - -	392	402	423	322
22 „ - -	397	410	427	330
23 „ - -	401	417	430	335
24 „ - -	402	421	431	337
25 „ - -	403	423	432	339

No. XI.

Extract from the Correspondance Mathématique et Physique, 1st Series, vol. ii. part 1. January 1838.

M. Horner's Investigation into the Development of the Growth of Boys and Girls.

Several years ago we published tables to show the degree of growth in both sexes at different ages. These tables, which at first sight might seem merely curious, became afterwards of real utility, especially in England. Their importance, indeed, was so much felt, that it was deemed advisable to repeat our experiments in several places, in order to find a measure of the modifications likely to be produced in our results by circumstances to which we could pay no attention. Thus, Mr Forbes of Edinburgh has measured a great number of young Englishmen, Scotchmen, and Irishmen, and a comparison of his results with ours has shown a remarkable correspondence in respect to the gradual development; at the same time, however, it has, notwithstanding, exhibited a real difference between the mean height of individuals belonging to different nations.*

In order to find out the influence produced on the development of the growth by working in manufactories, Mr J. W. Cowell has made different interesting observations at Manchester and Stockport. The result of these has been published in the first volume of the Factory Reports, and in an essay On the Philosophy of Society.

Hitherto we have only seen, from No. 339 of the Penny Magazine, July 1837, that the same experiments have also been repeated by Mr Horner, another English factory inspector. Mr Horner thought that he had observed that the people, in order to evade the law excluding young children from the heavy work in the factories, had hit on the plan of using false certificates of age, and Mr Horner, to discover the fraud, resorted to a direct test. He made use of a table similar to ours, and in order to arrive at a nearer approximation of the truth, he resolved to institute collateral observations. Mr Horner, therefore, procured from twenty-seven surgeons, the measure of 16,402 individuals, of whom 8469 were boys, and 7933 girls, of the age from 8 to 14 inclusive, and from the following places—Manchester, Bolton, Stockport, Preston, Leeds, Halifax, Rochdale, Huddersfield, and Skipton, and the neighbouring rural districts. The following table is an extract from one of greater dimensions, in which the distinction has been noted between towns of first and second rate magnitude and the country:—

* See the *Correspondance Mathématique*, volume ix. page 205 and following; and Transactions of the Royal Society, Edinburgh.

Age.	Number of Children Measured.	Mean Height.	Average Height of Boys & Girls taken Together.
		foot. inch.	foot. inch.
From 8 to 8½ years,	327 boys.	3 9½	3 9½
" " "	267 girls.	3 8 13/16	
From 8½ & below 9 years,	339 boys.	3 11	3 10½
" " " " "	272 girls.	3 10	
" 9 " 9½ "	527 boys.	3 11⅜	3 11½
" " " " "	438 girls.	3 11⅝	
" 9½ " 10 "	418 boys.	4 0⅛	4 0
" " " " "	375 girls.	4 0	
" 10 " 10½ "	574 boys.	4 1	4 1
" " " " "	506 girls.	4 1	
" 10½ " 11 "	550 boys.	4 1⅝	4 1½
" " " " "	421 girls.	4 1⅜	
" 11 " 11½ "	664 boys.	4 2⅜	4 2½
" " " " "	577 girls.	4 2½	
" 11½ " 12 "	559 boys.	4 3 1/16	4 3½
" " " " "	478 girls.	4 3½	
" 12 " 12½ "	767 boys.	4 3⅜	4 0
" " " " "	712 girls.	4 3⅝	
" 12½ " 13 "	690 boys.	4 4½	4 4⅜
" " " " "	618 girls.	4 4⅛	
" 13 " 13½ "	1269 boys.	4 5⅛	4 5½
" " " " "	1260 girls.	4 5⅜	
" 13½ " 14 "	864 boys.	4 6⅜	4 6½
" " " " "	930 girls.	4 6⅝	
" 14 " " "	951 boys.	4 7⅜	4 7⅞
" " " " "	1029 girls.	4 8	

The average, or the mean height of the young people between 14 and 18 years, has been ascertained according to the particular accounts given by Mr Harrison, surgeon at Preston.

Age.	Number of Young Persons Measured.	Average Height.	Total of Mean Height in both Sexes.
		foot. inch.	foot. inch.
From 14 to 15 years,	117 male sex.	4 8½	4 8¾
" " "	140 fem. "	4 9	
" 15 to 16 "	82 male "	4 10⅛	4 10⅜
" " "	106 fem. "	4 10⅝	
" 16 to 17 "	43 male "	5 0⅛	5 0⅛
" " "	90 fem. "	4 11⅛	
" 17 to 18 "	47 male "	5 0	5 0
" " "	112 fem. "	5 0	

In order to compare the height at similar ages in England and in Belgium, we have expressed, in the following table, the ciphers given in the Penny Magazine in metres; and in order to get, for instance, the height of a child of nine years of age, we have taken the mean of the child's height in the age between 8½ and 9 years, and the height of the age of 9 and 9½, &c. &c.

Age.	English.		Belgians.	
	Boys.	Girls.	Boys.	Girls.
	metres.	metres.	metres.	metres.
9 years, -	1·202	1·191	1·219	1·195
10 " -	1·234	1·232	1·275	1·248
11 " - -	1·273	1·267	1·330	1·299
12 " -	1·306	1·310	1·385	1·353
13 " - -	1·338	1·347	1·439	1·403
14 " -	1·400	1·403	1·493	1·453
15 " - -	1·457	1·420	1·546	1·499
16 " -	1·511	1·502	1·594	1·535
17 " - -	1·530	1·518	1·634	1·555

Of measurements which have been made in Cambridge, we have seen that, in general, Englishmen at the time of their complete bodily development are taller than the Belgians; yet we drew our conclusions also from the measurement of students. The results we communicate here are derived from young labourers.

From this it may be seen that the heavy work in manufactories forms an obstacle to the bodily development of men. We have already obtained analogous results from the numbers communicated by Mr Cowell, which refer to the youth employed in manufactories, and from others who were not so employed. In the following table we have placed together notices which, up to the present moment, we have procured on this matter; they may thus be compared with the preceding observations, and it is to be desired that in other countries similar observations should be made.

[*Note.*]—We have also inquired into the law of growth of plants, and in several animals; and although we have not as yet had time to pursue them with the requisite care and to the necessary extent, they have already afforded very interesting results, and some remarkable points of comparison.

Mean Height of Youth from 9 to 25 Years.

Age.	Boys.*		Girls.*		English.†	Scotch.†	Irish.†	Belgium.‡	
	Working in Manufactories.	Not so Employed.	Working in Manufactories.	Not so Employed.				Boys.	Girls.
	metres.	metres.	metres.	metres.	metres.	metres.	metres.	metres.	metres.
9 years, - -	1·222	1·233	1·218	1·230					
10 " - -	1·270	1·286	1·260	1·254				1·227	1·200
11 " - -	1·302	1·296	1·299	1·323				1·282	1·248
12 " - -	1·355	1·345	1·364	1·363				1·327	1·275
13 " - -	1·383	1·396	1·413	1·399				1·359	1·327
14 " - -	1·437	1·440	1·467	1·479				1·403	1·396
15 " - -	1·515	1·474	1·496	1·502	1·635	1·643		1·487	1·447
16 " - -	1·565	1·605	1·521	1·475	1·689	1·696		1·559	1·475
17 " - -	1·592	1·627	1·535	1·542	1·714	1·724		1·610	1·500
18 " - -	1·606	1·775	1·593	1·645	1·729	1·739	1·744	1·670	1·544
19 " - -					1·740	1·750	1·762	1·700	1·562
20 " - -					1·744	1·754	1·772	1·706	
21 " - -					1·747	1·757	1·777	1·711	1·570
22 " - -					1·750	1·757	1·779		
23 " - -					1·750	1·760	1·784		
24 " - -					1·750	1·760	1·784		
25 " - -					1·750	1·760	1·784	1·722	1·577

* These results were ascertained in the neighbourhood of Manchester.

† These by Mr Forbes of Edinburgh.

‡ These by measurement of the wealthy class.

No. XII.

ADDITION TO THE FOURTH SECTION OF THE SECOND BOOK.

Remarks on the Quality of the Blood, according to the Age and Sex.

We are of opinion that all the relations which may vary in different individuals, either according to age or to sex, ought to be subjected to investigations such as the preceding. In this respect the quality of the blood merits our attention, for it undergoes very remarkable changes. The investigations of MM. Lecanu and Denis have furnished, in respect to these variations, the following results:*—

We observe, in the blood of the fœtus, which is necessarily the same as that of the placenta, comparatively little serum and much cruor; this quality of the blood also continues for some time after birth, and seems to remain the same so long as the new-born child preserves the peculiar rosy colouring, that is, for two or three weeks.

From this period to about the fifth month, the quantity of serum increases and that of the cruor decreases.

From the fifth month to the fortieth year, the quantity of cruor increases and that of the serum decreases.

From the fortieth to the fiftieth year, again, the serum increases and the cruor decreases.

The following are the mean proportions obtained by a comparison of the blood of individuals of different ages:—

			Proportions.	
7 persons from	5 months to 10 years,		830 Serum,	11 Cruor.
13 ..	.. 10 years	.. 20 ..	800 ..	14 ..
11 ..	.. 20 ..	.. 30 ..	760 ..	17 ..
12 ..	.. 30 ..	.. 40 ..	760 ..	17 ..
6 ..	.. 40 ..	.. 50 ..	760 ..	16 ..
8 ..	.. 50 ..	.. 60 ..	780 ..	15 ..
2 ..	.. 66 ..	.. 70 ..	790 ..	14 ..

These are the results at different periods of life.

As to the different quality of the blood in the male and female sex, M. Lecanu has found that in the male there exists comparatively less serum in the blood than in the female. He found, in the

	Blood of the Male.	Blood of the Female.
Maximum, - -	805·263 Serum.	853·135 Serum.
Minimum, - - -	778·025 ..	790·394 ..
Mean, - - -	791·944 ..	821·764 ..

The blood of the male has consequently 29·820 less serum than that of the female.

On the other hand, the proportion of cruor is greater in the male, as may be seen by the following table:—

	Blood of the Male.	Blood of the Female.
Maximum, - -	148·450 Cruor.	129·999 Cruor.
Minimum, - - -	115·850 ..	68·349 ..
Mean, - - -	132·150 ..	99·169 ..

Thus the blood of the male sex contains 32·981 more cruor than that of the female.

No. XIII.

ADDITION TO THE FIRST AND THIRD SECTIONS OF THE THIRD BOOK.

Remarks concerning the Highest Development of the Passions.

The author of a kind notice of our work, published in a periodical, considers the opinion very bold that the passions of men attain their highest energy at the twenty-fifth year, and that, consequently, those talents which presuppose the development of the passions, and especially imagination, ought to produce at this period of life the most distinguished works. With the view of opposing our opinion, the critic cites the instance of J. J. Rousseau, who began to write his best works when about forty. Even if this instance were completely applicable to the question, it proves nothing: as we see that even the most accomplished scientific men commit such mistakes, it cannot be often enough repeated, that the result of calculations of probability can only apply to masses, and cannot be applied to individual cases. J. J. Rousseau did not die at that age which is usually reckoned the mean duration of the life of man; and yet no one would think of doubting on that account the correctness and the real value of the bills of mortality.

* S. Lecanu—*Etudes sur le Sang Humain.* Paris: 1837. 4to. And Denis—*Recherches Expérimentales sur le Sang Humain*, p. 267.

No. XIV.

Extract from the Bulletin de l'Académie Royale des Sciences de Bruxelles. 1836. No. 5.

Remarks on the Influence of Age on Insanity, and on the Disposition for Crime, by M. Quetelet.

In my work on Man, and on the development of his faculties, I have endeavoured to lay before the public the few documents which science possesses concerning the age most liable to mental disease. The accounts of Paris, Caen, and Norway, the only ones I could procure, all agreed in showing that most diseases of the mind occur between thirty and forty. In order to be able to compare the results, I took the total of the insane as unity, and thus I deduced for the different periods of life the following proportions:—

	Paris.	Caen.	Norway.
Below 20 years, - - -	0·06	0·03	0·17
From 20 to 30 years, - - -	0·20	0·17	0·19
.. 30 to 40 .. - - -	0·24	0·29	0·21
.. 40 to 50 .. - - -	0·22	0·25	0·16
.. 50 to 60 .. - -	0·14	0·17	0·13
Above 60 years, - - -	0·14	0·09	0·14

Since the publication of the work containing these investigations, I have received, through the kindness of Sir Charles Morgan, some interesting communications regarding the statistics of the lunatic asylums in Ireland, collected by Mr Radcliffe. Amongst these notices, there is a tabular view of 5021 insane, whose age was extracted from the tables of the institutions. Besides this, I found in the work of Mr Porter—Tables of the Revenue, Population, &c., 1834—a view of the insane in bedlam, which likewise contains information regarding the age of the insane who were received into this institution and not considered incurable. According to this view, there were, in the years—

	Insane.	Mean Age of the Insane.
1830, - - -	201	37 years.
1831, - - - -	212	35 ..
1832, - - -	163	37 ..
1833, - - - -	184	26 ..
1834, - - -	217	36 ..

They remained in the institution an average period of 204 days. The age of 977 of these insane will be found in the following table, in which also the notices concerning Ireland have been entered.

Age.	Bethlem Hospital.		Irish Lunatic Asylums.	
	Insane.	Proportion.	Insane.	Proportion.
Below 20 years, -	61	0·06	500	0·10
From 20 to 30 years,	261	0·27	1551	0·31
.. 30 to 40 ..	292	0·30	1234	0·25
.. 40 to 50 ..	203	0·21	930	0·19
.. 50 to 60 ..	107	0·11	609	0·12
Above 60 years, -	53	0·05	138	0·03
Total, -	977	1·00	5021	1·00

It may be seen that the numbers of the Bethlem Hospital agree pretty well with those of France and

Norway, according to which most insane exist between the years of thirty and forty; as far as Ireland is concerned, the maximum in this country appears somewhat earlier. However, we must not conclude from the circumstance that "in general the greatest number of insane are to be found between thirty and forty years of age," that also at this age the greatest number of outbreaks of this disease occur. In order to ascertain the critical age, we must take into account the population and the number of individuals from the different classes given in our table. If we then take the average number of the ciphers for those countries of which we now speak, we find—

	Mean of the Insane in the above 5 Tables.	Distribution of the Population.	Proportion of the Population.
Below 20 years,	0·08	0·40	0·20
From 20 to 30 years,	0·23	0·17	1·35
" 30 to 40 "	0·26	0·14	1·86
" 40 to 50 "	0·21	0·11	1·91
" 50 to 60 "	0·13	0·09	1·44
Above 60 years,	0·09	0·09	1·00
	1·00	1·00	1·00

Thus it appears, that if we have regard to the population, and if we may be allowed to generalise the preceding results, *that the age between forty and fifty, or rather the fortieth year, is the period of life most subject to insanity.* In my essay on the Natural Philosophy of Society, I have shown that it is the same age in which most masterpieces of dramatic literature are produced in England and France, with this only difference, that England has in that respect a slight advantage over France. May we draw from this the conclusion, that the human mind is affected by diseases which are in proportion to its energy or exercise? This is still a problem, the solution of which is of great importance to society, and which unquestionably will be elucidated by the theory of probabilities which is founded on correct observation.

To the preceding question another may be added, which perhaps is even of more direct importance to society, the question, namely, What influence does age exercise over the disposition to crime? Several years ago I had shown, what the results of the following years have confirmed, that in France not only the number of crimes committed by individuals at certain periods of life almost always recur in the same proportions, but also that the proportions, notwithstanding their difference, are equally regular, if we draw a distinction between the different kinds of crimes on account of the sex of the criminals.

Heretofore, the documents which have been afforded by the administration of justice in Belgium have shown that the same regularity is also to be found with us; further, that in like manner the proportion of the sexes in criminals of different ages is in both countries nearly the same. From this correspondence of the results, we must therefore conclude that they are either reproduced year after year by a kind of miracle, or that they arise in a very great similarity of the social organisation in the two countries, in so far at least as regards those relations which influence crime. I have even observed that this phenomenon of moral life shows a greater regularity of occurrence than many phenomena of the material world.

A short time ago, documents have been published regarding the administration of criminal law in the grand-dutchy of Baden, which likewise furnish information respecting the age of the accused individuals;* and here again we meet with a remarkable correspondence of numbers, as may be seen from the following table:—

Age of the Accused.	Grand-dutchy of Baden: 1833.		France 1826-1829.
	Number of the Accused.	Proportion.	
14 to 18 years,	93	0·06 } 54	0·53*
18 to 30 "	784	0·48 }	"
30 to 40 "	381	0·24	0·23
40 to 50 "	211	0·13	0·14
50 to 60 "	106	0·07	0·06
60 to 70 "	33	0·02	0·03
70 years and above,	1	0·00	0·01
	1609	1·00	1·00

At what conclusion must we then arrive from so many documents which show so surprising a correspondence, although the ciphers are not very large? Must we entirely deny the free will of individuals, or must we suppose that it is without influence if we consider the phenomena of society on a large scale—as happens with the phenomena of the material world, where the internal action and reaction of a system do not disturb the equilibrium? This at least seems to be deducible from observation, if we do not perhaps prefer blindly to reject what it teaches us.

That which in my opinion modifies the results of different years, is not the influence of free will, as far as it can in fact be active, but rather the changes which society undergoes by degrees, through the gradual reform of its institutions—as through the oscillations of its habits and wants—changes which fortunately take an extremely slow course. If the social organisation could experience sudden changes, the influence of free will would continually defy our foresight, which is of course based on a knowledge of past ages. Of what use would it be then to introduce wise institutions, or to think of a reform in our legislation? Experience convinces us more and more that, with the same social organisation, we may be prepared year after year for the return of the same moral phenomena. Violent changes or revolutions may indeed take place, which, for the moment, disturb the common course of things, the influence of which may even produce lasting modifications; but there is the same relation to be here observed as in epidemics and famines with regard to mortality. Do we reject the tables of the mean duration of life, upon which insurance companies found their speculations, on account of the disturbances their operations may experience from the occurrence of an epidemic? We may even foresee a revolution, or any other important shock society receives, at least to a certain extent; whilst this is not the case as regards an epidemic, and most other calamities which devastate mankind. Every country has its table of mortality, as every country must have its table of disposition to crime; therefore, we cannot conclude that, if we had found regarding the influence of age upon crime in France, Belgium, and the grand-dutchy of Baden, the same results, we necessarily also should arrive at the same results in England. We may, perhaps, find others, but I do not hesitate affirming that the ciphers of 1835 will also recur in 1836, as the same ciphers have occurred year after year in France, always under the supposition that the state of society undergoes no remarkable change.

* *Uebersicht der Strafrechtspflege u. s. w.* Karlsruhe: 1834. 4to. (Account of the Administration of Criminal Justice, &c.) The celebrated jurist, Mittermaier, in communicating this remarkable work to me, had the kindness to express his opinion regarding the investigations in which I was engaged, in the following terms:—"I am convinced that the manner in which you view things, proceeding, as you do, by combining facts, is the only way in which we may hope to penetrate the mysteries of nature. All my investigations regarding the nature of crime lead me to the same results as yours, and the inferences which the legislature might draw from them are of the highest importance. It is a sad truth which you profess in your work, that it is society which prepares the crime. This truth is especially confirmed by the statistics of *recidive cases* (relapses.)

* The French tables do not follow the same divisions according to the age.

Mr Porter, to whom we owe very interesting statistic contributions, has, sometime ago, published the first accurate tables respecting the age of the accused throughout the whole of England, for the year 1834;* and his results agree with those of France, Belgium, and the grand-dutchy of Baden, in so far as the maximum of the number of criminals belongs to the same age.

Age of the Accused.	England: 1834.		France: 1826-1829.
	Accused.	Proportion.	
Below 16 years, -	2,604	0·12	0·02
From 16 to 21 years,	6,473	0·29	0·16
.. 21 to 30 ..	7,069	0·32	0·35
.. 30 to 40 ..	3,146	0·15	0·23
.. 40 to 50 ..	1,525	0·07	0·14
.. 50 to 60 ..	686	0·03	0·06
Above 60 years,	303	0·02	0·04
	21,806	1·00	1·00

A remarkable difference between the tables of England and those of France is to be found in the circumstance, that in the former country there is comparatively a much greater number of juvenile accused than in the latter. This is partly owing to the circumstance, that the English assizes have also to decide on most of those crimes which in France are brought before the correctional police. Before the bar of the latter there appear, however, far more juvenile accused than before the assize or criminal courts. On the other hand, there is in England a class of criminals who train up children as implements for theft and all kinds of petty larceny.† But if we set aside these two causes, and other deviations which render difficult the comparison between two countries whose institutions and laws are so different, I think I require to yield nothing of the views with which I concluded several years ago a paper on the disposition to crime, which the academy directed to be inserted in the seventh volume of its Transactions, namely, that this afflicting condition seems to be developed in proportion to the intensity of the bodily strength and the passions of men, attaining their maximum about the twenty-fifth year, the period when the body has nearly reached its full development.

Afterwards the intellectual and moral development, which follows a slower course, contribute to the decrease of this disposition to crime, which in after life becomes still more striking in consequence of the decrease of the bodily strength and of the passions.

No. XV.

Extract from the Bulletin de l'Académie Royale des Sciences de Bruxelles: 1836. No. 6.

Influence of Age upon the Disposition to Crime.

Addition to the foregoing remark:—"Every country has its table of mortality, as every country must have its table of the disposition to crime," &c. &c.

When I communicated, about a month ago, the preceding remarks to the academy, I did not imagine that so soon thereafter facts would confirm, in the most decided manner, my opinions. I was then citing the proportional number of criminals of different ages, as the result from the statistical documents regarding England for 1834; and observing that they agreed with those of Belgium, France, and the grand-dutchy of Baden only in so far as the age of 25 years appears as that when most crimes are committed, I had no hesitation in saying, that the differences which are exhibited in other respects are by no means accidental, but must be the result of the social organisation of England; so that, as their organisation has been the same in 1834 and 1835, the ciphers observed during the former year ought also to occur, without change, in the latter. The documents of the English tribunals for the year 1835, which Mr Porter kindly communicated to me a few days ago, have just now decided the question. The following is an extract from the two reports:—

Age of the Criminals.	Proportion for each Age.	
	1834.	1835.
12 years and less, - - -	1·78	1·67
12 to 16 years, - - -	9·82	9·70
16 to 21 .. - - - -	28·83	29·65
21 to 30 .. - - - -	31·49	31·92
30 to 40 .. - - - -	14·01	14·01
40 to 50 .. - - - -	6·79	6·69
50 to 60 .. - - - -	3·06	3·24
60 and above, - - -	1·35	1·39
Age unknown, - - - -	2·87	1·91
Total, - - - -	100·00	100·00

These results, which differ considerably from those of France, agree, as we see, with each other in a remarkable manner; especially if we take into account that we have not to refer to Poisson's *Law of great numbers*. These were, in fact, during the two years the documents of which we have compared, founded on 22,451 and 20,731 criminals: this makes, according to Mr Porter—

In 1834, - - 1 criminal to 619 inhabitants.
.. 1835, - - - 1 .. .. 631 ..

The same regularity appears, also, in respect to the sex of criminals; for of 100 criminals, there were

84 men and 16 women in 1834.
83 .. .. 17 .. .. 1835.

The same regularity is also observed in other relations which come under our view. Thus we find, for instance, if we distinguish between the different crimes,

	1834.	1835.
Crimes against person, - - - - -	10·94	9·72
.. .. property, with violence, -	6·50	6·53
.. .. .. without violence,	73·97	74·66
Injury to property, - - - - -	0·72	0·75
Forgeries, &c., - - - - - - -	1·92	1·78
Crimes not included under the preceding categories, - - - - -	5·95	6·56
Total, - - - - -	100·00	100·00

This regularity is certainly as great as that which has been observed in the annual number of births and deaths, and still greater than that which has been observed in the recurrence of certain phenomena considered as purely physical. England, then, forms no exception to the following thesis: "*There is a budget which is paid with frightful regularity—a budget, namely, of prisons and scaffolds.*" I repeat once more, because I attribute a great importance to this observation, that "Human society, considered on a large scale, exhibits laws similar to those which regulate the material world;" that the greater the number of observed individuals may be, the more will disappear all bodily and intellectual peculiarities; and the series of general phenomena, by means of which society erects and maintains itself, predominates with remarkable regularity in their recurrence. Thus the possibility may be explained of analysing the different faculties of men in an inductive manner; and what in future will be wanting to us are, not methods of observation, but *observations* made in sufficient number and with sufficient care to claim full confidence for the deduced results.

* Tables showing the Number of Criminals Offenders in the Year 1834, &c.

† The cause which likewise must influence the results respecting the number of juvenile criminals, is, that the population of England has proportionally more children than that of France. From the tables of population for the two countries, it results, that in England, for 100 below 15 years, there are only 150 adults, whilst in France there are more than 200.

TRANSLATOR'S APPENDIX.—PHYSIOLOGICAL AND PATHOLOGICAL STATISTICS.

It was originally my intention to have added extensively to the admirable work of M. Quetelet, now submitted for the first time to the criticism of the British public; but two considerations have induced me to lay aside this idea, at least for the present. The first is, that accurate and official details, upon either general or national statistics, are not yet procurable, to a proper extent, in Great Britain. Secondly, the additional matter, even admitting it to be perfectly accurate, which could scarcely have happened, must to a certain extent have led the attention of the reader from the main object—the leading idea, if I may so speak, of the work—that bright and original conception of a great mind, which those who have perused the preceding pages must now fully understand.

Hitherto the attempts to apply to human physiology and pathology the science of numbers and weight, have neither been very numerous nor very successful. I shall merely select a few instances as illustrative of the principles advocated by M. Quetelet.

I.—PULSATIONS OF THE HEART.

The left ventricle or cavity of the heart acts as a powerful piston, and by its contractions discharges into the great artery of the body a certain quantity of arterial blood at each contraction. These contractions constitute, in fact, the pulse of the heart; but as the blood so discharged passes rapidly along the arteries to every part of the body, it is usual for the physiologist, and more especially the medical man, to reckon the number of these contractions at some of the more remote arteries, and the radial artery at the wrist is for many reasons the vessel usually selected. The phenomenon called the *pulse*, is erroneously supposed by many to reside in the arteries; but it is, in man at least, dependent solely on the heart's action and on the pressure of the observer's finger. It will now be understood, then, that by the number of the "pulsations" is meant the number of contractions which the left ventricle of the human heart performs in a given time.

The statistics of these pulsations, also of the number of respirations, had not escaped the observation of medical men. The reader is by this time aware of the extent of the valuable researches of M. Quetelet on these points—correct so far as they go, but requiring modification in consequence of an important element or two having been overlooked in the inquiry.

About one hundred years ago, Dr Bryan Robinson* made many accurate observations respecting the human pulse. If Kepler was the first to endeavour to arrive at the "constants" of the human pulse, yet he probably failed to discover that remarkable law, so clearly stated by Dr Robinson, which rests on the influence of posture (and muscular action generally) over the number of the human pulsations. "I took," says he, "the pulses in a minute, and measured the lengths of a great number of bodies. I took the pulses when the bodies were sitting, that they all might be situated alike with respect to the horizon; and in the morning before breakfast, that their hearts might be as free as possible from the influences of all disturbing causes; and when I had got a very large stock of observations, I took the means of the pulses." Unfortunately, he has not published the tables of observations on this point—a great neglect in an original observer, rendering it impossible for future experimenters to verify his observations. Instead of this, he says that he found those means "to be nearly as the biquadrate roots of the cubes of the lengths of the bodies inversely." Language of this kind has happily disappeared from most modern physiological works.

In the following table he lays down two other laws of the human pulse, tending to prove that the quickness of the pulse is, to a certain extent, inversely as

Ages in Years.	Length in Inches.	Pulse from Observation before Breakfast, and Sitting.	Pulse by Theory.
	72	65	65
	68	67	68
	60	72	74
14	55	77	79
12	51	82	84
9	46	90	91
6	42	97	97
3	35	113	111
2	32	120	119
1	28	126	132
½	25	137	144
0	18	150	184

the *age* and *height*. Having exemplified these laws of the pulse by a variety of observations and remarks, he next attempted to measure the effects of *diet and stimulants*, and of the *time of day*; but in this he failed, as was shown in 1812-14 by Dr Knox, whose inquiries and experiments led to the following conclusions:—

"1. That Dr Bryan Robinson was the discoverer of the 'differential pulse in man;' that he described it perfectly, and ascribed it to its real cause.

2. That he appreciated correctly enough the influence of food, and other disturbing causes of the heart's action, but that he knew nothing of the precise nature of the laws regulating these actions, not having submitted them to any statistical inquiry.

3. He first proved indisputably, that from birth to adult age, the rapidity of the pulse constantly declines, and he has given an accurate statistical table to prove this.

4. He endeavoured to show, by the same numerical method, that the rapidity of the pulse was inversely as the height of the person: or, to give an example, let A be five feet, and let B be six feet, then the pulse of A is to that of B as 72 to 65. But this table is not carefully drawn up, and the actual conclusions are not legitimate, though the law may be a correct one.

* A Treatise on the Animal Economy. Dublin: 1732.

5. He suspected a diurnal movement in the rapidity of the pulse; namely, that it decreased during sleep, and increased from morning until night. With several of his conclusions I do not agree.

Lastly, He attempted to ascertain, statistically, the effects of muscular motion on the pulse *in health*; the ratio of the pulsations to the inspirations; and the immediate result on the heart's action, of a temporary deprivation of air."

The true nature of the fourth law, regulating the human pulse, was discovered by Dr Knox in 1812–13: he calls it "*the diurnal revolution of the pulse*," and he proved that there was not only a *natural, numerical, diurnal revolution in the heart's action*, but that there existed a fifth law, namely, "a diurnal revolution in the *excitability* of the heart to stimulants of all kinds." These remarkable laws being opposed to the received medical notions and physiological theories of the day, were much disputed; but they have been completely proved by subsequent observers. The following remarks, quoted from his Memoirs, will readily explain these laws to the general reader:—

"The question of an average pulse for any particular age can only be put, at least in this form, by those ignorant to a great extent of the physiology of the pulse. Systematic writers on physiology, by stating such questions and replying to them, display a desire to satisfy the general reader at the expense of truth. The pulse varies every hour of the day and night, and after every meal; it is extensively influenced by merely rising from the sitting to the erect posture; and how, without a special attention to these circumstances, any one can arrive at an average pulse, it is somewhat difficult to imagine. Nothing can be more vague and more unsatisfactory than the following table:—

Average of the Human Pulse at Different Ages, according to Bryan Robinson.

Age.	Length in Inches.	Pulse.
At birth,	18	150
" ½ year,	25	137
" 1 "	28	126
" 2 "	32	120
" 3 "	35	113
" 6 "	42	97
" 9 "	46	90
" 12 "	51	82
" 14 "	55	77
	60	72
	68	67
	72	65

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		Before birth,	128		
At birth,	130 to 140			At birth,	140
" 1 year,	120 to 130	At 1 year,	124	At 1 year,	120
" 2 "	100 to 110	" 2 "	110	" 2 "	100 to 110
" 3 "	90 to 100	When the first			
" 7 "	85 to 90	teeth drop out,	86		
" 14 "	80 to 85	At puberty,	80	At puberty,	80
Adult age,	75 to 80	At manhood,	75	Adult from	70 to 75
First old age,	65 to 75	Old age, about	60	Old age,	60
Confirmed do.	60 to 65	Scarcely found it twice alike.			

Here the oldest writer is not only more minute, but approaches perhaps nearest to the truth.

Such tables as the above, are, for the most part, slightly varied copies of each other, and in respect to them I would make the following remarks:—

No mention is made how the averages of these three last tables were struck. We are left to guess, 1st, at what time of the day the pulse was noted, and if in all the individuals at the same time of day; 2dly, in male or female; 3dly, sitting, lying, or standing; 4thly, before or after meals; 5thly, morning, noon, or night; 6thly, whether sleeping or waking.

A little reflection clearly shows that there can be no such thing as an average pulse, unless counted under circumstances precisely similar in all the individuals experimented on; and even then we should only obtain the average for that particular hour and time of day. This would be an average pulse in a certain sense. In the absence, however, of such data, the practical utility even of which I question, there still are some, imperfect as they are, which merit attention.

In order to arrive at even an attempt at a fair average, we are forced to go back to Dr Robinson's Treatise, written nearly a hundred years ago, and find it to contain the only approach at an analysis of this subject. He gives, in Table II., the average pulse of two men at every hour of the day (whilst sitting), from 8 A.M. until 11 P.M., taken for several weeks: the mean of these waking hours was—for A, 76; for B, 78. But still there is a meagreness of detail, and a narrowness of observation, rendering it impossible to base, on such observations, any important conclusion.

The mid-day pulse of 25 young gentlemen, taken between the hours of 12 and 2, in July 1836, was as follows:—

No.	Age.	Height.	Pulse Sitting.	Pulse Standing.
1. H.	21	5 feet 5½ inch.	66	64
2. H.	22	5 " 7 "	74	82
3. R.	27	6 " 1¼ "	70	76
4. H.	18	5 " 6 "	68	72
5. G.	19	6 " 0 "	56	56
6. M'G.	18	5 " 5 "	74	76
7. S.	20	5 " 7½ "	68	74
8. W.	20	5 " 10 "	82	82
9. T.	17	6 " 0 "	96	96
10. E.	17	5 " 5½ "	61	70
11. H.	20	5 " 0 "	68	68
12. W.	20	5 " 5 "	60	72
13. W.	20	5 " 8 "	86	84
14. S.	22	5 " 6 "	68	76
15. D.	18	5 " 8 "	76	82
16. F.	22	5 " 3½ "	66	68
17. W.	19	5 " 6 "	64	64
18. C.	18	5 " 9 "	84	82
19. K.	39	5 " 11 "	66	74
20. B.	24	5 " 11 "	52	56
21. T.	20	5 " 11½ "	69	81
22. D.	17	5 " 7 "	84	86
23. S.	22	5 " 10 "	82	82
24. M'D.	16	5 " 8 "	80	80
25. O.	29	5 " 10½ "	70	72
Mean,	21		72·4	75·4

This table, which was drawn up with the greatest attention to accuracy, discloses some curious facts in the history of the pulse. So far as could be determined, all these young gentlemen were in good health, with one exception; and yet we find two, in whom the pulse constantly decreased on rising from their seat, and became accelerated on sitting down; being the very reverse of a law which all physiologists had thought to be universal.

Besides these two, in whom the pulse showed so singular a character, there were six others who had no differential pulse, that is, in whom the muscular action required to maintain the body erect did not accelerate the pulse a single beat.

Is there, or is there not, a "diurnal revolution" of the pulse in respect merely to numbers, independent of stimulation by food or exercise? Now, I fancy that this has been completely proved in my first memoir, published more than twenty years ago. But some have asserted that this morning acceleration and evening retardation depends altogether on the use of food and other stimulants, and that, were it not for these, the pulse would not rise early in the morning and fall towards evening, but would sink constantly. This opinion is incorrect, as the following table, given as a specimen of the experiments by which the exist-

ence of a differential pulse was established, will tend to show :—

Table showing the differential pulse, observed in Mr S., aged 20, morning and evening; proving a diurnal revolution, both as to numbers and as to excitability, altogether independent of food or exercise, and proving the morning pulse to be quicker than the evening one.

Date.	Hour.	Horizontal.	Sitting.	Standing.	Differential.
April 5,	10 P.M.	53	64	78	25
" 6,	7 A.M.	60	75	90	30
" 7,	7 A.M.	65	80	90	25
" 8,	10 P.M.	57	66	78	21
" 9,	7 A.M.	65	80	90	25
" 10,	10 A.M.	60	82	95	35
	10 P.M.	58	70	76	18

Average Differential Pulse.

Morning, - 28·7 Evening, - 21·3

	Horizontal.	Sitting.	Standing.
Average morning pulse,	- 62	78·3	90
Average evening pulse, -	56	67	77

The apartments occupied by Mr S. (a gentleman of the most regular habits and in excellent health) seemed to me cold, and exposed to the boisterous westerly winds of this climate. I have no doubt that the temperature of the room had fallen greatly during the night, otherwise the difference between the morning and evening pulse would have been still more marked.

The morning pulse was of course noted before breakfast.

Without doubt, were we to continue long without food, the pulse would first sink, and then become exceedingly quick on the slightest excitement. No one doubts this; but that the morning pulse is quicker than the evening one, altogether independent of any stimulants, is proved, I think, beyond a doubt by this and other tables.

The next question, which is a more important one in many respects, is as to the existence of a diurnal revolution in the excitability of the heart; by this I mean a varying susceptibility, according to the time of day, for a healthy powerful action of the heart, when influenced by food, exercise, &c.

The numerous observations detailed throughout this paper, and in my former memoir, published in 1814-15, may, it is hoped, settle this question with unprejudiced persons. The excitability of the heart diminishes regularly from an early hour until late in the evening. Indeed, I have reason to think that, since the publication of my first memoir in 1815, few have doubted this fact; and I beg leave, therefore, to refer at once to that memoir."

The following observations will explain to the reader the nature of the "elements" omitted by M. Quetelet:—

"I can nowhere find in the valuable works of M. Quetelet, that he was aware of the effects of position on the pulse, or of its diurnal revolution, or of the diurnal change in its excitability; and this lessens, I regret to say, the otherwise entire confidence I and all others would be disposed to place in the results arrived at by this profound and ingenious philosopher. In the tables, for example, constructed to determine the influence of sleep on the pulse and respiration, compared with the waking state, no mention is made of the time of day or night, nor of the position of the person whilst awake, whether horizontal, sitting, or standing upright. The pulsation of the person sleeping would, in all probability, be reckoned in the evening, at a time when the pulse sinks naturally, altogether independent of sleep.

Again, he found that in a male child from four to five years old, the pulsations and inspirations were—

Asleep.		Awake.	
Pulsations, - -	77·3	Pulsations, - -	93·4
Inspirations, - -	24·5	Inspirations, - -	29·3

In the construction of these tables, two great data have been neglected, namely, the position of the person and the time of the day.

If the pulsations and inspirations were reckoned during the night, as an index of the effects of sleep, then the effects of the time of day are mistaken for the effects of sleep; for at midnight the pulse numerically is low in a healthy and stout person, whether asleep or not, and the excitability of the heart is nearly at its zero. Again, the pulse would be counted at one time whilst the person was in a horizontal position, and at another time whilst sitting, or even standing. This would also make a difference of 10 or 12 beats, which M. Quetelet has not taken into account. I question much if any effects arise from sleep, excepting of a very trivial nature; but restlessness and watchfulness, arising from any cause, when the body ought to sleep and requires it, would produce a highly excited pulse, the result of weakness and temporary ailment.

In this climate, the temperature of our rooms often sinks very much during winter, and especially towards the morning;* with the temperature the pulse sinks, and this may be one cause why, as I have just remarked, some have doubted the fact of the pulse being quicker in the morning than towards evening.

The effects of a cold room in depressing the pulse, is such, that even the active exercise of writing fails to counteract it.

The following table shows that the pulse remained much depressed under circumstances in which it ought to have risen very much:—

1st December.

2 A.M.—In bed, - - - - - -	60
5 A.M.—Sitting and writing for some hours, (There was no fire in the room).	60
6 A.M.—Still writing, - - - - -	62
7 A.M.—Ditto, - - - - - -	60

Here the pulse ought, but for the cold room, to have risen very much, for the action of writing raises the pulse considerably; that of composition still more. Those whose minds are much occupied with business, are not *fair* subjects for experiments on the pulse.

The use or abuse of wine and spirituous liquors, renders all observations on the pulse inaccurate. These liquors, in my opinion, are purely medicinal. Their daily, or even frequent use in any climate, or in any quantity, I apprehend to be a great error in regimen, and can never be required. I think them directly opposed to the enjoyment of perfect health and strength."

I shall conclude these remarks by adding the general results:—

"1. The velocity of the heart's action is in the direct ratio of the age of the individual, being quickest in young persons, slowest in the aged. There may be exceptions to this, but they do not affect the general law.

2. The question of an average pulse for all ages has hitherto been determined upon insufficient data.

3. There is a morning acceleration and an evening retardation in the number of the pulsations of the heart, independent of any stimulation by food, &c.

* The thermometer being seldom above 61 or 62 degrees of Fahrenheit, even with a strong fire in the room. It is unnecessary to remark to any medical person that, if he sits before a strong fire, his pulse will rise almost at any time, and that if he sits still in a cold room until his feet feel chilled, his pulse will sink proportionally; hence, if possible, all observations on the pulse ought to be made in summer. I attribute to an inattention to the fact of the coldness of apartments in this country generally during the night and towards morning, why some have thought that there is no diurnal revolution of the pulse as to its numbers, independent of stimulation by food and otherwise; or, in other words, that the pulse will not accelerate towards morning spontaneously.

4. The excitability of the heart undergoes a daily revolution, that is, food and exercise most affect the heart's action in the morning and during the forenoon, least in the afternoon, and least of all in the evening. Hence we should infer that the pernicious use of spirituous liquors must be greatly aggravated in those who drink before dinner.

5. Sleep does not farther affect the heart's action than by a cessation of all voluntary motion, and by a recumbent position.

6. In weak persons, muscular action excites the action of the heart more powerfully than in strong and healthy individuals; but this does not apply to other stimulants—to wine, for example, or to spirituous liquors.

7. The effects of the position of the body in increasing or diminishing the number of pulsations, is solely attributable to the muscular exertion required to maintain the body in the sitting or erect position; the debility may be measured by altering the position of the person from a recumbent to the sitting or to the erect position.

9. The law of the differential pulse is not universal. There are exceptions to be found even in those in perfect health. It is also possible that there may be some in whom the diurnal revolutions of the pulse takes place only in consequence of the use of stimulants. But this has not been proved satisfactorily.

10. The most powerful stimulant to the heart's action is muscular exertion. The febrile pulse never equals this.

11. The law of relation between the inspiration and pulsation of the heart has been stated by M. Quetelet."

II.—CLIMATE.

Since the publication of M. Quetelet's work, the different effects of various climates on the sickness, mortality, and invaliding of British troops, have been carefully and admirably investigated by Major Tulloch.* These researches are not confined exclusively to British troops, as they include an inquiry into the effects of climate on the Negro or black troops in the British service, when removed from the tropical to colder but yet comparatively warm, or at least mild, regions of the earth. Previous to laying before the reader some of the more important results deduced by Major Tulloch, from the data placed in his hands by the unwearied exertions of Sir James Macgrigor (to whom the chief merit of these reports is due), I shall take the liberty of making the following observations.

The various climates of the globe may practically be arranged under two zones or belts—inter-tropical and extra-tropical, north and south of the equator. The extra-tropical regions may again be subdivided into two or three regions, which may be designated as warm, temperate, and cold or frozen. These respective regions differ much in climate, and, to a great extent, in their botanical and zoological sections, including man himself; for, whilst the tropical regions of the Old World have been inhabited from the earliest historic period by the Negro and other dark-coloured races, the warm climates have equally been held by the Pelasgic, Copt, Syrian, Arab, and Jewish (on the supposition that these are distinct races of men); the temperate by the Celtic and Saxon; and *probably* (for the fact is not certain) the cold or frozen by a race, the Fin and Laplander, differing from all the others. The following observations may conveniently form an introduction to the subject of emigration, which I shall discuss in the next section.

* See Statistical Reports ordered to be printed by the House of Commons.

The influence of climate over the health of Europeans of the Saxon and Celtic races, in tropical regions possessing no countervailing advantages, such, more especially, as *great elevation* (this being seemingly the only security), had been ascertained, at least practically, and on a great scale, long prior to Major Tulloch's researches. The first report of that gentleman referred to the West Indies. "The main object kept in view," says the major, "has been merely to determine the extent of sickness and mortality at each station, the diseases by which it has been induced, and such causes of these diseases as appear sufficiently obvious or tangible to admit of remedy." This report was followed by a second on the sickness, mortality, and invaliding among the troops in the United Kingdom, the Mediterranean, and British America; and this by a third on Western Africa, St Helena, the Cape of Good Hope, and the Mauritius.

It would appear, from these documents, that neither the Saxon, nor Celtic, nor mixed race, composing the troops of Great Britain, can withstand, even under the most favourable circumstances, the deleterious influence of a tropical climate. Disposed at one time to ascribe this sad result to the deplorable habits of intemperance, the besetting vice of all soldiers, I am now, though most reluctantly, compelled to admit that even temperance, however it may diminish the effects of the climate, and add to the chances in favour of the European, is by no means a permanent security. So far as regards the vast regions of the earth—the most fertile, the richest—the question as to their permanent occupancy by the Saxon and Celt—I mean as *Britain and France are now occupied*, or any other country, by its *native* inhabitants—will be regarded as settled by almost all who peruse these reports. The Anglo-Saxon is now pushing himself towards the tropical countries; Mexico has been invaded and partitioned; another battle of San Jacinto will shortly decide the fate of California; Central Mexico may follow, and Peru: but can the Saxon maintain himself in these countries—in Brazil, Columbia?—It is to be feared not. Experience seems to indicate that neither the Saxon nor Celtic races can *maintain themselves*, in the strict sense of the word, within tropical countries. To enable them to do so they require a *slave population of native* labourers, or of coloured men at least, and, in addition, a constant draught from the parent country. The instances of Cuba, Brazil, Mexico, Columbia, &c., where the Spanish and Portuguese seem to be able to maintain their ground, do not bear so directly on the question as many may suppose: for, in the first place, we know not precisely the extent to which these have mingled with the dark and native races; and, secondly, the emigrants from Spain and Portugal partook, in all probability, more of the Moor, Pelasgic, and even Arab blood, than of the Celt or Saxon.

But can these latter maintain their ground in the warm but extra-tropical regions of the earth? This question has not yet been fully answered. The Dutch have held possession of the Cape for nearly two hundred and fifty years, and have thriven well; have been free of disease, and multiplied exceedingly; *but*—and here comes the trying part of the question—*they have never laboured.* So with Algeria, which the Celt now attempts to colonise. Can he *stand labour in the field?* I doubt it exceedingly. Time alone can satisfactorily offer a solution of this question. Yet in many parts of Southern Australia, the Saxon and Celtic races can withstand labour in the field; but the experiment has been made on too limited a scale to warrant important deductions. But the cold and frozen regions they tolerate easily; it seems, indeed, to have been their congenial soil. Yet even here, fever, that scourge of the human race in all climates, commits sad ravages, and consumption of the lungs, by its numerous victims, causes many ever-recurring woes. But the reproductive principle is equal and

even much superior to all the diseases incident to these climates when inhabited by their indigenous races; not so, however, when the natives of tropical countries attempt to settle in them. Major Tulloch has proved that to them such climates are at least as disastrous as the tropical regions have proved to Europeans.

Before concluding these general remarks, I take the liberty of adding a single one in respect to acclimatation. When our troops occupied Walcheren and Flushing, during the deplorable scheme of invading Europe, the mortality assumed a most alarming character: it more than decimated the British troops, as it seems always to have similarly affected the French, the Dutch or Saxon inhabitants suffering, as was said, in no shape from fever, wondering at the mortality amongst the British, and asserting the climate to be as good as any other. Now all this, if true, must arise from acclimatation, seeing that both races, English and Dutch, arise from one parent stock; and it seems probable, therefore, that in progress of time the descendants of those very men who fell in the prime of life at Flushing, cut off by fever, might experience no ill effects from a climate to which they and their forefathers, for several generations, had become inured. This is merely thrown out as a hint for future inquirers. In the mean time, it has been proved that the mortality of our troops *increased* with length of residence in the West Indies and in all tropical countries, so that acclimatation is the reverse of salutary, at least in so far as regards the first emigrants. This law holds even in cold climates, such as Britain, at least in regard to large towns, a residence in which, by persons who have come to reside in them from the country, is constantly injurious to health; the longer always the worse. So much for the theories of medical men in respect to acclimatation; on careful inquiry they have proved (a not unusual occurrence) the reverse of truth.

Upon the whole, every reliance may be placed in the following deductions by Major Tulloch, the result of the first series of his inquiries.

"It has been supposed by many, that the diseases which prove so fatal to Europeans in these latitudes, especially fevers, are, if not a necessary, at least a very general, consequence of continued exposure to a high temperature. The sufficiency of this, however, as a uniform cause of sickness and mortality, is contradicted by the fact, that these vary considerably in different stations, the mean temperature of which is nearly alike. The range of the thermometer, for instance, in Antigua and Barbadoes, is rather higher than in Dominica, Tobago, Jamaica, or the Bahamas; yet we find that the troops in the latter stations suffer nearly three times as much as those in the former. There are also several instances in which epidemic fever made its appearance, and raged with the utmost virulence during the winter months—a circumstance not likely to have taken place if that disease had originated in increased temperature.

If elevated temperature was an essential cause of the mortality to which Europeans are liable in this climate, we might expect it in every year to produce similar effects; whereas, on the contrary, it appears, from the tabular statements in the preceding report, that the mortality in one year is sometimes twenty times as high as in another, without any perceptible difference in the range of temperature. This fact has already attracted the notice of some medical authors, who, in treating of yellow fever, adduce instances of various epidemics both within and beyond the tropics, during which the temperature was not above the average, and was sometimes even a little below it, and inversely where the existence of a high temperature was not attended with the prevalence of fever."*

In accounting for the unhealthiness of these colonies, great influence has been ascribed to excess of moisture.

That neither heat nor moisture can be the primary causes which influence the health of troops in the West Indies, is at once established by referring to the comparative view of the ratio of mortality in each year at every station, in which there are numerous instances of two adjacent islands, or even of two contiguous stations in the same island, being subject in an equal degree to the operation of these agencies; and yet, while the one has been desolated by the ravages of fever, the other has been enjoying a degree of salubrity equal to that of Great Britain.

Though heat and moisture are not the primary causes of fever, however, it is highly probable their operation tends in some measure to increase its intensity. The tables illustrating the influence of the seasons on the health of the troops in each station, show, that the greatest number of admissions into hospital, and deaths, has, on the average of a series of years (though not uniformly or equally in each year), taken place in those months when the greatest degree of heat was combined with the greatest moisture; and it may be observed, as a striking exemplification of this fact, that as the sun proceeds northward in the ecliptic, carrying heat and moisture in his train, the period generally termed the unhealthy season is later in the northern colonies than in those to the south.

The unhealthy character of that period of the year in which the greatest degree of heat and moisture is combined, is not, however, confined to the West Indies, but extends also to the East, as well as over a large portion of the northern temperate zone." Hence (Major Tulloch continues) these causes cannot specially render the West Indies so unhealthy. He also shows, by a comparison of stations, that neither can the rank vegetation of marsh or savannah be held the primary cause of West Indian maladies, and concludes with the following suggestion, which chimes in with an idea gradually acquiring more and more importance in medical statistics:—

"We are too sensible of the difficulty of the subject to venture on any theory of our own, which might on subsequent examination prove as futile as those which preceded it; but we merely wish to call the attention of such persons as may be disposed for further inquiry, to the circumstance that as yet no experiments have been made on the electrical condition of the atmosphere in the West Indies, during periods of epidemic; and as it is possible either an excess or deficiency of that powerful though unseen agent, may exercise an important influence on the vital functions, the subject seems worthy of attention. Heat and moisture are well known to be intimately connected with the development of electrical phenomena, and its influence on vegetation has also recently been established by experiment; consequently, if the prevalence of disease could be satisfactorily traced to that source, the reason why heat, moisture, and vegetation should have been mistaken as the causes, when acting only as auxiliaries, would be readily accounted for; and even should the results leave the cause of disease as undetermined as before, science will at least be benefited by the inquiry." The main practical result accruing from the researches of Major Tulloch, has reference to the effect of an elevated site on the health of a resident population within the tropics.

This is a point deeply affecting all such colonisation schemes as that proposed for the Darien isthmus, and other tropical localities. The report demonstrates, beyond a doubt, as regards remittent fever, "that, at an elevation of from 2000 to 2500 feet, settlers or troops are likely to be either wholly exempt from that disease, or to encounter it in so very modified a form, that the mortality from all causes will not, on the average of a series of years, materially

* Craigie—*Practice of Physic*, pp. 224, 226, 227.

exceed that to which an equal number of European troops would be subject in the capital of their native country. The diseases of the tropics seem, like the vegetable productions of the same regions, to be restricted to certain altitudes and particular degrees of temperature. The researches of Humboldt on this subject have tended to establish that yellow fever is never known beyond the height of 2500 feet, so that the nearer this boundary can be approached the more likely is the health of the troops to be secured."

In the second report by the same able statistician, we find the following deductions. They refer chiefly to the comparative salubrity of the Mediterranean stations, and those occupied by our soldiery in North America. After showing that the Mediterranean troops, from many causes *independent of climate*, are less exposed to the influences producing pulmonary disease, Major Tulloch proceeds thus:—

"When we find, notwithstanding all these circumstances apparently so favourable to the greater development of these diseases in Canada and Nova Scotia, that the troops there do not suffer from them to a greater extent than in the Mediterranean, it would manifestly be incorrect to attribute their prevalence in North America to the reduced temperature, and sudden atmospherical vicissitudes, incident to that quarter of the globe, seeing that the sufferings of the troops from these diseases are equally great in other climates where no such causes are in operation to induce them.

The caution necessary to be exercised in attributing to certain peculiarities of climate the prevalence of any class of diseases, is so strikingly exhibited by the proportion of rheumatic affections ascertained to have occurred among the troops in different colonies, that the following abstract will best serve to illustrate our observations on this head:—

	Admissions from Rheumatic Affections annually per 1000 of mean Strength.
Jamaica,	29
Nova Scotia and New Brunswick,	30
Bermudas,	33
Malta,	34
Ionian Islands,	34½
Gibraltar,	38
Canada,	40
Mauritius,	46
Windward and Leeward Command,	49
United Kingdom,	50
Cape of Good Hope,	57

Thus we find that in the mild and equable climate of the Mediterranean, or the Mauritius, the proportion of rheumatic affections is even greater than in the inclement regions of Nova Scotia and Canada, and that, though some of the provinces of the Cape of Good Hope have occasionally been without rain for several years, these diseases are more frequent in the dry climate of that command than in the West Indies, where the condition of the atmosphere is as remarkably the reverse; yet have extreme cold and atmospheric vicissitudes, coupled with excess of moisture, been assigned as satisfactory causes for their prevalence.

Considering that medical officers have hitherto possessed no means of comparing the influence of such diseases in different climates, any erroneous impressions which may be entertained on that subject, need not excite surprise. The information now collected, in regard to those prevalent among troops in every colony, will best serve to counteract such impressions, and afford a surer basis for future theories on that subject.

The results of this report, in regard to the relative prevalence, at different stations in British America, of remittent and intermittent fevers, add still further to the difficulty of establishing any uniform connexion between the presence of marshy ground and the existence of those febrile diseases to which the exhalations from it are supposed to give rise.

When, in subsequent reports, we come to investigate the operation of these diseases on the west coast of Africa and other colonies, we shall be able to adduce still more satisfactory evidence on this subject; in the mean time, we have felt it our duty to place the preceding facts in a prominent point of view, not for the purpose of establishing any particular theory, but to show how inadequate, in many instances, is the supposed influence of emanations from a marshy soil to account for the origin of these diseases. All the evidence obtained seems only to warrant the inference, that a morbific agency of some kind is occasionally present in the atmosphere, which, under certain circumstances, gives rise to fevers of the remittent and intermittent type; and that, though the vicinity of marshy and swampy ground appears to favour the development of that agency, it does not necessarily prevail in such localities, nor are they by any means essential either to its existence or operation.

Notwithstanding the doubt in which this branch of the investigation is still involved, we may venture, from the facts adduced in all the reports hitherto submitted, also to draw the conclusion, that when this morbific agency manifests itself in the epidemic form, its influence is frequently confined to so limited a space, as to afford a fair prospect of securing the troops from its ravages, by removal to a short distance from the locality where it originated. The history of the epidemic fevers at Gibraltar furnishes several remarkable instances of this kind; and we have also shown that, both in the West Indies and Ionian Islands, one station has frequently suffered to a great extent from yellow fever, while others, within the distance of a few miles, have been entirely exempt. In the epidemic cholera at Montreal and Halifax, which seems to have been in this respect somewhat analogous in its operation, we have also had occasion to remark the sudden cessation of the disease immediately on the removal of the troops, even to a short distance.

Instead of entering, therefore, into any discussion as to the causes which seem thus to limit the range of these epidemics to particular localities, we shall merely call the attention of medical officers to the fact, that on the outbreak of any serious disease of that nature, they may forthwith take into consideration the expediency of removing the troops from the locality where it originated—a measure which, whenever camp equipage can readily be procured, or the necessary accommodation obtained for them, is likely to be attended with but little temporary inconvenience, and may probably lead to the happiest results. We are aware that this suggestion is by no means a new one, having already been made and acted upon in various colonies, and we only advert to it now, for the purpose of bearing testimony to its apparent efficacy, and encouraging the adoption of it whenever circumstances will permit."

It may be interesting to many of our readers to have placed before them the following section on the "Influence of the Seasons in producing Sickness and Mortality among the Troops serving in North America":—

"The following table, illustrative of this subject, has been prepared from the returns of the Canada command. In Bermuda, Nova Scotia, &c., the dates of the admissions and deaths have not been recorded with sufficient regularity to admit of similar results being exhibited on as extensive a scale, and we have therefore confined our calculations to Canada, where, on account of its severity, we might expect to find the influence of winter on the health of the troops very strongly manifested:—

Table showing the Influence of the Seasons on the Sickness and Mortality of Troops in British America.

Months.	Admissions into Hospital in 20 Years of Troops in Canada.				Deaths in 20 Years of Troops in Canada.			
	By Acute Diseases.	By Chronic Diseases.	By Surgical Diseases.	Total by all Diseases.	By Acute Diseases.	By Chronic Diseases.	By Surgical Diseases.	Total by all Diseases.
January,	2,142	273	2,270	4,695	36	35	5	76
February,	1,918	227	2,026	4,171	31	23	3	57
March,	1,950	266	1,910	4,126	31	41	3	75
April,	2,551	294	2,038	4,883	33	39	1	73
May,	2,820	303	2,216	5,339	28	34	2	64
June,	3,063	298	2,479	5,840	58	37	9	104
July,	4,183	332	2,570	7,105	53	29	8	90
August,	5,144	354	2,678	8,176	103	21	4	28
September,	4,440	332	2,436	7,208	54	24	4	82
October,	3,055	241	2,280	5,576	38	27	6	71
November,	2,798	229	2,241	5,268	32	27	3	62
December,	2,252	197	2,072	4,521	35	23	3	61
Total,	36,316	3366	27,216	66,836	532	360	51	943

Thus, so far from the extreme severity of the winter in Canada operating very prejudicially to the health of the troops, we find, that in January, February, and March, when the minimum of the thermometer is many degrees below zero, the admissions from acute diseases, in which the influence of the seasons is most likely to be manifested, are not half so numerous as in July, August, and September, while those from chronic and surgical diseases are also lower, though not in the same proportion. In fact, so rare are the cases of sickness during winter, that not more than five and a half per cent. of the force come under treatment monthly; whereas, during July, August, and September, the monthly admissions average more than ten per cent. of the force. The ratio of deaths follows the same law, though the influence of the cholera during the summer and autumn of 1832 and 1834 increased the relative mortality at that period in a still greater proportion than the admissions.

The numbers reported sick on each muster-day, establish the same results in regard to the comparative salubrity of the winter season, not in Canada alone, but also in Nova Scotia, New Brunswick, and Bermuda.

	Mean Sick.		
	Canada.	Nova Scotia and New Brunswick.	Bermuda.
January,	124	72	28
February,	125	73	27
March,	124	72	30
April,	127	69	31
May,	123	78	30
June,	135	81	30
July,	144	82	32
August,	161	89	35
September,	162	84	33
October,	136	80	34
November,	124	67	32
December,	116	67	30

The general prevalence of febrile affections in Upper Canada during summer, might be supposed to account for the preponderance of sickness there at that season; but the same peculiarity extends also to the lower province, where febrile diseases are more rare. The same feature is observable among the civil inhabitants, as will be seen from the following abstract of the deaths in each month among the population of the several districts in the lower province, made up pursuant to an order of the House of Commons, dated 6th December 1832.

Deaths in each Month, from 1829 to 1831 inclusive, in the following Districts of Lower Canada:—

Months.	Quebec.	Montreal.	Three Rivers.	Gaspar.	St Francis.	Total in whole Province.
January,	974	1186	194	10	1	2365
February,	996	1241	244	16	2	2499
March,	1005	1325	292	10	3	2735
April,	1012	1293	318	6	..	2629
May,	978	1382	392	14	6	2772
June,	1129	1496	307	10	1	2943
July,	1464	2221	368	13	2	4068
August,	1395	2178	358	9	5	3945
September,	1147	1562	240	11	1	2961
October,	956	1392	215	15	..	2578
November,	950	1130	196	11	2	2279
December,	1070	1236	176	14	2	2498

Thus, even in the lower province, where intermittents are comparatively rare, June, July, August, and September, prove much more fatal to the civil inhabitants than the most severe of the winter months. The preponderance of mortality during that period may in a slight degree be accounted for by the influx of emigrants in summer, but is by far too great to be entirely attributable to that source; especially as the preceding abstract shows that it commenced prior to the month of April, while the ports were closed, and again fell to its former level in November, though many of the emigrants must have been still in the province.

In the state of New York, the seasons are found to exercise a corresponding influence on mortality, even when no visitation of yellow fever is experienced. From 1816 to 1826, the dates of decease of 24,852 persons were carefully recorded, and of every thousand of these deaths the relative proportion in each month was found to have been as follows:—

January,	75	July,	95½
February,	75½	August,	108½
March,	74	September,	109½
April,	73	October,	97
May,	72	November,	79½
June,	65	December,	75½
Total,	1000		

From all these facts, then, we are forced to arrive at the conclusion, that the constitution of the soldier, serving in these commands, is not affected in any material degree either by the extreme severity of a North American winter, or the sudden transitions he undergoes at that season, in passing from a heated guard-room, with the thermometer at 80 degrees, to his sentinel duties in the open air, under a temperature of 25 or 30 degrees below zero. On the contrary, the degree of health enjoyed by the troops during winter is not exceeded in any quarter of the globe.

The extreme rarity of sickness and mortality among the crews of vessels employed in the arctic regions, when exposed to a lower temperature, and still more sudden vicissitudes than any we have had to record, affords a striking illustration how little the constitution of our countrymen is likely to be affected even by the severest climate to which they are exposed.

While febrile affections of the intermittent and remittent types prevail during spring and autumn, bowel complaints during summer, catarrhs and all the train of pulmonary affections during spring and the commencement of the winter, there are comparatively few diseases of any kind during the severest part of the season, except those of the eyes, induced by the reflection of the snow, frost-bites from exposure, and a few cases of acute rheumatism and pneumonia, which, however, may be said to prevail with equal severity at other periods of the year."

The following table is also curious and interesting, as contrasting the soldier and the civilian.

	Ages.	By Tables of Scotch Benefit Societies.	By Tables of English Benefit Societies.	Returns of East India Company's Labourers in London.	Returns of Portsmouth Dock Labourers.	Returns of Woolwich Dock Labourers.
Constantly Sick per 1000,	20 to 30	11·4	15·4	13·6	19·9	23·4
	30 to 40	13·2	18·3	13·8		
		Days.	Days.	Days.	Days.	Days.
Average number of Days Sick in each Year,	20 to 30	4·1	5·6	4·02	7·3	8·5
	30 to 40	4·8	6·6	5·06		
Average Duration of each Attack of Sickness,	20 to 30	..	..	18·7	13·2	..
	30 to 40	..	..	22·6		

In the third report by Major Tulloch, the two extremes are happily contrasted, viz., Western Africa and the Cape of Good Hope; the latter, perhaps—nay, almost certainly—the healthiest climate in the world, the former proverbial for being a grave to Europeans. His details fully bear out the general character of the stations. In conclusion, it may be remarked, that, independent of all other important results, these reports are peculiarly valuable from the ample refutation they afford, to all minds open to conviction, of the more generally received medical theories in respect to the causes of many fatal and harassing diseases. They may also prove of much practical benefit, in freeing the minds of emigrants from those terrors which the very thought of particular localities has long been apt to induce. Rheumatism and ague rise to the mind, whenever men think of a Canadian winter; but we find that, in reality, the soldiery in the Mauritius suffer more severely from that disease than they do in British America. In short, Major Tulloch's elaborate researches lead to the conclusion, that atmospheric causes, operating on all climes in common, and modified only to a comparatively slight degree by local circumstances, form the great source of the morbific influences affecting mankind. When this point is more fully investigated, and fitting remedial means discovered, emigration will be stripped of half its difficulties, and a new lease given to civilised man, as it were, of a large portion of the globe, of which at this moment he can scarcely be called the occupant.

END OF TREATISE ON MAN.

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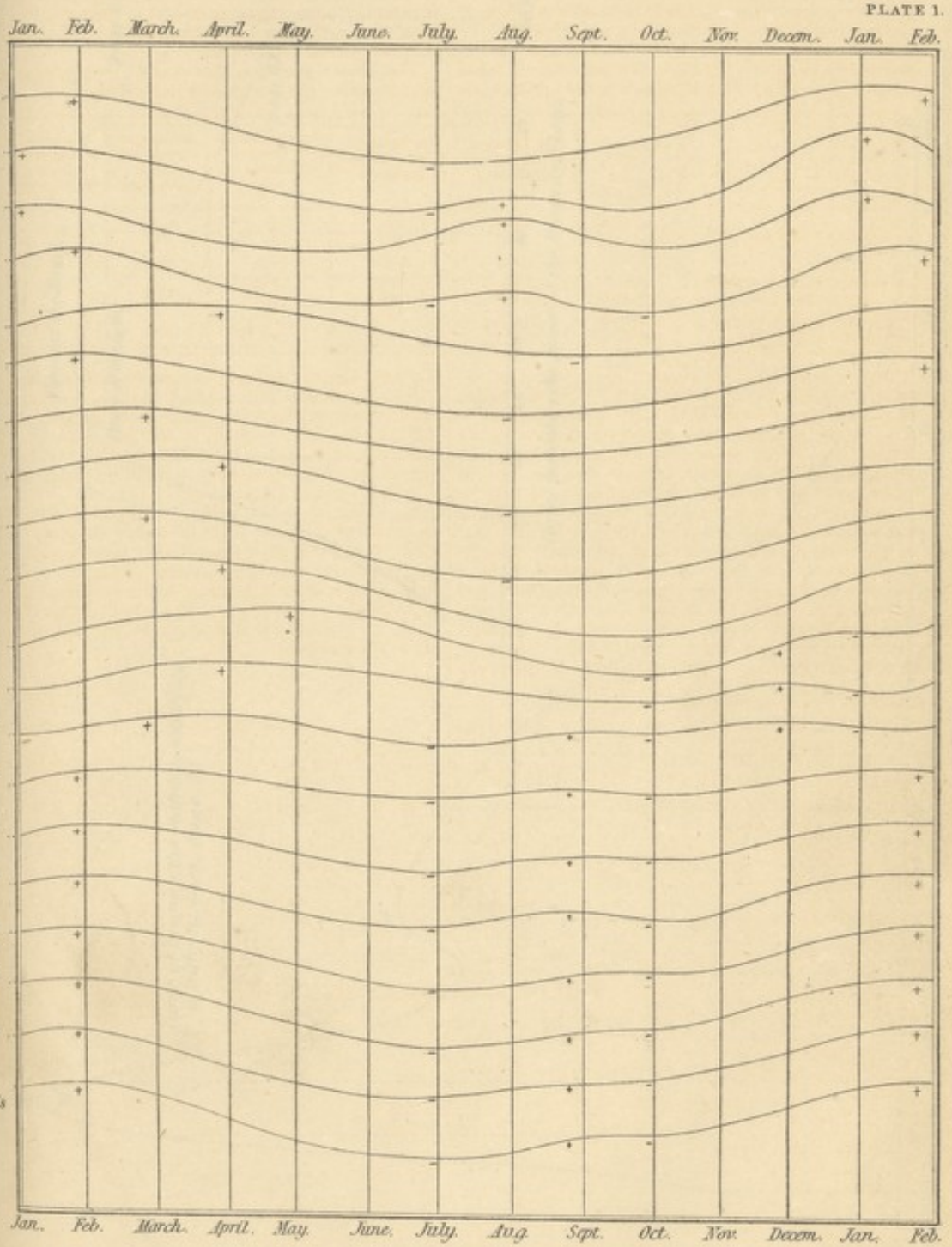
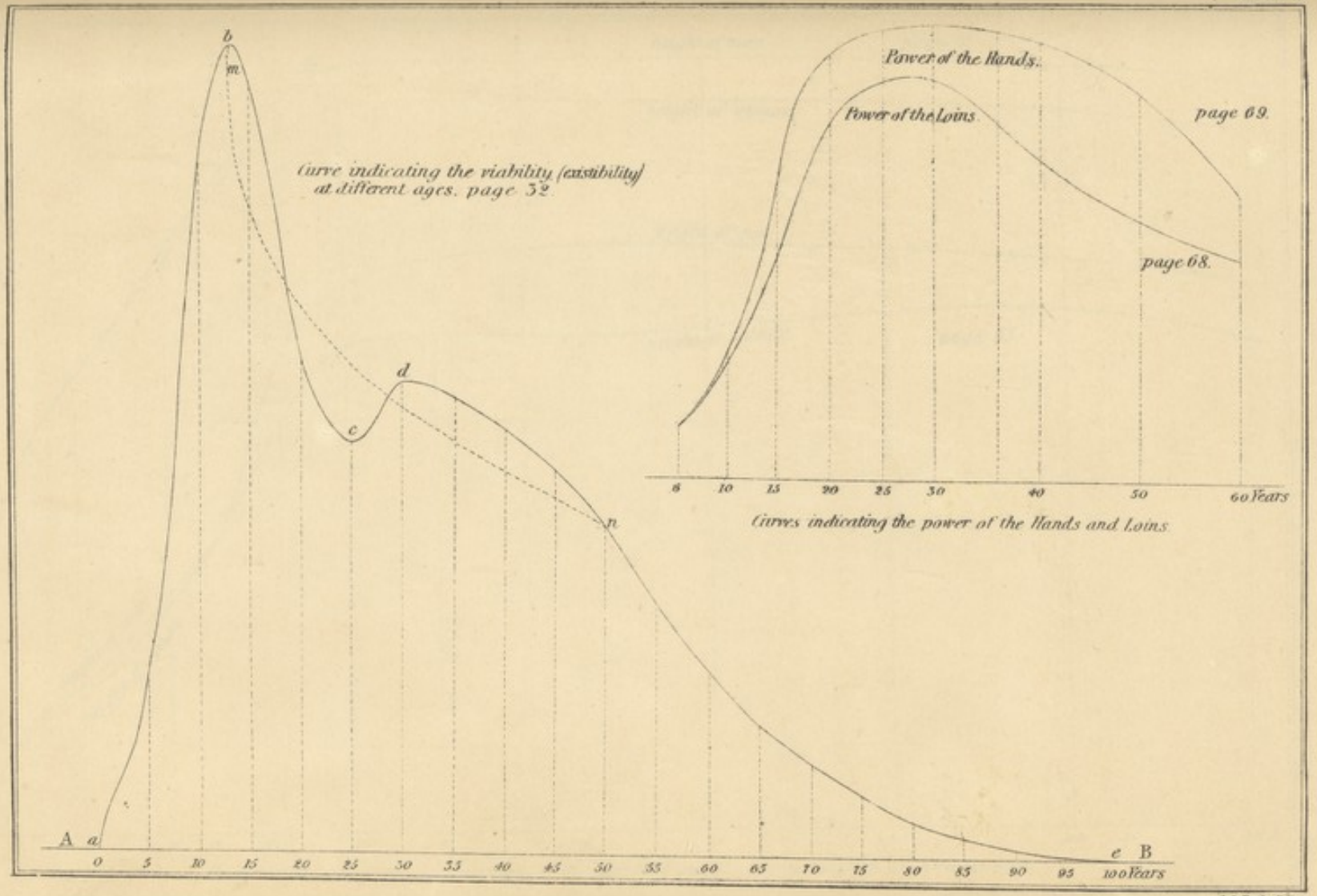


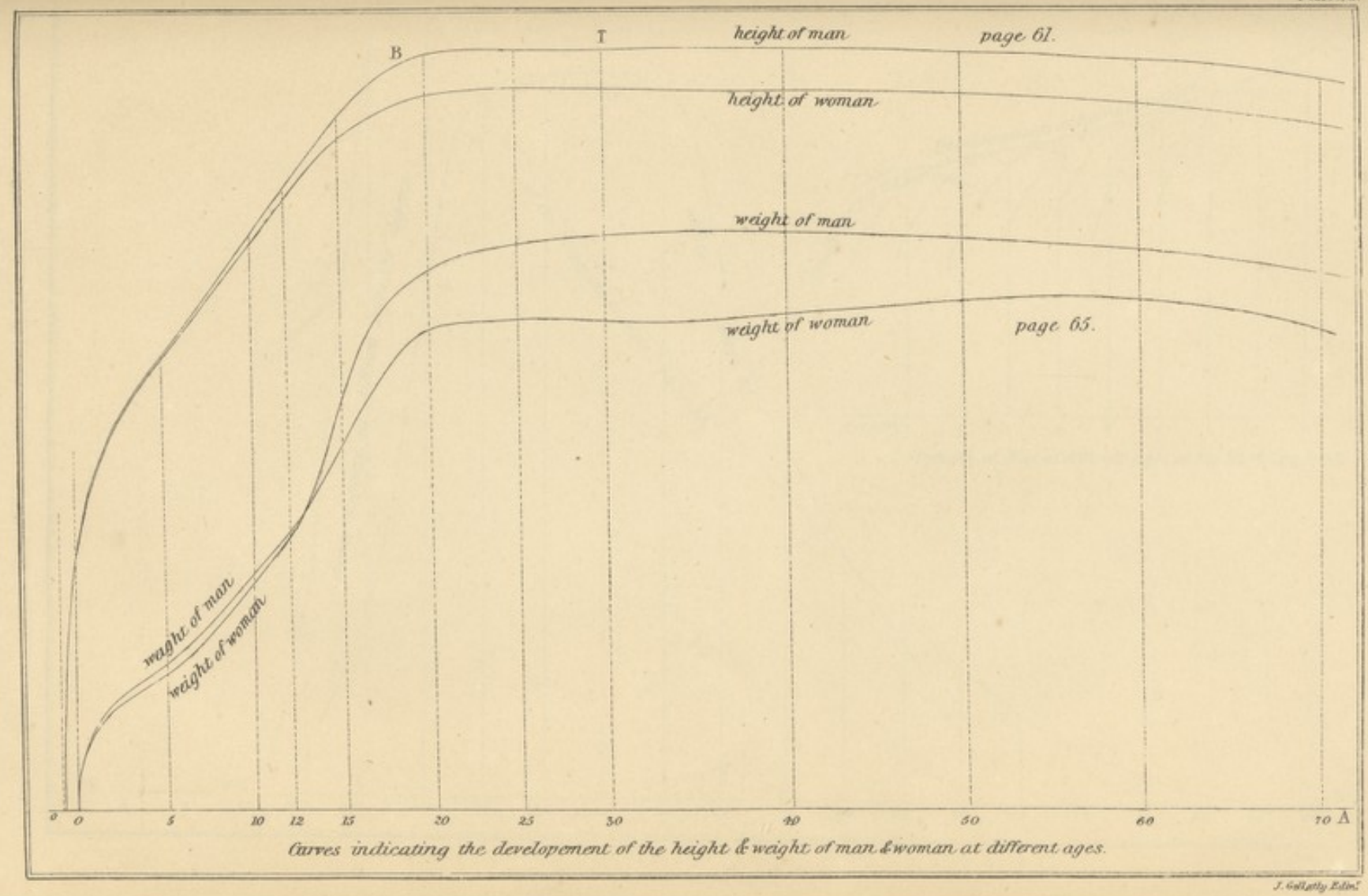
Lines indicating the Mortality of each Month for different ages. page 36.

J. Gellatly Edin.r



Curves indicating the power of the Hands and Loins.

J. Gellatly, F.din.



Curves indicating the developement of the height & weight of man & woman at different ages.

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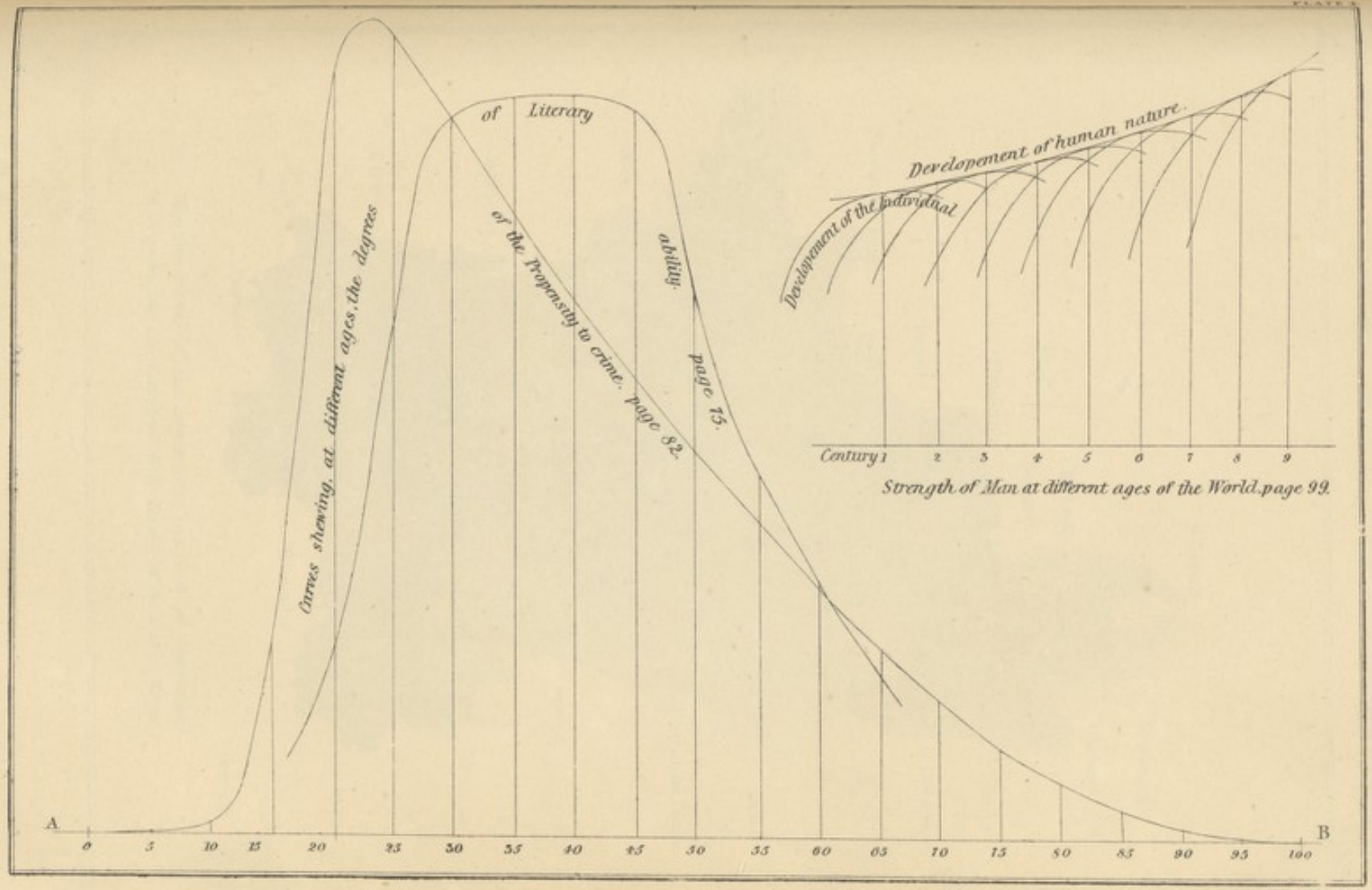

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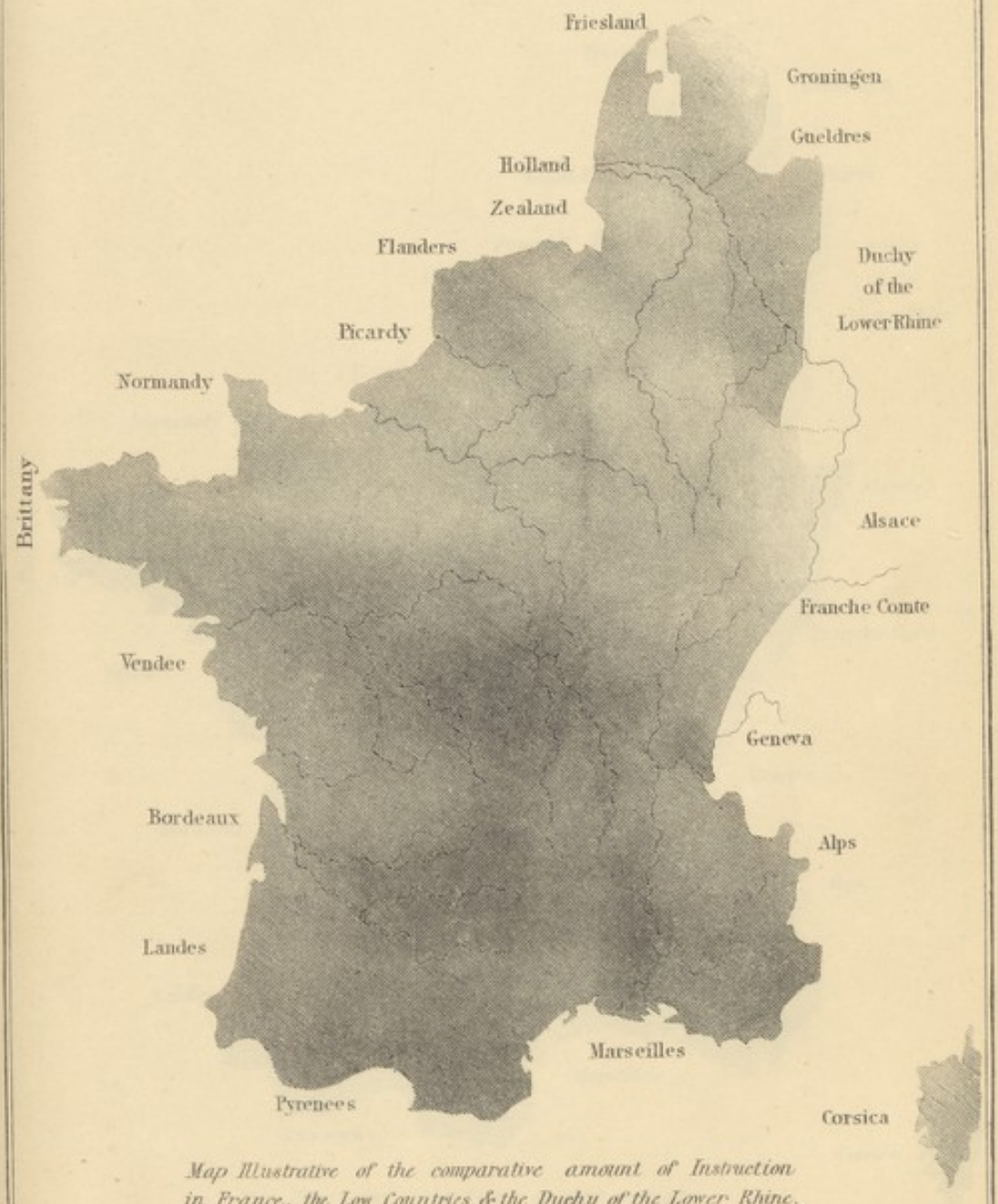
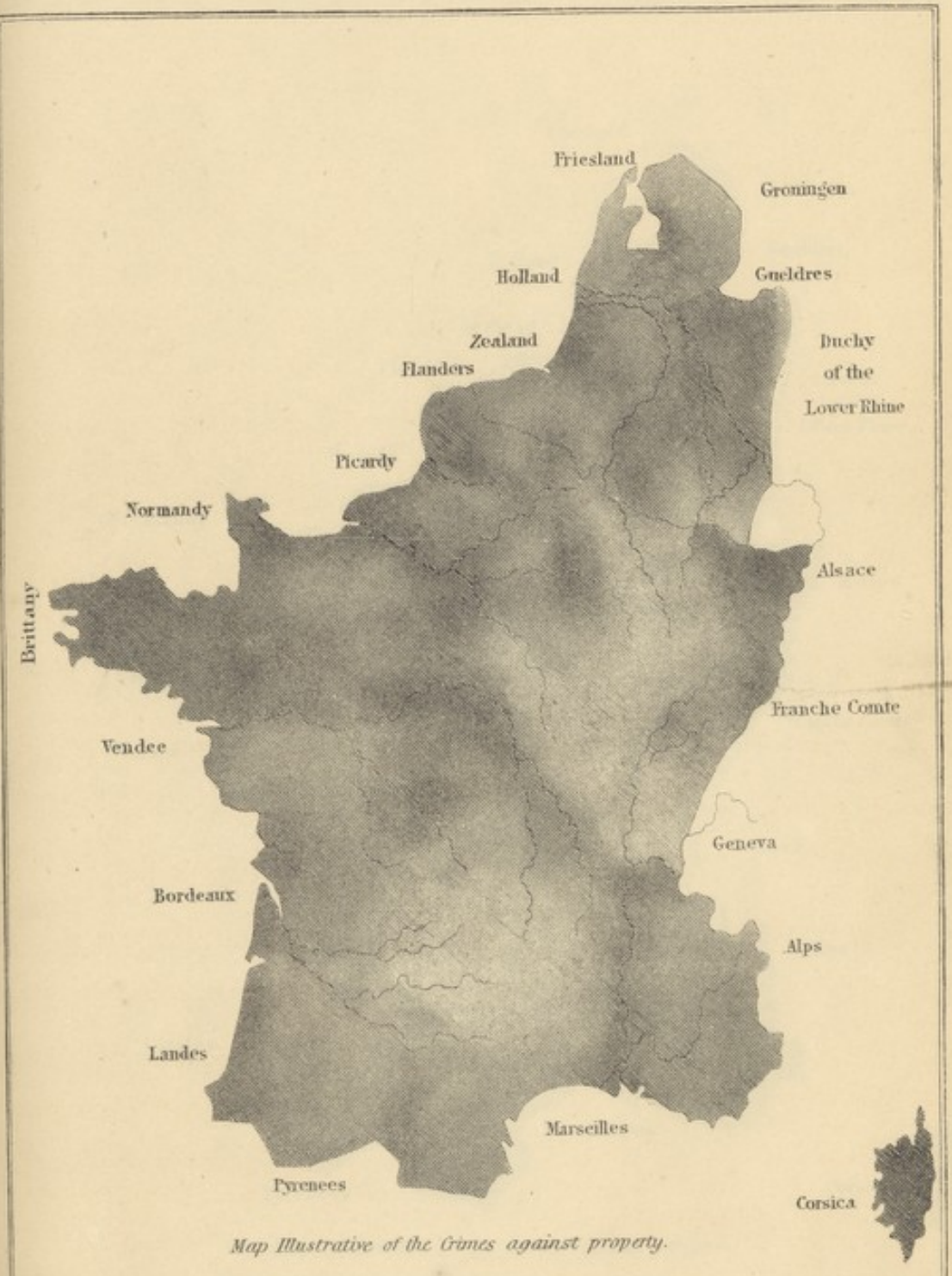


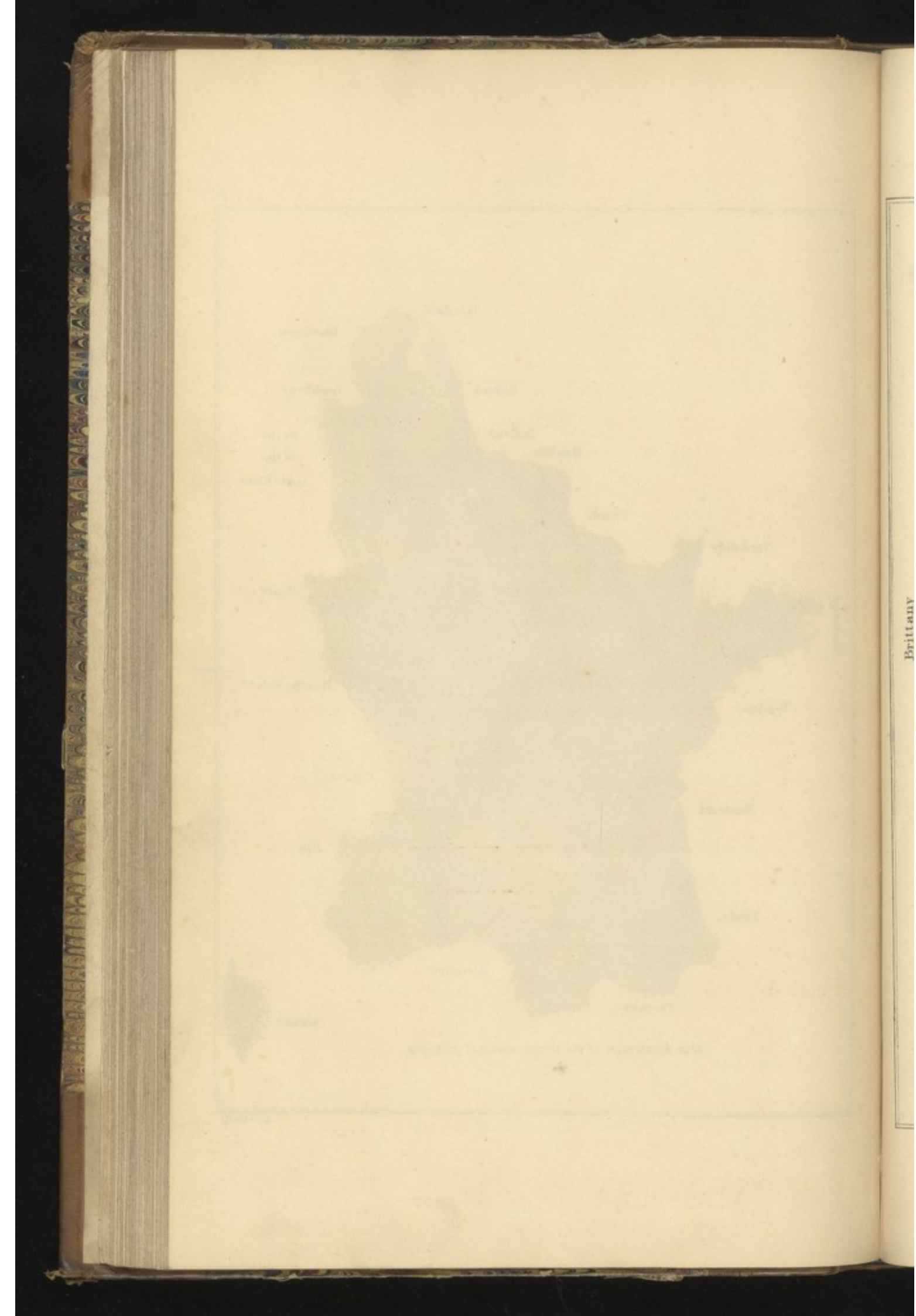
Map Illustrative of the comparative amount of Instruction in France, the Low Countries & the Duchy of the Lower Rhine.

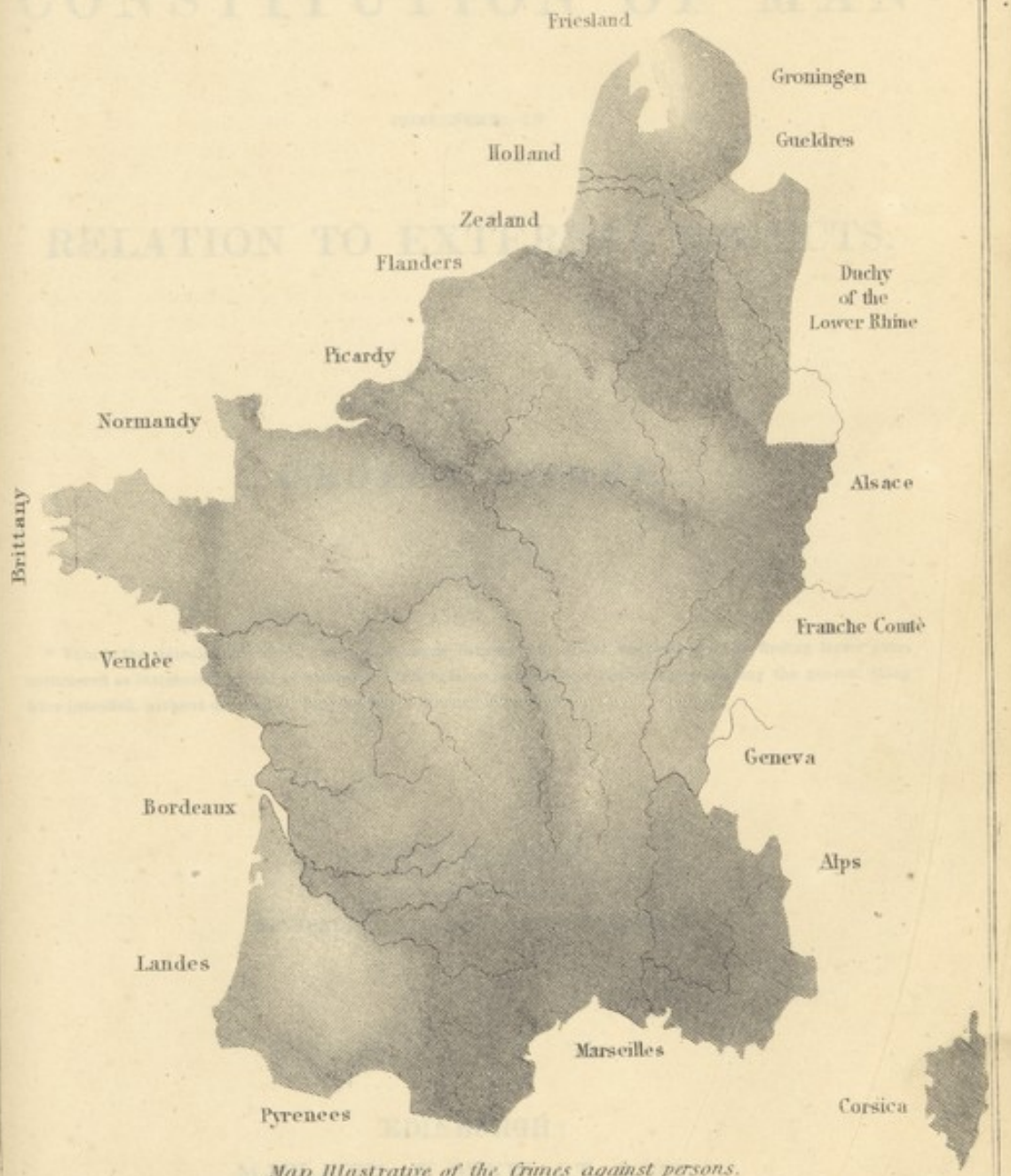
J. Gellatly



Map Illustrative of the Crimes against property.

J. Gellatly


Brittany



Map Illustrative of the Crimes against persons.

J. Gellatly

THE

CONSTITUTION OF MAN

CONSIDERED IN

RELATION TO EXTERNAL OBJECTS.

BY

GEORGE COMBE.

"Vain is the ridicule with which one foresees some persons will divert themselves, upon finding lesser pains considered as instances of divine punishment. There is no possibility of answering or evading the general thing here intended, without denying all final causes."—BUTLER'S *Analogy*.

SIXTH EDITION,
(*Thirteenth Impression*),
REVISED, CORRECTED, AND ENLARGED.

EDINBURGH:
MACLACHLAN STEWART, & CO..
LONGMAN & CO., SIMPKIN, MARSHALL & CO., AND W. S. ORR & CO., LONDON.
SOLD BY ALL BOOKSELLERS.
1847.

PRINTED BY NEILL AND COMPANY, EDINBURGH.

HENDERSON BEQUEST.

On 27th May 1829, the late W. R. Henderson, Esq., younger of Warriston and Eildon Hall, executed a deed of settlement, by which he conveyed to certain Trustees such funds as he should die possessed of; and in the event of his dying without leaving children, he appointed them to pay certain legacies and annuities to individual friends, and gave the following instructions regarding the application of the residue of his funds:

"And, lastly, the whole residue of my means and estate shall, after answering the purposes above written, be applied by my said Trustees in whatever manner they may judge best for the advancement and diffusion of the science of Phrenology, and the practical application thereof in particular; giving hereby and committing to my said Trustees the most full and unlimited power to manage and dispose of the said residue, in whatever manner shall appear to them best suited to promote the ends in view: Declaring, that if I had less confidence in my Trustees, I would make it imperative on them to print and publish one or more editions of an 'Essay on the Constitution of Man considered in Relation to External Objects, by George Combe,'—in a cheap form, so as to be easily purchased by the more intelligent individuals of the poorer classes, and Mechanics' Institutions, &c.; but that I consider it better only to request their particular attention to this suggestion, and leave them quite at liberty to act as circumstances may seem to them to render expedient; seeing that the state of the country, and things impossible to foresee, may make what would be of unquestionable advantage now, not advisable at some future period of time. But if my decease shall happen before any material change affecting this subject, I request them to act agreeably to my suggestion. And I think it proper here to declare, that I dispose of the residue of my property in the above manner, not from my being carried away by a transient fit of enthusiasm, but from a deliberate, calm, and deep-rooted conviction, that nothing whatever hitherto known can operate so powerfully to the improvement and happiness of mankind, as the knowledge and practical adoption of the principles disclosed by Phrenology, and particularly of those which are developed in the Essay on the Constitution of Man, above mentioned."

Mr Henderson having died on the 29th of May 1832, his trustees carried his instructions in regard to the present work into effect, and the impressions of it have been as follows:—

		Copies.
	I. EDITION in 12mo.	
1828, June.	First edition, published at 6s. in boards,	1500
	Mr Henderson's Trustees reduced the price of 200 copies of this edition to 1s. 6d., and of 81 copies to 2s. 6d.	
1835, March.	Second edition, enlarged, and printed on fine paper; the usual price of the volume 7s. 6d.,	1000
	This was reduced to 4s.	
	The Henderson edition, 6s.,	2000
	Reduced to 2s. 6d.	
... Aug.	Third edition, stereotyped, 6s., reduced to 4s.	1000
... Nov.	... Second impression of do. at 6s., reduced to 4s.	1000
1836, March.	... Third do. of do. at 6s. do. to 4s.	1500
... Oct.	... Fourth do. of do. at 6s. do. to 4s.	3000
1844, Sept.	... Fifth do. of do. at 6s. do. to 4s.	500
	Total duodecimo,	11,500

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II. The PEOPLE'S EDITION, in double columns, royal 8vo, published at 1s. 6d. per copy.		
1835, Nov. 13.	First impression, stereotyped,	2000
... Jan.	Second do.	5000
... Feb.	Third do.	5000
... April.	Fourth do.	5000
... June.	Fifth do.	5000
... Nov.	Sixth do.	10,000
1838, March.	Seventh do.	5000
1839, Jan.	Eighth do.	5000
1840, Oct.	Ninth do.	5000
1841, Dec.	Tenth do. new stereotype plates.	5000
1843, Oct.	Eleventh do. do. do.	5000
1845, May.	Twelfth do. do. do.	5000
1847, Jan.	Thirteenth do. do. do.	5000
		67,000
	III. SCHOOL EDITION, at 1s. 6d., in boards.	
1838, Oct.	First impression,	1000
	Total,	79,500

PREFACE.

THIS Work would not have been presented to the Public, had I not believed that it contains views of the constitution, condition, and prospects of Man, which deserve attention. But these, I trust, are not ushered forth with anything approaching to a presumptuous spirit. I lay no claim to originality of conception. My first notions of the natural laws were derived from a manuscript work of Dr Spurzheim, with the perusal of which I was honoured in 1824, and which was afterwards published under the title of "A Sketch of the Natural Laws of Man, by G. Spurzheim, M.D." A comparison of the text of it with that of the following pages, will shew to what extent I am indebted to my late excellent and lamented master and friend for my ideas on the subject. All my inquiries and meditations since have impressed me more and more with a conviction of their importance. The materials employed lie open to all. Taken separately, I would hardly say that a new truth has been presented in the following work. The parts have nearly all been admitted and employed again and again, by writers on morals, from the time of Socrates down to the present day. In this respect, there is nothing new under the sun. The only novelty in this work respects the relations which acknowledged truths hold to each other. *Physical laws* of nature, affecting our physical condition, as well as regulating the whole material system of the universe, are universally acknowledged to exist, and constitute the elements of natural philosophy and chemical science: Physiologists, medical practitioners, and all who take medical aid, admit the existence of *organic laws*: And the sciences of government, legislation, education, indeed our whole train of conduct through life, proceed upon the admission of *laws in morals*. Accordingly, the laws of nature have formed an interesting subject of inquiry to philosophers of all ages; but, so far as I am aware, no author has hitherto attempted to point out, in a systematic form, the relations between those laws and the constitution of Man; which must, nevertheless, be done, before our knowledge of them can be beneficially applied. Dr Spurzheim, in his "Philosophical Principles of Phrenology," adverted to the independent operation of the several classes of natural laws, and pointed out some of the consequences of this doctrine, but without entering into detailed elucidations. The great object of the following treatise is to exhibit the constitution of Man, and its relations to several of the most important natural laws, with a view to the improvement of education, and the regulation of individual and national conduct.

But although my purpose is practical, a theory of Mind forms an essential element in the execution of the plan. Without it, no comparison can be instituted between the natural constitution of man and external objects. Phrenology appears to me to be the clearest, most complete, and best supported system of mental philosophy which has hitherto been taught; and I have assumed it as the basis of this work. But the practical value of the views to be unfolded does not depend entirely on Phrenology. The latter as a theory of Mind, is itself valuable only in so far as it is a *just exposition* of what previously existed in human nature. We are physical, organic, and moral beings, acting under general laws, whether the connection of different mental qualities with particular portions of the brain, as taught by Phrenology, be admitted or denied. Individuals, under the impulse of passion, or by the direction of intellect, will hope, fear, wonder, perceive, and act, whether the degree in which they habitually do so be ascertainable by the means which it points out or not. In so far, therefore, as this work treats of the known qualities of Man, it may be instructive even to those who contemn Phrenology as unfounded; while it can prove useful to none, if the doctrines which it unfolds shall be found not to be in accordance with the principles of human nature, by whatever system these may be expounded.

Some individuals object to all mental philosophy as useless, and argue, that, as Mathematics, Chemistry, and Botany, have become great sciences without the least reference to the faculties by means of which they are cultivated; so Morals, Religion, Legislation, and Political Economy, have existed, have been improved, and may continue to advance, with equal success, without any help from the philosophy of mind. Such objectors, however, should consider that lines, circles, and triangles—earths, alkalis, and acids—and also corollas, stamens, pistils, and stigmas,—are objects which exist independently of the mind, and may be investigated by the application of the mental powers, in ignorance of the constitution of the faculties themselves—just as we may practise archery without

studying the anatomy of the hand; whereas the objects of moral and political philosophy are the qualities and actions of the mind itself:—These objects have no existence independently of mind; and they can no more be systematically or scientifically understood without the knowledge of mental philosophy, than optics can be cultivated as a science in ignorance of the structure and modes of the action of the eye.

I have endeavoured to avoid religious controversy. "The object of Moral Philosophy," says Mr Stewart, "is to ascertain the general rules of a wise and virtuous conduct in life, in so far as these rules may be discovered by the unassisted light of nature; that is, by an examination of the principles of the human constitution, and of the circumstances in which man is placed."* By following this method of inquiry, Dr Hutcheson, Dr Adam Smith, Dr Reid, Mr Stewart, and Dr Thomas Brown, have, in succession, produced highly interesting and instructive works on Moral Science; and the present Treatise is an humble attempt to pursue the same plan, with the aid of the new lights afforded by Phrenology. I confine my observations exclusively to Man as he exists in the present world, and beg that, in perusing the subsequent pages, this explanation may be constantly kept in view. In consequence of forgetting it, my language has occasionally been misapprehended, and my objects misrepresented. When I speak of man's highest interest, for example, I uniformly refer to man as he exists in this world; but as the same God presides over both the temporal and the eternal interests of the human race, it seems to me demonstrably certain, that what is conducive to the one will in no instance impede the other, but will in general be favourable to it also. This work, however, does not directly embrace the interests of eternity. These belong to the department of theology, and demand a different line of investigation: I confine myself exclusively to philosophy.

Since the first edition of this work appeared, on 9th June 1828, additional attention has been paid to the study of the laws of nature, and their importance has been more generally recognised. In "A Discourse on the Studies of the University, by Adam Sedgwick, M. A., &c.," of which a third edition was published at Cambridge in 1834, the author remarks, that "we are justified in saying, that, in the moral as in the physical world, God seems to govern by general laws." "I am not now," says he, "contending for the doctrine of moral necessity; but I do affirm, that the moral government of God is by general laws, and that it is our bounden duty to study these laws, and, as far as we can, to turn them to account." "If there be a superintending Providence, and if his will be manifested by general laws operating both on the physical and moral world, then must a violation of these laws be a violation of his will, and be pregnant with inevitable misery." "Nothing can, in the end, be expedient for man, except it be subordinate to those laws the Author of Nature has thought fit to impress on his moral and physical creation." "In the end, high principle and sound policy will be found in the strictest harmony with each other."

These are precisely the views which it is the object of the present work to enforce; and it is gratifying to me to see them so ably and eloquently recommended to the attention of the students of the University of Cambridge.

* Outlines of Moral Philosophy, p. 1.

45 Melville Street, Edinburgh,
1*st January* 1847.

INTRODUCTORY REMARKS.

GENERAL VIEW OF THE CONSTITUTION OF HUMAN NATURE, AND ITS RELATIONS TO EXTERNAL OBJECTS.

Man compared with the lower animals—Opposite phases of his character—The world seems constituted on the principle of slow and progressive improvement—Light thrown by geology on the physical history of the globe before the creation of man—Death and reproduction appear to have existed before his creation—The world arranged so as to afford him every inducement to cultivate and exercise his understanding—Power of man to control and turn to account the capabilities of the physical world—Barbarism and civilization compared—Progressive improvement of man apparent from history—Reasons for anticipating a future increase of the happiness and intelligence of the race—Mental philosophy hitherto very imperfect—Do the physical and moral worlds contain the elements of amelioration?—The capabilities of physical and human nature have hitherto been ignorantly undervalued—Errors of theologians on this subject—Light thrown upon the question by phrenology—Constitution of the human mind, and its adaptation to the external world, not expounded in the Bridgewater Treatises—Natural laws, physical, organic, and moral—The independent operation of these, very important in relation to the moral government of the world—The present work not hostile to religion—Philosophy and Scripture cannot be at variance—Physiological preliminaries of moral and religious conduct must exist before preaching can produce its full effects.

In surveying the external world, we discover that every creature and every physical object has received a definite constitution, and been placed in certain relations to other objects. The natural evidence of a Deity and his attributes is drawn from contemplating these arrangements. Intelligence, wisdom, benevolence, and power, characterize the works of creation; and the human mind ascends by a chain of correct and rigid induction to a great First Cause, in whom these qualities must reside. But hitherto this great truth has excited a barren though sublime admiration, rather than led to beneficial practical results.

Man obviously stands pre-eminent among sublunary objects, and is distinguished by remarkable endowments above all other terrestrial beings. Nevertheless no creature presents such anomalous appearances as man. Viewed in one aspect he almost resembles a demon; in another he still bears the impress of the image of God. Seen in his crimes, his wars, and his devastations, he might be mistaken for the incarnation of an evil spirit; contemplated in his schemes of charity, his discoveries in science, and his vast combinations for the benefit of his race, he seems a bright intelligence from Heaven. The lower animals exhibit a more simple and regulated constitution. The lion is sly and ferocious, but he is regularly so; and, besides, is placed in circumstances suited to his nature, in which at once scope is given, and limits are set, to the gratification of his instincts. The sheep, on the other hand, is mild, feeble, and inoffensive; but its external condition also is suited to its constitution, and it apparently lives and flourishes in as great enjoyment as the lion. The same remark applies to other inferior creatures. Their bodily organs, faculties, instincts, and external circumstances, form parts of a system in which adaptation and harmony are discoverable; and the enjoyment of the animals depends on the adaptation of their constitution to their external condition. If we saw the lion one day tearing in pieces every animal that crossed his path, and the next oppressed with remorse for the death of his victims, or compassionately healing those whom he had mangled, we should exclaim, What an inconsistent creature! and conclude that he could not by possibility be happy, on account of this opposition between the principles of his nature. Two conditions are essential to enjoyment: first, the different instincts of an animal must be in harmony with each other; and, secondly, its constitution must be in accordance with its external condition.

When, keeping these principles in view, we direct our attention to Man, very formidable anomalies present themselves. The most opposite instincts or impulses exist in his mind: actuated by Combativeness, Destructiveness, Acquisitiveness, and Self-Esteem, the moral sentiments being in abeyance, he is almost a fiend; on the contrary, when inspired by Benevolence, Veneration, Hope, Conscientiousness, Ideality, and Intellect, the benignity, serenity, and splendour of a highly-elevated nature beam from his countenance, and radiate from his eye. He is then lovely, noble, and gigantically great. But how shall these conflicting tendencies be reconciled, and how can external circumstances be devised that shall accord with such heterogeneous elements? Here again a conviction of the power and goodness of the Deity comes to our assistance. Man is obviously an essential and most important part of the present system of creation; and, without doubting of his future destinies, we ought not, so long as our knowledge of his nature is incomplete, to consider his condition here as inexplicable. The nature of man has hitherto, to all philosophical purposes, been unknown, and both the designs of the Creator and the situation of man have been judged of ignorantly and rashly. The sceptic has advanced arguments against religion, and in different ages, ignorant or interested men have founded systems of superstition, on the disorder and inconsistency which are too readily admitted to be inseparable attributes of human existence on earth. But I venture to hope that man may yet be found in harmony with himself and with the condition in which he is placed.

I am aware that some individuals, whose piety is entitled to respect, conceive, that, as the great revolutions of human society, as well as all events in the lives of individuals, take place under the guidance of the Deity, it is presumptuous, if not impious, to endeavour to scan their causes and effects. But as the Creator has bestowed faculties on man, it is presumable that He governs him in accordance with them, and their constitution implies that he should investigate creation. The young swallow, when it migrates on the approach of the first winter of its life, is impelled by an instinct implanted by the Deity, and it neither knows the causes that prompt it to fly, nor the end to be attained by its flight. It has no powers exciting it to reflect on itself and external objects, and to inquire whence came its desires, or to what object they tend. Man, however, has been differently framed. The Creator has bestowed on him faculties to observe phenomena, and to trace causes and effects; and *he has constituted the external world to afford scope to these powers.* We are entitled, therefore, to say, that the Creator himself has commanded us to observe and inquire into the causes that operate in us and around us, and into the results that naturally follow, and to modify our conduct according to the discoveries which we shall make.

They enable us to form a just estimate of our duty and

interest as the rational occupants of this world, we may inquire briefly into the constitution of our own and of external natures.

The constitution of this world does not look like a system of optimism. It appears to be arranged, to some extent, on the principle of slow and progressive improvement. Physical nature has undergone many revolutions; and, according to some geologists, it has been gradually prepared for successive orders of living beings, rising higher and higher in the scale of intelligence and organization, until man appeared.

The globe, in the first state in which the imagination can venture to consider it, says Sir H. Davy,* appears to have been a fluid mass, with an immense atmosphere revolving in space around the sun. By its cooling, a portion of its atmosphere was probably condensed into water, which occupied a part of its surface. In this state no forms of life, such as now belong to our system, could have inhabited it. The crystalline rocks, or, as they are called by geologists, the primary rocks, which contain no vestiges of a former order of things, were the result of the first consolidation on its surface. Upon the farther cooling, the water, which, more or less, had covered it, contracted; depositions took place; shell-fish and coral insects were created, and began their labours. Islands appeared in the midst of the ocean, raised from the deep by the productive energies of millions of zoophytes. These islands became covered with vegetables fitted to bear a high temperature, such as palms, and various species of plants similar to those which now exist in the hottest parts of the world. The submarine rocks of these new formations of land became covered with aquatic vegetables, on which various species of shell-fish, and common fishes, found their nourishment. As the temperature of the globe became lower, species of the oviparous reptiles appear to have been created to inhabit it, and the turtle, crocodile, and various gigantic animals of the Saurian (lizard) kind, seem to have haunted the bays and waters of the primitive lands. But in this state of things, there appears to have been no order of events similar to the present. Immense volcanic explosions seem to have taken place, accompanied by elevations and depressions of the surface of the globe, producing mountains, and causing new and extensive depositions from the primitive ocean. The remains of living beings, plants, fishes, birds, and oviparous reptiles, are found in the strata of rocks which are the monuments and evidence of these changes. When these revolutions became less frequent, and the globe became still more cooled, and inequalities of temperature were established by means of the mountain-chains, more perfect animals became its inhabitants, such as the mammoth, megalonix, megatherium, and gigantic hyena, many of which have become extinct. Five successive races of plants, and four successive races of animals, appear to have been created and swept away by the physical revolutions of the globe, before the system of things became so permanent as to fit the world for man. In none of these formations, whether called secondary, tertiary, or diluvial, have the fossil remains of man, or any of his works, been discovered. At last, man was created, and since that period there has been little alteration in the physical circumstances of the globe.

"In all these various formations," says Dr Buckland, "the coprolites" (or the dung of the Saurian reptiles in a fossil state, exhibiting scales of fishes and other traces of the prey which they had devoured) "form records of warfare waged by successive generations of inhabitants of our planet on one another; and the general law of nature, which bids all to eat and be eaten in their turn, is shewn to have been co-extensive with animal existence upon our globe, the *carnivora* in each period of the world's history fulfilling their destined office to check excess in the progress of life, and maintain the balance of creation."

This brief summary of the physical changes of the Globe, is not irrelevant to our present object. The more we discover of creation, the more conspicuously does uniformity of design appear to pervade it. According to this theory, the physical world seems to have been gradually *improved* and *prepared for man*.

Let us now contemplate Man himself, and his adaptation to the external creation. The world, apparently, was inhabited by living beings, and death and reproduction prevailed before Man occupied its soil. The order of creation seems not to have been changed at his introduction, but he appears to have been adapted to it. He received from his Creator an organized structure, and animal instincts. The brain is unquestionably the workmanship of God, and there exist in it organs of faculties impelling man to kill that he may eat, to oppose aggression, and to shun danger,—impulses related to a constitution of nature similar to that which is conjectured to have existed prior to his introduction. Man, then, apparently took his station among, yet at the head of, the beings that inhabited the earth at his creation. He is to a certain extent an animal in his structure, powers, feelings, and desires, and is adapted to a world in which death reigns, and generation succeeds generation. This fact, although so trite and obvious as to appear scarcely worthy of being noticed, is of importance in treating of Man; because the human being, in so far as he resembles the inferior creatures, is capable of enjoying a life like theirs: he has pleasure in eating, drinking, sleeping, and exercising his limbs; and one of the greatest obstacles to improvement is, that many of the race are contented with these enjoyments, and consider it painful to be compelled to seek higher sources of gratification. But to the animal nature of man have been added, by a bountiful Creator, moral sentiments and reflecting faculties, which not only place him above all other creatures on earth, but constitute him a different being from any of them, a rational and accountable being. These faculties are his best and highest gifts, and the sources of his purest and intensest pleasures. They lead him directly to the great objects of his existence,—obedience to God, and love towards his fellow-men. But this peculiarity attends them, that while his animal faculties act powerfully of themselves, his rational faculties require to be cultivated, exercised, and instructed, before they will yield their full harvest of enjoyment.

The Creator has so arranged the material world as to hold forth strong inducements to man to cultivate his higher powers. The philosophic mind, in surveying it, perceives in external nature, a vast assemblage of stupendous powers, too great for the feeble hand of man entirely to control, but kindly subjected, within certain limits, to the influence of his will. Man is introduced on earth apparently helpless and unprovided for, as a homeless stranger; but the soil on which he treads is endowed with a thousand capabilities of production, which require only to be excited by his intelligence to yield him the most ample returns. The impetuous torrent rolls its waters to the main; but as it dashes o'er the mountain-cliff, he is capable of withdrawing

* The description in the text is extracted chiefly from "The Last Days of a Philosopher," by Sir Humphrey Davy, 1831, p. 134, on account of its popular style; but similar representations may be found in several recent works on Geology, particularly "A Geological Manual, by H. T. De La Beche;" the Penny Magazine of 1833, in a very instructive popular form; and Sedgwick's Discourse on the Studies of the University of Cambridge, third edition. Mr Lyell, however, in his Principles of Geology, vol. i. ch. ix. controverts the doctrine of a progressive development of plants and animals, and his view is probably the more strictly philosophic of the two. I have introduced the theory of Sir Humphrey Davy merely as a remote analogy, on which I lay no particular stress; and whether it be correct or not, is a point of no essential importance to the views advanced in this work touching the progress of mankind.

it from its course, and rendering its powers subservient to his will. Ocean extends o'er half the globe her liquid plain, in which no path appears, and the rude winds oft lift her waters to the sky; but there the skill of man may launch the strong-knit bark, spread forth the canvass to the gale, and make the trackless deep a highway through the world. In such a state of things, knowledge is truly power; and it is highly important to human beings to become acquainted with the constitution and relations of every object around them, that they may discover its capabilities of ministering to their advantage. Farther, where these physical energies are too great to be controlled, man has received intelligence by which he may observe their courses, and accommodate his conduct to their influence. This capacity of adaptation is a valuable substitute for the power of regulating them by his will. He cannot arrest the sun in its course, so as to avert the wintry storms, and cause perpetual spring to bloom around him; but, by the proper exercise of his intelligence and corporeal energies, he is able to foresee the approach of bleak skies and rude winds, and to place himself in safety from their injurious effects. These powers of applying nature, and of accommodating his conduct to her course, are the direct results of his rational faculties; and in proportion to their cultivation is his sway extended. Man, while ignorant, is a helpless creature; but every step in knowledge is accompanied by an augmentation of his power.

Again: We are surrounded by countless beings, inferior and equal to ourselves, whose qualities yield us the greatest happiness, or bring upon us the bitterest evil, according as we affect them agreeably or disagreeably by our conduct. To draw forth all their excellencies, and cause them to diffuse joy around us—to avoid touching the harsher springs of their constitution, and bringing painful discord to our feelings—it is necessary that we should know their nature, and act with a habitual regard to the relations established by the Creator between ourselves and them.

Man, ignorant and uncivilized, is a ferocious, sensual, and superstitious savage. The world affords some enjoyments to his animal feelings, but it confounds his moral and intellectual faculties. External nature exhibits to his mind a mighty chaos of events, and a dread display of power. The chain of causation appears too intricate to be unravelled, and the power too stupendous to be controlled. Order and beauty, indeed, occasionally gleam forth to his eye from detached portions of creation, and seem to promise happiness and joy; but more frequently, clouds and darkness brood over the scene, and disappoint his fondest expectations. Evil seems so mixed up with good, that he regards it as either its direct product, or its inseparable accompaniment. Nature is never contemplated with a clear perception of its adaptation to promote the enjoyment of the human race, or with a well founded confidence in the wisdom and benevolence of its Author. Man, when civilized and illuminated by knowledge, on the other hand, discovers, in the objects and occurrences around him, a scheme beautifully arranged for the gratification of his whole powers, animal, moral, and intellectual; he recognises in himself the intelligent and accountable subject of an all-bountiful Creator, and in joy and gladness desires to study the Creator's works, to ascertain his laws, and to yield to them a steady and a willing obedience. Without undervaluing the pleasures of his animal nature, he tastes the higher, more refined, and more enduring delights of his moral and intellectual capacities; and he then calls aloud for education as indispensable to the full enjoyment of his powers.

If this representation be correct, we perceive the advantage of gaining knowledge of our own constitution and of that of external nature, with a view to regulating our conduct according to rules drawn from such information. Our constitution and our position equally imply, that we should not remain contented with the pleasures of mere animal life, but that we should take the dignified and far more delightful station of moral and rational occupants of this lower world.

If, according to some philosophers, the physical history of the globe indicate progression in an advancing series of changes, the civil history of man also proclaims the march, although often vacillating and slow, of moral and intellectual improvement. To avoid too extensive an inquiry, unsuitable to an introductory discourse, let us confine our attention to the aspects presented by society in our native country.

At the time of the Roman invasion, the inhabitants of Britain lived as savages, and appeared in painted skins. After the Norman conquest, one part of the nation was placed in the condition of serfs, condemned to labour like beasts of burden, while the other devoted itself to war. The nobles fought battles during the day, and in the night probably dreamed of bloodshed and broils. Next came the age of chivalry. These generations severally believed their own condition to be the highest, or at least the permanent and inevitable lot of man. Now, however, have come the present arrangements of society, in which millions of men are shut up in cotton and other manufactories for ten or twelve hours a-day; others labour under ground in mines; others plough the fields; while thousands of higher rank pass their whole lives in frivolous amusements. The elementary principles, both bodily and mental, were the same in our painted ancestors, in their chivalrous descendants, and in us, their shopkeeping, manufacturing, and money-gathering children. Yet how different the external circumstances of the individuals of these several generations! If, in the savage state, the internal faculties of man were in harmony among themselves, and his external condition was in accordance with them, he must then have enjoyed all the happiness of which his nature was capable, and must have erred when he changed it;—if the institutions and customs of the age of chivalry were calculated to gratify his whole nature harmoniously, he must have been unhappy as a savage, and must be miserable now;—if his present condition be the perfection of his nature, he must have been far from enjoyment, both as a savage and as a feudal warrior;—and if none of these conditions have been in accordance with his constitution, he must still have his happiness to seek. Every age, accordingly, has testified that *it* was not in possession of contentment; and the question presents itself,—If human nature has received a definite constitution, and if one arrangement of external circumstances be more suited to yield it gratification than another, what *are* that constitution and that arrangement? No one among the philosophers has succeeded in informing us.—If we in Britain have not reached the limits of attainable perfection, what are we next to attempt? Are we and our posterity to spin and weave, build ships, and speculate in commerce, as the highest occupations to which human nature can aspire, and persevere in these labours till the end of time? If not, who shall guide the helm in our future voyage on the ocean of existence? and by what chart of philosophy shall our steersman be directed? The British are here cited as a type of mankind at large; for in every age and every clime, similar races have been run, with similar conclusions. Only one answer can be returned to these inquiries. Man is, apparently, a progressive being; and the Creator, having designed a higher path for him than for the lower creatures, has given him intellect to discover his own nature and that of external objects, and left him, by the exercise of that intellect, to find out for himself the method of placing his faculties in harmony among themselves, and in accordance with the external world. Time and experience are necessary to accomplish these ends; and history exhibits the human race only in a state of progress towards the

full development of its powers, and the attainment of rational enjoyment.

As long as man remained ignorant of his own nature, he could not, of design, form his institutions in accordance with it. Until his own faculties and their relations became the subjects of his observation and reflection, they operated as mere blind impulses. He adopted savage habits, because, at first, his animal propensities were not directed by the moral sentiments, or enlightened by reflection. He next assumed the condition of the barbarian, because his higher powers had made some advance, but had not yet attained supremacy; and he now devotes himself, in Britain, to commerce and manufactures, because his constructive faculties and intellect have given him power over physical nature, while his love of property and ambition are predominant, and are gratified by such avocations. Not one of these conditions, however, has been adopted from design, or from perception of its suitableness to the nature of man. He has been ill at ease in them all; but it does not follow that he must continue for ever equally ignorant of his nature, and equally incapable of framing institutions in harmony with it. The simple facts, that the Creator has bestowed on man reason, capable of discovering his own nature, and its relations to external objects; that He has left him to apply it in framing suitable institutions to ensure his happiness; that, nevertheless, man has hitherto been ignorant of his nature and of its relations; and that, in consequence, his modes of life have never been adopted from *enlightened views of his whole qualities and capacities*, but have sprung up from the impulsive ascendency of one blind propensity or another,—warrant us in saying, that a new era will begin, when man shall study his constitution and its relations with success; and that the future may exhibit him assuming his station as a rational creature, pursuing his own happiness with intelligence and design, and at length attaining to higher gratification than any which he has hitherto enjoyed.

In the next place, the inquiry naturally occurs, What has been the cause of the human race remaining for so many ages unacquainted with their own nature and its relations? The answer is, that, before the discovery of the functions of the brain, it was impossible to reach a practical philosophy of mind. The philosophy of man was cultivated as a speculative and not as an inductive science; and even when attempts were made at induction, the manner in which they were conducted was at variance with the fundamental requisites of a sound philosophy.* Consequently, even the most enlightened nations have never possessed any true philosophy of mind, but have been bewildered amidst innumerable contradictory theories.

This deplorable condition of the philosophy of human nature is strikingly and eloquently described by Mons. de Bonald, in a sentence translated by Mr Dugald Stewart, in his Preliminary Dissertation to the Encyclopædia Britannica: "Diversity of doctrine," says he, "has increased from age to age, with the number of masters, and with the progress of knowledge; and Europe, which at present possesses libraries filled with philosophical works, and which reckons up almost as many philosophers as writers; poor in the midst of so much wealth, and uncertain, with the aid of all its guides, which road it should follow; Europe, the centre and focus of all the lights of the world, has yet its *philosophy* only in expectation."

In our own country two views of the constitution of the world and of human nature have long been prevalent, differing widely from each other, and which, if legitimately followed out, would lead to different practical results. The one is, that the world, including both the physical and moral departments, is, in itself, well and wisely constituted, on the principle of a progressive system, and, therefore, capable of improvement. This hypothesis ascribes to the power and wisdom of the Divine Being the whole phenomena which nature, animate and inanimate, exhibits; because, in conferring on each part the specific qualities and constitution which belong to it, and in placing it in the circumstances in which it is found, He is assumed to have designed, from the first, the whole results which these qualities, constitution, and circumstances, are capable of exhibiting. No countenance is given by this theory to atheism. On the contrary, it affords the richest and most comprehensive field imaginable, for tracing the evidence of Divine power, wisdom, and goodness in creation.

The other hypothesis is, that the world was perfect at first, but fell into derangement, continues in disorder, and can be rectified only by supernatural means.

If the former view be sound, an important object of man, as an intelligent being in quest of happiness, must be to study the elements of external nature and their capabilities; the elementary qualities of his own nature, and their applications; and the relationship between these. His second object will be to discover and carry into effect the conditions,—physical, moral, and intellectual,—which, in virtue of this constitution, require to be realized before the fullest enjoyment of which he is capable can be attained.

According to the second view, little good can be expected from the merely natural action of creation's elements, especially the mental ones, these being all essentially disordered; and human improvement and enjoyment must be derived chiefly from spiritual influences. If the one hypothesis be sound, man must fulfil the *natural conditions* requisite to the existence of religion, morality, and happiness, *before* he can reap full benefit from religious truth: according to the other, he must believe aright in religion, and be the subject of spiritual influences to rectify the disorders of nature, before he can become capable of virtue or enjoyment: in short, according to it, science, philosophy, and all arrangements of the physical, moral, and intellectual elements of nature, are subordinate, in their effects on human happiness on earth, to religious faith.

It appears to me extremely difficult to reconcile these conflicting views.

The theologians who condemned the natural world, lived in an age when there was no sound philosophy, and almost no knowledge of physical science; they were unavoidably ignorant of the elementary qualities of human nature, and of the influence of organization on the mental powers—the great link which connects the moral and physical worlds. They were unacquainted with the relations subsisting between the mind and external nature; and could not by possibility divine, to what extent individuals and society were capable of being improved by natural means. In the history of man, they had read chiefly of misery and crime, and had in their own age beheld much of both. They were, therefore, naturally led to form a low estimate of human nature, and to expect little good from the development of its inherent capabilities. These views appear to me to have influenced their interpretations of Scripture: and these, having once been entwined with religious sentiments, have descended from generation to generation:—Consequently, persons of sincere piety have, for several centuries, been induced to look down on this world as a wilderness abounding with briars, weeds, and noxious things,—and to direct their chief attention, not to the study of its elements and their relations, in the hope of reducing them to order, but to enduring the disorder with patience and resignation, and to securing, by faith and penitence, salvation in a future life. It has never been with them a practical principle, that human nature itself may be vastly improved in its moral and intellectual capacities, by those means which Physiology and Phrenology have recently opened up; or that human nature and the external world are adapted to each other with the view of favouring the development of the higher powers of the mind; or that this world and its professions and pursuits may be rendered favourable to virtue by searching out

* See System of Phrenology, Fourth Edition, p. 51.

the natural qualities and relations of its elements, and the moral plan on which God has constituted and governs it. Some philosophers and divines, having failed to discover a consistent order or plan in the moral world, have rashly concluded that none such exists, or that it is inscrutable. It appears never to have occurred to them that it is impossible to comprehend a whole system without becoming acquainted with its parts:—Although ignorant of the physiology of man, of mental philosophy, of the philosophy of external nature, and of their relations, these authors have not perceived that this extensive ignorance of the details, rendered it impossible for them to comprehend the plan of the whole. Hence they have involved themselves in contradictions; for, while it has been a leading principle with them, that enjoyment in a future state is to be the consequence of the believer's attaining to a holy and pious frame of mind in this life, they have represented the constitution of the world to be so unfavourable to piety and virtue, that men in general, who continue attached to it, cannot attain to this right frame of spirit, or act habitually in consistency with it. They have not perceived that man must live in society to be either virtuous, useful, or happy; that the social atmosphere is to the mind what air is to the lungs; and that if an individual cannot exist to virtuous ends out of society, neither can he exist in a right frame of mind in it, if the moral atmosphere with which he is surrounded be deeply contaminated with vice and error. Individual merchants, for example, cannot act habitually on Christian principles, if the operations of trade be *necessarily* inconsistent with Christianity; and if the constitution of the world do not admit of the rules of trade becoming Christian, then active life and practical religion must be naturally opposed to each other. Divines have laboriously recommended spiritual exercises as means of improvement in this life, and of salvation in the next; but have rarely dealt with the philosophy of this world, or attempted its rectification, so as to render these exercises truly efficacious. Their minds have been occupied with the idea that this world is irremediably defective in its constitution, and that human hope must be concentrated chiefly on the next. This may be attributed to the premature formation of a system of theology in the dawn of civilization, before the qualities of the physical world, and the elements of the moral world, and their relationships, were known; and to erroneous interpretations of Scripture, formed in consequence, partly, of that ignorance.

If the discovery of the philosophy of mind, founded on the physiology of the brain, be destined to operate at all in favour of human improvement, one of its most striking effects will be the lifting up of the veil which has so long concealed the natural world and its capabilities from the eyes of divines. To all practical ends connected with theology, the philosophy of nature might as well not exist: With few exceptions, the sermons preached a century ago are equal, if not superior, in sense and suitableness to human nature, to those delivered yesterday; and yet, in the interval, the human mind has made vast advances in knowledge of the works of creation. Divines have frequently applied scientific discoveries in proving the existence and developing the attributes of the Deity; but they have failed in applying either the discoveries themselves, or the knowledge of the Divine character obtained by means of them, to the formation of any system of mental philosophy, capable of combining harmoniously with religion, and promoting the improvement of the human race.

This, however, Phrenology will enable them one day to do. In surveying the world itself, the phrenologist perceives that the Creator has bestowed definite qualities on the human mind, and on external objects, and established certain relations between them; that the mental faculties have been incessantly operating according to their inherent tendencies, generally aiming at good, always desiring it, but often missing it through ignorance and blindness, yet capable of attaining it when enlightened and properly directed. The baneful effects of ignorance are every where apparent. Three-fourths of the mental faculties have direct reference to this world, and in their functions appear to have no intelligible relation to another—such are Amativeness, Philoprogenitiveness, Combativeness, Destructiveness, Constructiveness, Acquisitiveness, Secretiveness, and others; while the remaining fourth appear calculated to act both in this life and in a higher state of existence—such are Benevolence, Ideality, Wonder, Veneration, Hope, Conscientiousness, and Intellect. While the philosophy of mind continued a purely abstract theory, moralists and divines enjoyed an unlimited privilege (of which they largely availed themselves) of ascribing or denying to human nature whatever qualities best suited their several systems; but now the case is different. Organs cannot be added to, or displaced from, the brain, by the fancy or the logic of contending disputants or sects; and philosophers and divines must hereafter study human nature as it exists, and accommodate their views to its actual qualities and relations. To guide and successfully apply the former class of faculties to the promotion of human happiness, it appears indispensable that the faculties themselves,—the physical conditions on which their strength and weakness, inertness and vivacity, depend,—the relations established between them and the external world, which is the grand theatre of their action,—and, finally, the relation between them and the superior faculties, which are destined to direct them, should be known; and yet, scarcely any thing *is* known, in a philosophical and practical sense, on these points, by the people at large.

If I am correct in saying that these faculties, by their constitution, appear to have reference to this world alone, then knowledge useful for their guidance may be obtained from the philosophy of this world; and the wisdom which is to reduce them to order may receive important aids from studying the constitution which it has pleased the Creator to bestow on them, and the relations which he has instituted between them and the other departments of his works. His wisdom and goodness will be found to pervade them. He has bestowed on us intellect to discover his will, and sentiments disposing us to obey it, in whatever record its mandates are inscribed.

Knowledge of the constitution, capabilities, and relations, of sublunary things and beings, is indispensable also to the proper exercise and direction of the superior powers of the mind. In all ages, practical men have dedicated three-fourths of their time to pursuits calculated to gratify the faculties that bear reference to this world alone; but, unfortunately, the remaining fourth has not been devoted to objects related to their higher powers. A defective intellectual education has rendered them incapable of deriving pleasure from the study of nature; while, owing to the barbarism which has pervaded society in general, there has been only an imperfect moral atmosphere in which their superior sentiments could play. Ambition, that powerful stimulant of the mind in social life, has not been directed exclusively to moral objects, but generally the reverse. The hours which should have been dedicated to the improvement of their higher faculties, have been either devoted to the pursuit of gain, sensual pleasure, or the objects of a vulgar ambition, or spent in mere trifling amusements and relaxation. There has been little onward purpose of moral and intellectual advancement in the secular occupations of society; and the divines who formed public opinion, so far from discovering that this disorder is not inherent in the constitution of nature,—and that Christianity, in teaching the doctrine of the supremacy of the moral faculties, necessarily implies the adaptation of the human mind to a state of society accordant with that principle,—fell into the opposite error, and

represented the world not only as deranged in all its parts, but as consisting of elements incapable of natural rectification; and they thereby added strength and permanence to the evils originating in ignorance and unguided passion.

I am far from casting blame on the excellent individuals who fell into these mistakes: such errors were inevitable at the time when they lived, and with the lights which they possessed; but I point them out as imperfections which ought to be removed.

The late Earl of Bridgewater died in February 1829, and left the sum of L.8000, which, by his will, he directed the President of the Royal Society of London to apply in paying any person or persons to be selected by him, "to write, print, and publish one thousand copies of a work 'On the Power, Wisdom, and Goodness of God, as manifested in the Creation;' illustrating such work by all reasonable arguments, as, for instance, the variety and formation of God's creatures in the animal, vegetable, and mineral kingdoms; the effect of digestion, and thereby of conversion; the construction of the hand of man, and an infinite variety of other arguments; as also by *discoveries, ancient and modern, in arts, sciences, and the whole extent of literature.*" The President of the Royal Society called in the aid of the Archbishop of Canterbury and of the Bishop of London, and with their advice nominated eight gentlemen to write eight treatises on different branches of this great subject.

One of the objects of the Earl of Bridgewater appears to have been to ascertain what the character of external nature and the capacities of the human mind really are, and what is the adaptation of the one to the other; questions of vast importance in themselves, and which can be solved only by direct, bold, and unbiassed appeals to Nature. This subject was committed to Dr Chalmers.

In the execution of this object, the first inquiry should have been, "What is the constitution of the human mind?" because, before we can successfully trace the adaptation of two objects to each other, we must be acquainted with each separately. But Dr Chalmers and all the other authors of the Bridgewater Treatises have neglected this branch of inquiry. They disdained to acknowledge Phrenology as the philosophy of mind, yet they have not brought forward any other. Indeed they have not attempted to assign to human nature any definite or intelligible constitution. In consequence, they appear to me to have thrown extremely little new light on the moral government of the world.

In the following work, the first edition of which was published in 1828, before the Earl of Bridgewater's death, I have endeavoured to avoid this inconsistency. Having been convinced, after minute and long-continued observation, that Phrenology is the true philosophy of mind, I have assumed it as the basis of my reasoning. In this inquiry, it is indispensably necessary to adopt some system of mental philosophy, in order to obtain one of the elements of the comparison; but the reader, if he choose, may regard the phrenological views as hypothetical, and judge of them by the result. Or he may attempt to substitute in their place any better system with which he is acquainted, and try how far it will enable him successfully to proceed in the investigation.

In the next place, in instituting the comparison in question, I have brought into view, and endeavoured to substantiate and apply, a doctrine, which, so far as I have yet been able to discover, is the key to the true theory of the divine government of the world, but which has not hitherto been duly appreciated,—namely, THE INDEPENDENT EXISTENCE AND OPERATION OF THE NATURAL LAWS OF CREATION. The natural laws may be divided into three great classes,—Physical, Organic, and Moral; and the peculiarity of the new doctrine is, its inculcating that these operate *independently of each other*; that each requires obedience to itself; that each, in its own specific way, rewards obedience and punishes disobedience; and that human beings are happy in proportion to the extent to which they place themselves in accordance with *all* of the divine institutions. For example, the most pious and benevolent missionaries sailing to civilize and Christianize the heathen, may, if they embark in an unsound ship, be drowned by disobeying a physical law, without their destruction being averted by their morality. On the other hand, if the greatest monsters of iniquity were embarked in a staunch and strong ship, and managed it well, they might, and, on the general principles of the government of the world, they would, escape drowning in circumstances exactly similar to those which would send the missionaries to the bottom. There appears something inscrutable in these results, if only the *moral qualities* of the men be contemplated; but if the principle be recognised that ships float in virtue of a purely physical law,—and that the physical and moral laws operate independently, each in its own sphere,—the consequences appear in a totally different light.

In like manner, the *organic* laws operate independently; and hence, one individual who has inherited a sound bodily constitution from his parents, and observed the rules of temperance and exercise, will enjoy robust health, although he may cheat, lie, blaspheme, and destroy his fellow-men; while another, if he have inherited a feeble constitution, and disregarded the laws of diet and exercise, will suffer pain and sickness, although he may be a paragon of every Christian virtue. These results are frequently observed; and on such occasions the darkness and inscrutable perplexity of the ways of Providence are generally moralized upon; or a future life is called in as the scene in which these crooked paths are to be rendered straight. But if my views be correct, Divine wisdom and goodness are abundantly conspicuous in these events; for by this distinct operation of the organic and moral laws, order is preserved in creation, and, as will afterwards be shewn, the means of discipline and improvement are afforded to all the human faculties.

The *moral and intellectual* laws also have an independent operation. The man who cultivates his intellect and higher sentiments, and who habitually obeys the precepts of Christianity, will enjoy within himself a fountain of *moral and intellectual happiness*, which is the appropriate reward of that obedience. He will also become more capable of studying, comprehending, and obeying, the physical and organic laws;—of placing himself in harmony with the whole order of creation;—and of attaining to the highest degree of perfection, and reaping the greatest extent of happiness, of which human nature in this world is susceptible. In short, whenever we apply the principle of the *independent operation* of the natural laws, the apparent confusion of the moral government of the world is greatly diminished.

These views will be better understood and appreciated after perusing the subsequent chapters, the object of which is to unfold and apply them; the aim of these introductory remarks being merely to prepare the reader for travelling over the more abstruse portions of the work with a clearer perception of their scope and tendency. The work itself has now been before the public for thirteen years, and I have seen no criticism which has shaken my conviction of the substantial truth of the principles maintained in it. Of its value as a contribution to the philosophy of human nature, the public are the only legitimate judges.

Some well-meaning individuals have imagined that this work is hostile to religion, because it is confined to principles which can be discovered by observation and reflection, and to human conduct in this life without direct reference to a future state; but such ideas are entirely unfounded. Human nature and the external world have both proceeded from the Creator, and it is

impossible, in interpreting their constitution aright, to arrive at any conclusions at variance with true religion. It is argued, indeed, by some theologians, that the human faculties are no longer in the condition in which they were created, and that hence no sound philosophy can be deduced from studying their manifestations. (Christian Ethics, by Ralph Wardlaw, D. D., p. 40.) I have considered this topic in my lectures on Moral Philosophy, and here only remark, that man did not make the cerebral organs which he now possesses, nor bestow on them their functions. Both organs and functions are as assuredly the direct gifts of the Creator, as is the eye, the ear, or the stomach. The science of optics is never questioned by any person who understands it, on the ground that the eye (on the structure, properties, and relations of which it depends) is not now in the condition in which it was created. Yet to do this would be as reasonable as to deny the truth and authority of a philosophy of mind derived from correct observations on the constitution and relations of the mental faculties and organs. It is presumable that the same Divine power, wisdom, and goodness, which instituted the eye, and adapted its structure to light, presided also over the institution and adaptations of the internal organs of the mind. If a theologian were to maintain that these organs, or several of them, were bestowed on man in consequence of sin, or from any other cause, philosophers would remain silent to such a proposition; because they do not inquire into the motives which induced the Creator to confer on man the organs and faculties which he possesses. They limit their investigations to objects that exist, and their relations and uses. But, on the ground that organs and faculties have been given by the Creator, they are entitled to maintain, that a philosophy of morals correctly deduced from their constitution must accord with all sound religion. As, then, all real philosophy and all true religion must harmonize, there will be a manifest advantage in cultivating each by itself, till its full dimensions, limits, and applications, shall be brought clearly to light. We may then advantageously compare them, and use the one as a means of elucidating or correcting our views of the other.

To the best of my knowledge, there is not one practical result of the natural laws expounded in the subsequent pages, which does not harmonize precisely with the moral precepts of the New Testament. Indeed, this work has been characterized by some individuals as the philosophy of Christian morality, because they regard it as exhibiting the natural foundations of the admirable precepts which in the New Testament are taught only dogmatically. It is objected, however, that, by omitting the sanction of future reward and punishment, this treatise leaves out the highest, best, and most efficacious class of motives to virtuous conduct. This objection is founded on a misapprehension of the object of the book. It is my purpose to shew, that the rewards and punishments of human actions are more complete, certain, and efficacious, in this life, than is generally believed; but by no means to interfere with the sanctions to virtue afforded by the prospect of future retribution. It appears to me that every action which is morally wrong in reference to a future life, is equally wrong and inexpedient with relation to this world; and that it is of essential advantage to virtue to prove this to be the case. Having observed a great tendency in many religious men to overlook the importance of understanding the moral administration of this world, and to turn their attention too exclusively to the next, I have endeavoured to present the administration of the present world in a clear light, calculated to arrest attention, and to draw towards it that degree of consideration to which it is justly entitled. This proceeding will be recognised as the more necessary, if one principle, largely insisted on in the following pages, shall be admitted to be sound, viz. that religion operates on the human mind, in subordination, and not in contradiction, to its natural constitution. If this view be well founded, it will be indispensable that all the *natural conditions* required by the human constitution as preliminaries to moral and religious conduct be complied with, *before* any purely religious teaching can produce its full effects. If, for example, an ill-constituted brain be unfavourable to the appreciation and practice of religious truth, it is not an unimportant inquiry, whether any, and what, influence can be exercised by human means in improving the size and proportions of the mental organs. If certain physical circumstances and occupations,—such as insufficient food and clothing, unwholesome workshops, dwelling-places, and diet, and severe and long-protracted labour,—have a natural tendency, in consequence of their influence on the nervous system in general, and the brain in particular, to blunt all the higher feelings and faculties of the mind, and if religious emotions cannot be experienced with full effect by individuals so situate, the ascertainment, with a view to removal, of the nature, causes, and effects of these impediments to holiness, is not a matter of indifference. This view has not been systematically adopted and pursued by the religious instructors of mankind in any age, or any country; and, in my humble opinion, for this sole reason, that the state of moral and physical science did not enable them either to appreciate its importance, or to carry it into effect. By presenting Nature in her simplicity and strength, a new impulse and direction may perhaps be given to their understandings; and they may be induced to consider whether their universally confessed failure to render men as virtuous and happy as they desired, may not, to some extent, have arisen from their non-fulfilment of the natural conditions instituted by the Creator as preliminaries to success. They have complained of war waged, openly or secretly, by philosophy against religion; but they have not duly considered whether religion itself warrants them in treating philosophy and all its dictates with neglect in their instruction of the people. True philosophy is a revelation of the Divine Will manifested in creation; it harmonizes with all truth, and cannot with impunity be neglected.

CHAPTER I.

ON NATURAL LAWS.

Man's faculties capable of ascertaining what exists, and the purpose of what exists, but not the will of the Deity in creation—All the departments of Nature have definite constitutions and fixed laws imposed by the Deity—The term *law* defined and illustrated—Man's pleasure and pain depend, in this world, upon observance of, and obedience to, these constitutions and laws; an opinion supported by Bishop Butler—The Natural Laws divided into Physical, Organic, and Moral, and obedience or disobedience to each asserted to have distinct effects; while the whole are universal, invariable, unbending, and in harmony with the entire constitution of man—Death in certain circumstances appears desirable—Full and universal obedience not supposed to interfere with the prospects of futurity—Benevolence not the exclusive or immediate, but the ultimate, principle on which the world is arranged; evil in no case the ultimate, but only in certain instances the immediate, principle, and that for wise and benevolent ends—The will of the Deity in designing evil inscrutable, but the mental constitution shewn by Phrenology to bear relation to it.

In natural science, three subjects of inquiry may be distinguished: 1*st*, What exists? 2*dly*, What is the use of what exists? and, 3*dly*, Why was what exists designed for such uses as it evidently subserves?

It is matter of fact, for instance, that arctic regions and the torrid zone exist,—that a certain kind of moss is abundant in Lapland in winter,—that the rein-deer feeds on it, and enjoys health and vigour in situations where most other animals would die; that camels exist in Africa,—that they have broad hoofs, and stomachs

fitted to retain water for a considerable time,—and that they flourish amid arid tracts of sand, where the rein-deer would hardly live for a day. All this falls under the inquiry, What exists?

In contemplating these facts, the understanding is naturally led to infer that one object of the Lapland moss is to feed the rein-deer, and that one purpose of the deer is to assist man; and that broad feet have been given to the camel to allow it to walk on sand, and a retentive stomach to fit it for arid places in which water is found only at wide intervals. These conclusions result from inquiries into the uses or purposes of what exists; and such inquiries constitute a legitimate exercise of the human intellect.

But, 3*dly*, we may ask, Why were animals formed of organized matter? Why were trackless wastes of snow and burning sands called into existence? Why were all the elements of nature created such as they exist? These are inquiries why what exists was made such as it is; or into the will of the Deity in creation.

Now, man's perceptive faculties are adequate to the first inquiry, and his reflective faculties to the second: but it may well be doubted whether he has powers suited to the third. My investigations are confined to the first and second, and I do not discuss the third.

The Creator has bestowed on physical nature, on man and on animals, definite constitutions, which act according to fixed laws. A *law of nature* denotes a fixed mode of action; it implies a subject which acts, and that the actions or phenomena which that subject exhibits take place in an established and regular manner; and this is the sense in which I shall use it when treating of physical substances and beings. Water, for instance, when at the level of the sea, and combined with that portion of heat indicated by 32° of Fahrenheit's thermometer, freezes or becomes solid; when combined, under a certain pressure, with the portion denoted by 212° of that instrument, it rises into vapour or steam. Here water and heat are the substances, and the freezing and rising in vapour are the appearances or phenomena presented by them; and when we say that these take place according to a Law of Nature, we mean only that these modes of action appear, to our intellects, to be established in the very constitution of the water and heat, and in their natural relationship to each other; and that the processes of freezing and rising in vapour are constant appearances, when, in the same circumstances, the substances are combined in these proportions.

The ideas chiefly to be kept in view are, 1*st*, That all substances and beings have received definite natural constitutions; 2*dly*, That every mode of action, which is inherent in the constitution of the substance or being, may be said to take place according to a natural law; and, 3*dly*, That the modes of action are universal and invariable, wherever and whenever the substances or beings are found in the same circumstances. For example, water under that degree of pressure which exists at the level of the sea, freezes and boils at the same temperature in China, in France, in Peru, and in England; and there is no exception to the regularity with which it exhibits these appearances, when all its other conditions are the same. This last qualification, however, must constantly be attended to, in all departments of science. If water be carried to the top of a mountain 20,000 feet high, it will boil at a lower temperature than 212°; but this takes place also according to fixed and invariable principles. The atmosphere exerts a pressure on water. At the level of the sea the pressure is every where nearly the same, and in that situation the freezing and boiling points correspond all over the world; but on the top of a high mountain the pressure is much less, and the vapour, not being held down by so great a power of resistance, rises at a lower temperature than 212°. But this change of appearances does not indicate a change in the constitution of the water and the heat, but only a variation in the circumstances in which they are placed; and hence it is not correct to say, that water boiling on the tops of high mountains at a lower temperature than 212° is an exception to the general law of nature. There are no exceptions to the laws of nature; for the Creator is too wise and too powerful to make imperfect or inconsistent arrangements. The error is in the human mind inferring the law to be, that water boils at 212° in every altitude; when the real law is only that it boils at that temperature under the pressure which occurs *at the level of the sea* in all countries,—and that it boils at a lower temperature the higher it is carried, because there the pressure of the atmosphere is diminished.

Intelligent beings are capable of observing nature and of modifying their actions. By means of their faculties, the laws impressed by the Creator on physical substances become known to them; and, when perceived, constitute laws to them by which to regulate their conduct. For example, it is a physical law that boiling water destroys the muscular and nervous systems of man. This is the result of the constitution of the body, and the relation established between it and heat; and man cannot alter or suspend the law. But whenever the relation, and the consequences of disregarding it, are perceived, the mind is prompted to avoid infringement, in order to avert the torture attached by the Creator to the decomposition of the human body by heat.

Similar views have long been taught by philosophers and divines. Bishop Butler, in particular, says:—"An Author of Nature being supposed, it is not so much a deduction of reason as a matter of experience, that we are thus under his government: under his government in the same sense as we are under the government of civil magistrates. Because the annexing pleasure to some actions, and pain to others, in our power to do or forbear, and giving notice of this appointment beforehand to those whom it concerns, *is the proper formal notion of government*. Whether the pleasure or pain which thus follows upon our behaviour, be owing to the Author of Nature's acting upon us every moment in which we feel it, or to his having at once contrived and executed his own part in the plan of the world, makes no alteration as to the matter before us. For, if civil magistrates could make the sanctions of their laws take place, without interposing at all after they had passed them, without a trial and the formalities of an execution; if they were able to make their laws execute themselves, or every offender to execute them upon himself, we should be just in the same sense under their government then as we are now; but in a much higher degree and more perfect manner. Vain is the ridicule with which one foresees some persons will divert themselves, upon finding lesser pains considered as instances of divine punishment. There is no possibility of answering or evading the general thing here intended, without denying all final causes. For, final causes being admitted, the pleasures and pains now mentioned must be admitted too, as instances of them. And if they are, if God annexes delight to some actions and uneasiness to others, with an apparent design to induce us to act so and so, then he not only dispenses happiness and misery, but also rewards and punishes actions. If, for example, the pain which we feel upon doing what tends to the destruction of our bodies,—suppose upon too near approaches to fire, or upon wounding ourselves,—be appointed by the Author of Nature to prevent our doing what thus tends to our destruction; this is altogether as much an instance of his punishing our actions, and consequently of our being under his government, as declaring, by a voice from heaven, that if we acted so he would inflict such pain upon us, and inflicting it whether it be greater or less."*

* Butler's Works, vol. i. p. 44. The remarks of other authors on the Laws of Nature will be found in the Appendix, No. I.

In the following treatise, we must distinguish between modes of action inherent in the constitution of creatures and things (to which alone the term natural law can be properly applied), and the rules which the human intellect may deduce, from contemplating the phenomena of nature, for its own guidance. The former are invariable, while the latter are not laws of nature, but rules of human conduct inferred from observing nature, and are perfect or imperfect according to the opportunities and degrees of intelligence employed in observation and reflection.

If, then, the reader keep in view that God is the creator; that Nature, in the general sense, means the world which He has made,—and, in a more limited sense, the particular constitution which He has bestowed on any special object, of which we may be treating;—that the Laws of Nature mean the established modes in which the actions and phenomena of any creature or object exhibit themselves;—and that an obligation is imposed on intelligent beings to act in conformity with nature,—he will be in no danger of misunderstanding my meaning.

Every natural object has received a definite constitution, in virtue of which it acts in a particular way. There must, therefore, be as many natural laws as there are distinct modes of action of substances and beings, viewed by themselves. But substances and beings stand in certain relations to each other, and modify each other's action, in an established and definite manner, according to that relationship; pressure, for instance, modifies the effect of heat upon water. There must, therefore, be also as many laws of nature as there are *relations* between different substances and beings. The practical rules deducible from these laws will become more precise and explicit in proportion as the laws themselves are understood: in the mean while, however, as the natural laws are invariable, man suffers from not accommodating his conduct to them, even although his omission be the result exclusively of ignorance.

It is impossible, in the present state of knowledge, to elucidate all these laws: numberless years may elapse before they shall be discovered; but we may investigate some of the most familiar and striking of them. Those which most readily present themselves bear reference to the great classes into which the objects around us may be divided, namely, Physical, Organic, and Intelligent. I shall therefore at present consider the physical laws, the organic laws, and the laws which characterize intelligent beings.

1*st*, The Physical laws embrace all the phenomena of mere matter: a heavy body, for instance, when unsupported, falls to the ground with a certain force, accelerating in proportion to the distance which it falls, and its own density; and this motion is said to take place according to the law of gravitation. An acid applied to a vegetable blue colour converts it into red, and this is said to take place according to a chemical law.

2*dly*, Organized substances and beings stand higher in the scale of creation, and have properties peculiar to themselves. They act, and are acted upon, in conformity with their constitution, and are therefore said to be subject to a peculiar set of laws, termed the Organic. The distinguishing characteristic of this class of objects is, that the individuals of them derive their existence from other organized beings, are nourished by food, and go through a regular process of growth and decay. Vegetables and animals are the two great subdivisions of it. The organic laws are different from the merely physical: a stone, for example, does not spring from a parent stone; it does not take food; it does not increase in vigour for a time, and then decay and suffer dissolution; all which processes characterize vegetables and animals.

The organic laws are superior to the merely physical. A living man, or animal, may be placed in an oven, along with the carcass of a dead animal, and remain exposed to a heat which will bake the dead flesh, and may yet come out alive, and not seriously injured. The dead flesh being mere physical matter, its decomposition by heat instantly commences; but the living animal is able, by its organic qualities, to counteract and resist, to a certain extent, that influence. The Organic Laws, therefore, mean the established modes according to which all phenomena connected with the production, health, growth, decay, and death, of vegetables and animals, take place. In the case of each animal or vegetable of the same kind, their action is always the same in the same circumstances. Animals are the chief objects of my present observations.

3*dly*, Intelligent beings stand yet higher in the scale than merely organized matter, and embrace all animals that have distinct consciousness, from the lowest of the inferior creatures up to man. The two great divisions of this class are *Intelligent and Animal*—and *Intelligent and Moral* creatures. The dog, horse, and elephant, for instance, belong to the former class, because they possess some degree of intelligence, and certain animal propensities, but no moral feelings; man belongs to the second, because he possesses all the three. These various faculties have received a definite constitution, and stand in determinate relationship to external objects: for example, a healthy palate cannot feel wormwood sweet, nor sugar bitter; a healthy eye cannot see a rod partly plunged in water straight—because the water so modifies the rays of light, as to give to the stick the appearance of being crooked; a healthy sentiment of Benevolence cannot feel gratified with murder, nor a healthy Conscientiousness with fraud. As, therefore, the mental faculties have received a precise constitution, have been placed in fixed and definite relations to external objects, and act regularly;—we speak of their acting according to rules or laws, and call these the Moral and Intellectual Laws, inherent in the constitutions of these beings.

Several important principles strike us very early in attending to the natural laws, viz. 1*st*, Their independence of each other; 2*dly*, That obedience to each of them is attended with its own reward, and disobedience with its own punishment; 3*dly*, That they are universal, unbending, and invariable in their operation; 4*thly*, That they are in harmony with the constitution of man.

1. The *independence* of the natural laws may be illustrated thus:—A ship floats because a part of it being immersed displaces a weight of water equal to its whole weight, leaving the remaining portion above the fluid. A ship, therefore, will float on the surface of the water, as long as these physical conditions are observed; no matter although the men in it should infringe other natural laws—as, for example, although they should rob, murder, blaspheme, and commit every species of debauchery: and it will sink whenever the physical conditions are subverted, however strictly the crew and passengers may obey the moral laws. In like manner, a man who swallows poison, which destroys the stomach or intestines, will die, just because an organic law has been infringed, and because it acts independently of others; although he should have taken the drug by mistake, or have been the most pious and charitable individual on earth. Or, thirdly, a man may cheat, lie, steal, tyrannise, and, in short, break a great variety of the moral laws, and, nevertheless, if he sedulously observe the organic laws of temperance and exercise, he may be fat and rubicund; while, on the other hand, an individual who neglects these, may pine in disease, and be racked with torturing pains, although, at the very moment, he may be devoting his mind to the highest duties of humanity.

2. *Obedience to each law is attended with its own reward, and disobedience with its own punishment.* Thus the mariners who preserve their ship in accordance with the physical laws, reap the reward of sailing in safety; and those who permit a departure from them, are punished by the ship's sinking. People who obey the

moral law, enjoy the intense internal delights that spring from active moral faculties; they render themselves, moreover, objects of affection and esteem to moral and intelligent beings, who, in consequence, reciprocate with them many other gratifications. Those who disobey that law are tormented by insatiable desires, which, from the nature of things, cannot be gratified; they are punished by the perpetual craving of whatever portion of moral sentiment they possess, for higher enjoyments, which are never attained; and they are objects of dislike and malevolence to other beings of similar dispositions with themselves, who inflict on them the evils dictated by their own provoked propensities. Those who obey the organic laws, reap the reward of health and vigour of body, and buoyancy of mind; while those who break them are punished by sickness, feebleness, languor, and pain.

3. The natural laws are *universal, invariable, and unbending*. When the physical laws are infringed in China or Kamtschatka, there is no instance of a ship floating there more than in England; and, when they are observed, there is no instance of a vessel sinking in any one of these countries more than another. There is no example of men, in any country, enjoying the mild and generous internal joys, and the outward esteem and love, that attend obedience to the moral law, while they give themselves up to the dominion of brutal propensities. There is no example, in any latitude or longitude, or in any age, of men who entered life with a constitution in harmony with the organic laws, and who continued to obey these laws throughout, being, in consequence of this obedience, visited with pain and disease; and there are no instances of men who were born with constitutions marred by the organic laws, and who lived in habitual disobedience to them, enjoying that sound health and vigour of body that are the rewards of obedience.

4. The natural laws are *in harmony with the whole constitution of man*. If ships in general had sunk when they were stanch, strong, and skilfully managed, this would have outraged the perceptions of reason; but as they float, the physical law is, in this instance, in harmony with the moral and intellectual law. If men who rioted in drunkenness and debauchery had thereby established health and increased their happiness, this, again, would have been at variance with our intellectual and moral perceptions; but the opposite and actual result is in harmony with them.

It will be subsequently shewn, that our moral sentiments desire universal happiness. If the physical and organic laws are constituted in harmony with them, it ought to follow that the natural laws, when obeyed, will conduce to the happiness of the moral and intelligent beings who are called on to observe them; and that the evil consequences, or punishments, resulting from infringement of them, will be calculated to enforce stricter obedience, for the advantage of those creatures themselves. According to this view, when a ship sinks, in consequence of a plank starting, the punishment is intended to impress upon the spectators the absolute necessity of having every plank strong and secure before going to sea, this being a condition indispensable to safety. When sickness and pain follow a debauch, the object of the suffering is to urge a more scrupulous obedience to the organic laws, that the individual may escape premature death, which is the inevitable consequence of too great and continued disobedience to these laws,—and enjoy health, which is the reward of the opposite conduct. When discontent, irritation, hatred, and other mental annoyances, arise out of infringement of the moral law, this punishment is calculated to induce the offender to return to obedience, that he may enjoy the rewards attached to it.

When the transgression of any natural law is excessive, and so great that return to obedience is impossible, one purpose of death, which then ensues, may be to deliver the individual from a continuation of the punishment which then could do him no good. Thus, when, from infringement of a physical law, a ship sinks at sea, and leaves men immersed in water, without the possibility of reaching land, their continued existence in that state would be one of cruel and protracted suffering; and it is advantageous to them to have their lives extinguished at once by drowning, and to be thereby withdrawn from farther agony. In like manner, if a man in the vigour of life so far infringe any organic law as to destroy the function of a vital organ —the heart, for instance, or the lungs, or the brain—it is better for him to have his life cut short, and his pain ended, than to have it protracted under all the tortures of an organic existence, without lungs, without a heart, or without a brain, if such a state were possible, which, for this wise reason, it is not.

I do not intend to predicate any thing concerning the absolute perfectibility of man by obedience to the laws of nature. The system of sublunary creation, so far as we perceive it, does not appear to be one of optimism; yet benevolent design, in its constitution, is undeniable. Paley says, "Nothing remains but the supposition, that God, when he created the human species, wished them happiness, and made for them the provisions which he has made, with that view and for that purpose. The same argument may be proposed in different terms: Contrivance proves design; and the predominant tendency of the contrivance indicates the disposition of the designer. The world abounds with contrivances; and all the contrivances which we are acquainted with, are directed to beneficial purposes."—(Paley's Moral Phil. Edin. 1816, p. 51.) Many of the contrivances of the Creator, for effecting beneficial purposes, have been discovered by philosophers; but, so far as I am aware, no one has adverted to the foregoing principles as those according to which these contrivances operate, so that nothing like a systematic view of the moral government of the world has hitherto been presented to mankind.

Human interests regard this world and the next.

Different religious sects, interpreting the Bible differently, have formed different opinions concerning the danger to which the human soul is exposed in a future state, and have propounded different views of the means of averting it. The present work is not intended to throw light on this subject, which lies beyond the limits of philosophy. But I humbly maintain that, to enjoy this world, man must discover and obey the natural laws; while Scripture is his guide regarding a future state of existence. The Bible, however, does not communicate complete information concerning the best mode of pursuing his temporal interests; and numerous practical duties resulting from his constitution are discoverable, which are not treated of in detail in its pages—the mode of preserving health, for example; of pursuing with success a temporal calling; of discovering the qualities of men with whom we mean to associate; and so on. This is the case, probably because faculties have been given to man to discover arts, sciences, and the natural laws, and to adapt his conduct to them; and because the physical, moral, and intellectual nature of man, is itself left open to investigation by these faculties.

Although the natural laws form no guides to faith; yet, so far as I can perceive, their dictates and those of the Bible coincide in all matters relating to practical duties in temporal affairs.

It may be asked, whether mere *knowledge* of the natural laws is sufficient to ensure observance of them? Certainly not. Mere knowledge of music does not enable one to play on an instrument, nor of anatomy to perform skilfully a surgical operation. Practical training, and the aid of every motive that can interest the feelings, are necessary to lead individuals to obey the natural laws. Religion, in particular, may furnish motives highly conducive to this obedience. But it

must never be forgotten, that although mere knowledge is not all-sufficient, it is a primary and indispensable requisite to regular observance; and that it is as impossible effectually and systematically to obey the natural laws without knowing them, as it is to perform any other complicated and important duty in ignorance of its principles and practical details. Some persons are of opinion that Christianity alone suffices, for our guidance in all practical virtues, without knowledge of, or obedience to, the laws of nature; but from this notion I respectfully dissent. One reason why vice and misery do not diminish in proportion to the sermons preached against them, seems to be that the natural laws are too much overlooked, and very rarely considered as having any relation to human conduct. The theological doctrine of the corruption and disorder of human nature, joined to the want of knowledge of real science, have probably been the causes why the professed servants of God have made so little use of His laws, revealed in creation, in instructing the people to live according to His will. Before religion can yield its full practical fruits in this world, it must be wedded to a philosophy founded on those laws; it must borrow light and strength from them, and in return communicate its powerful sanction towards enforcing obedience to their dictates.

It is proper to state, in connection with this subject, that I do not maintain that the world is arranged on the principle of benevolence exclusively: my idea is, that it is constituted in harmony with the whole faculties of man; the moral sentiments and intellect holding the supremacy. What is meant by creation being constituted in harmony with the whole faculties of man, may be thus illustrated. Suppose that we should see two men holding a third in a chair, and a fourth drawing a tooth from his head:—While we contemplated this bare act, and knew nothing of the intention with which it was done, and of the consequences that would follow, we should set it down as purely cruel, and say, that, although it might accord with the propensity which prompts men to inflict pain and destroy, it could not harmonize with Benevolence. But, when we were told that the individual in the chair was a patient and the operator a dentist, and that the object of all the parties was to deliver the first from violent torture, we should then perceive that an operation attended with pain had been used as a means to accomplish a benevolent purpose,—or, in other words, that the operator had acted under the guidance of moral sentiment and intellect,—and we should approve of his conduct. If the world had been created on the principle of Benevolence exclusively, the toothache could not have existed; but, as pain does exist, a mental faculty, called by the phrenologists Destructiveness, has been given, to place man in harmony with its existence, when used for a benevolent end.

To apply this illustration to the works of Providence, I humbly suggest it as probable, that if we knew *thoroughly* the design and whole consequences of such institutions of the Creator as are attended with pain, (including death itself), we should find that its infliction is used as a *means*, subservient to Benevolence and Justice, to arrive at an end in harmony with the moral sentiments and intellect; in short, that no institution of the Creator has pure evil, or destruction alone, for its object. "In maturity of sense and understanding," says Lord Kames, "benevolence appears more and more; and beautiful final causes are discovered in many of Nature's productions, that formerly were thought useless, or perhaps hurtful: and the time may come—we have solid ground to hope that it *will* come—when doubts and difficulties about the government of Providence will all of them be cleared up, and every event be found conducive to the general good."*

The opposite of this doctrine, viz. that there are institutions of the Creator which have suffering for their exclusive object, is clearly untenable; for this would be ascribing malevolence to the Deity. As, however, the existence of pain is undeniable, it is equally impossible to believe that the world is arranged on the principle of Benevolence exclusively. The view now presented makes no attempt to explain why pain or evil exist, because I consider this inquiry to surpass the limits of the human understanding. It offers an explanation, however, of the use which pain serves—that of enforcing obedience to the natural laws; and it shews that the human mind is constituted in harmony with this order of creation. Phrenology alone, of all systems of mental philosophy, admits faculties clearly related to difficulty, pain, and death, and thus enhances our perceptions of divine wisdom and goodness.

* Sketches, B. 3, Sk. 3, ch. 2.

CHAPTER II.

ON THE CONSTITUTION OF MAN, AND ITS RELATIONS TO EXTERNAL OBJECTS.

The constitution of man, on the principle of a subjection of the whole to reflection and the highest sentiments, shewn by Bishop Butler to be conformable to the constitution of the external world.—(1.) Man considered as a physical being, and the evils resulting from breach of the physical laws shewn to be only exceptions from the benefits habitually flowing from those laws.—(2.) Man considered as an organised being, and the rules for the enjoyment of a sound body explained.—(3.) Man considered as an animal, moral, and intellectual being, and his mental constitution detailed.—(4.) The mental faculties compared with each other.—Their uses and abuses.—The propensities designed for good, when acting harmoniously with, and guided by, the higher sentiments and intellect; otherwise lead to evil.—True happiness of individuals and societies found ultimately to consist in a habitual exercise of the higher sentiments, intellect, and propensities, in harmony with each other.—(5.) The faculties of man compared with external objects, and the means of their gratification specified.

Let us next consider the Constitution of Man, and the natural laws to which he is subjected, and endeavour to discover how far the external world is arranged with wisdom and benevolence in regard to him. Bishop Butler, in the Preface to his Sermons, says, "It is from considering the relations which the several appetites and passions in the inward frame have to each other, and above all, the supremacy of reflection or conscience, that we get the idea of the system or constitution of human nature. And from the idea itself it will as fully appear, that this our nature, *i. e.* constitution, is adapted to virtue, as from the idea of a watch it appears that its nature, *i. e.* constitution or system, is adapted to measure time."

"Mankind has various instincts and principles of action, as brute creatures have; some leading most directly and immediately to the good of the community, and some most directly to private good.

"Man has several which brutes have not; particularly reflection or conscience, an approbation of some principles or actions, and disapprobation of others.

"Brutes obey their instincts or principles of action, according to certain rules; suppose the constitution of their body, and the objects around them.

"The generality of mankind also obey their instincts and principles, all of them; those propensions we call good, as well as the bad, according to the same rules, namely, the constitution of their body, and the external circumstances which they are in.

"Brutes, in acting according to the rules before mentioned, their bodily constitution and circumstances, act suitably to *their whole nature*.

"Mankind, also, in acting thus, would act suitably to their whole nature, if no more were to be said of man's nature than what has been now said; if that, as it is a true, were also a complete, adequate account of our nature.

"But that is not a complete account of man's nature.

Somewhat further must be brought in to give us an adequate notion of it; namely, *that one of those principles of action, conscience, or reflection*, compared with the rest, as they all stand together in the nature of man, *plainly bears upon it marks of authority over all the rest, and claims the absolute direction of them all*, to allow or forbid their gratification;—a disapprobation on reflection being in itself a principle manifestly superior to a mere propension. And the conclusion is, that to allow no more to this superior principle or part of our nature, than to other parts; to let it govern and guide only occasionally, in common with the rest, as its turn happens to come from the temper and circumstances one happens to be in; *this is not to act conformably to the constitution of man*; neither can any human creature be said to act conformably to his constitution of nature, unless he allows to that superior principle the absolute authority which is due to it."—*Butler's Works*, vol. ii. *Preface*. The present treatise is in a great measure founded on the principles here suggested.

SECT. I.—MAN CONSIDERED AS A PHYSICAL BEING.

The human body consists of bones, muscles, nerves, and bloodvessels, besides organs of nutrition, of reproduction, of respiration, of feeling, and of thought. These parts are all composed of physical elements, and, to a certain extent, are subjected to the physical laws of creation. By the law of gravitation, the body, when unsupported, falls to the ground, and is liable to be injured like any frangible substance: by a chemical law, excessive cold freezes, and excessive heat dissipates, its fluids; and life, in either case, is extinguished.

To discover the real effect of the physical laws of nature on human happiness, we need to understand, 1*st*, The physical laws themselves, as revealed by the phenomena of natural substances. These laws, so far as discovered, are treated of in works on natural philosophy, natural history, chemistry, and their subordinate branches; 2*dly*, The anatomical and physiological constitution of the human body; and, 3*dly*, The adaptation of the former to the latter. These expositions are necessary to ascertain the extent to which it is possible for man to place himself in accordance with the physical laws, so as to reap advantage from them; and also to determine how far the sufferings which he endures may be ascribed to the inevitable operation of these laws, and how far to his ignorance and infringement of them. In the subsequent pages, this subject will be treated somewhat in detail: at present I confine myself to a single instance as an illustration of the mode in which the investigation will be conducted.*

By the law of gravitation, heavy bodies tend towards the centre of the earth. Some of the advantages of it are, that objects, when properly supported, remain at rest; that walls, when built sufficiently thick and perpendicular, stand firm and erect; that water descends from high places, turns mill-wheels in its course, and sets in motion the most stupendous and useful machinery; and that ships float steadily with part of their hulls immersed in water and part rising above it, exposing their masts and sails to catch the breeze.

The Creator has bestowed on man bones, muscles, nerves, and intellectual faculties, constructed on admirable principles, which place him in harmony with this law, and enable him to adapt his movements to its influence. Intellect also enables him to perceive the existence of the law, its modes of operation, the relation between it and himself, the beneficial consequences of observing this relation, and the painful results of disregarding it.

When a person falls over a precipice, and is maimed or killed,—when a ship springs a leak and sinks,—or when a reservoir of water breaks its banks and ravages a valley,—the evils proceed from the operation of this law; but, in judging of its utility to man, we should consider all its beneficial consequences, and also inquire whether, when productive of evil, the effects could or could not have been avoided, by a due exercise of physical and mental power.

By pursuing this course, we shall arrive at sound conclusions concerning the adaptation of the human mind and body to the physical laws of creation. The subject is too extensive to be here prosecuted in all its details, and, besides, I am incompetent to do it justice; but enough has been said to elucidate the principle advocated. The more minutely any one inquires, the more firm will be his conviction, that, in these relations, provision has been made by the Creator for human happiness, and that the evils which arise from neglect of them, are attributable, to a great extent, to man's failure in applying his powers to the promotion of his own enjoyment.

SECT. II.—MAN CONSIDERED AS AN ORGANIZED BEING.

Man is an organized being, and subject to the organic laws. An organized being, as was formerly noticed, is one which derives its existence from a previously existing organized being, which subsists on food, which grows, attains maturity, decays, and dies. To render an organized being perfect in its kind, the germ from which it springs must be complete in all its parts, and sound in its whole constitution. This is the *first* organic law. If we sow an acorn in which some vital part has been destroyed altogether, the seedling plant, and the full grown oak, if it ever attain to maturity, will be deficient in the lineaments which are wanting in the embryo root; if we sow an acorn entire in its parts, but only half ripened, or damaged in its whole texture by damp or other causes, the seedling oak will be feeble, and will probably die early. A similar law holds in regard to man. A *second* organic law is, that the organized being, the moment it is ushered into life, and so long as it continues to live, must be supplied with food, light, air, and every other physical element which nature has rendered requisite for its support, in due quantity, and of the kind best suited to its particular constitution. Obedience to this law is rewarded with a vigorous and healthy development of its powers, and, in animals, with a pleasing consciousness of existence, and aptitude for the performance of their natural functions; disobedience is punished with feebleness, general imperfection, pain, or early death. A single fact will illustrate this observation. At the meeting of the British Association, held in Edinburgh in 1834, there was read an Abstract, by Dr Joseph Clarke, of a Registry kept in the Lying-in Hospital of Great Britain Street, Dublin, from the year 1758 to the end of 1833, from which it appeared that, in 1781, when the hospital was imperfectly ventilated, every sixth child died within nine days after birth of convulsive disease, and that, after means of thorough ventilation had been adopted, the mortality of infants, within the same time, in five succeeding years, was reduced to nearly one in twenty.* A *third* organic law, applicable to man, is, that he shall duly exercise his organs; this condition being an indispensable requisite of health. The reward of obedience to this law is enjoyment in the very act of exercising the functions, pleasing consciousness of existence, and the acquisition of numberless gratifications and advantages, of which labour, or the exercise of our powers, is the procuring means: disobedience is punished with derangement and sluggish-

* The reader will find many valuable illustrations of these laws in "The Principles of Physiology applied to the Preservation of Health, and to the Improvement of Physical and Mental Education." By Andrew Combe, M. D. Eighth edition. And also in "The Management of Infancy," by the same author. Maclachlan & Stewart, Edinburgh; and Simpkin, Marshall & Co., London.

* Edin. New Phil. Jour., Oct. 1834, p. 416.

ness in the functions, general uneasiness or positive pain, and the denial of gratification to numerous faculties.

Directing our attention to the constitution of the human body, we perceive that the power of reproduction is bestowed on man, as well as intellect to enable him to discover and obey the conditions necessary for the transmission of a healthy organic frame to his descendants; that digestive organs are given to him for his nutrition, and that innumerable vegetable and animal productions are placed around him, in wise relationship to these organs.

Without attempting to expound minutely the organic structure of man, or to trace in detail its adaptation to his external condition, I shall offer some observations in support of the proposition, that the due exercise of the osseous, muscular, and nervous systems, under the guidance of intellect and moral sentiment, and in accordance with the physical laws, contributes to human enjoyment; and that the neglect of this exercise, or an abuse of it, by carrying it to excess, or by conducting it in opposition to the moral, intellectual, or physical laws, is punished with pain.

The earth is endowed with the capability of producing an ample supply of food, provided we expend muscular and nervous energy in its cultivation; while, in most climates, it refuses to produce, if we withhold this labour and allow it to lie waste: Further, the Creator has presented us with timber, metal, wool, and countless materials, which, by means of muscular power, may be converted into dwelling-places, clothing, and all the luxuries of life. The fertility of the earth, and the demands of the body for food and clothing, are so benevolently adapted to each other, that, with rational restraint on population, a few hours' labour each day from every individual capable of working, would suffice to furnish all with every commodity that could really add to enjoyment. "It has been computed," says Dr Franklin, "by some political arithmetician, that, if every man and woman would work for four hours each day on something useful, that labour would be sufficient to procure all the necessaries and comforts of life; want and misery would be banished out of the world; and the rest of the twenty-four hours might be leisure and pleasure."—(*Essay on Luxury, Idleness, and Industry.*)

In many of the tropical regions of the globe, where a high atmospheric temperature diminishes the quantum of muscular energy, the fertility and productiveness of the soil are increased in a like proportion, so that less labour suffices. Less labour, also, is required to provide habitations and raiment. In the colder latitudes, muscular energy is more abundant; and there, much higher demands are made upon it;—the earth is more sterile, and the piercing frosts render a thicker covering necessary for the body.

Farther, the food afforded by the soil in each climate appears to be adapted to the maintenance of the organic constitution of the people in health, and to the supply of the muscular energy necessary for the particular wants of the situation. In the Arctic Regions, no farinaceous food ripens; but on the question being put to Dr Richardson, how he, accustomed to the bread and vegetables of the temperate regions, was able to relish the pure animal diet, which formed his only support on his expedition to the shores of the Polar Sea along with Captain Franklin, he replied, that the effect of the extreme dry cold to which he and his companions were constantly exposed—living, as they did, in the open air—was to produce a desire for the most stimulating food they could obtain; that bread in such a climate was not only not desired, but comparatively impotent, as an article of diet; that pure animal food, and the fatter the better, was the only sustenance that maintained the tone of the corporeal system; but that when it was abundant (and the quantity required was much greater than in milder latitudes), a delightful vigour and buoyancy of mind and body were enjoyed, that rendered life highly agreeable. In beautiful harmony with these wants of the human frame, these regions abound, during summer, in countless herds of deer, in rabbits, partridges, ducks, and, in short, every sort of game, and also in fish; and the flesh of these, dried, constitutes delicious food in winter, when the earth is wrapped in one wide mantle of snow.

Among the Greenlanders and other Esquimaux tribes, nothing is so much relished as the fat of the whale, the seal, or the walrus: a tallow-candle and a draught of train-oil are regarded as dainties; while a piece of bread is spit out with strong indications of disgust.

In Scotland, the climate is moist and moderately cold; the greater part of the surface is mountainous, and well adapted for rearing sheep and cattle; while a certain portion consists of fertile plains, fitted for raising farinaceous food. If the same law holds in this country, the diet of the people should consist of animal and farinaceous food, the former predominating. And on such food, accordingly, the Scotsman thrives best. As we proceed to warmer latitudes, to France, for instance, we find the soil and temperature less congenial to sheep and cattle, but more favourable to corn and wine; and the Frenchman flourishes in health on less of animal food, than would be requisite to preserve the Scottish Highlander, in the recesses of his mountains, in a strong and alert condition. From one of a series of interesting letters on the agriculture of France by M. Lullin de Chateauvieux, published in the Bibliothèque Universelle, it appears that the consumption of beef in that country relative to the population, is only one-sixth of what it is in England. (*Journal of Agriculture*, No. iii. p. 390.) The plains of Hindustan are too hot for the extensive rearing of the sheep and the ox, but produce rice and vegetable spices in prodigious abundance; and the native is healthy, vigorous, and active, when supplied with rice and curry, and becomes sick when obliged to live chiefly on animal diet. He is supplied with less muscular energy by this species of food; but his soil and climate require far less laborious exertion to maintain him in comfort, than those of Britain, Germany, or Russia.

So far, then, the external world appears to be wisely and benevolently adapted to the organic system of man; that is, to his nutrition, and to the development and exercise of his corporeal organs. The natural law appears to be, that every one who desires to enjoy the pleasures of health, must expend in labour the energy which the Creator has infused into his limbs. A wide choice is left to man, as to the *mode* in which he shall exercise his nervous and muscular systems: The labourer, for example, digs the ground, and the squire engages in the chase; both pursuits exercise the body. The penalty for neglecting this law is imperfect digestion and disturbed sleep, debility, bodily and mental lassitude, and, if carried to a certain length, confirmed bad health and early death. The penalty for overexerting these systems is exhaustion, mental incapacity, the desire of strong artificial stimulants (such as ardent spirits), general insensibility, grossness of feeling and perception, with disease and shortened life.

Society has not recognised this law; and, in consequence, the higher orders despise labour and suffer the first penalty, while the lower orders are oppressed with toil and undergo the second. The penalties serve to provide motives for obedience to the law; and when ever it is recognised, and the consequences are discovered to be inevitable, men will no longer shun labour as painful and ignominious, but resort to it as a source of pleasure and advantage.*

SECT. III.—MAN CONSIDERED AS AN ANIMAL, MORAL, AND INTELLECTUAL BEING.

I have adverted to the bodily constitution of man, which is essentially animal; but I observe, in the third

* See Appendix, No. II.

place, that man, viewed in regard to his mental constitution, is an animal, moral, and intellectual being. To discover the adaptation of the mental parts of his nature to his external circumstances, we must first know what are his various animal, moral, and intellectual powers themselves. Phrenology gives us a view of them, drawn from observation; and as I have verified the inductions of that science, so as to satisfy myself that it is the best exposition of the nature of man which has yet been given, I adopt its classification of faculties as the basis of the subsequent observations. One great advantage presented by Phrenology, is the light which it throws on the *natural* constitution of the mind. Philosophers and divines have long disputed about the number and functions of the human faculties; and while each assumed his own consciousness as the standard of nature, and occupied himself chiefly with observations on its phenomena, as his means of study, there could be no end to their discussions. But the organs of the mind can be seen and felt, and their size estimated,—and the mental manifestations also that accompany them can be observed, in an unlimited number of instances,—so that, assuming the existence of organs, it is clear that a far higher degree of certainty in regard to the *natural* endowments of the mind may be attained by studying them, than by any means previously applied. It is disputed also whether man be now in possession of the same qualities as those with which he was created: but if mental organs exist at all, they have been bestowed by the Creator; and if we discover their functions and their uses, and distinguish these from their abuses, we shall obviously obtain clearer views of what God has instituted, and of the extent to which man himself is chargeable with error and perversion, than could be arrived at by the means hitherto employed. Such conclusions, if correctly drawn, will possess an irresistible authority—that of the record of creation itself. If, therefore, any reader be disposed to question the existence of such qualities in man as I am about to describe,—to do so consistently, he must be prepared to deny, on reasonable grounds, that mental organs exist, —or, if he allows their existence, he must establish that the observations of phrenologists in regard to them are incorrect, or their inferences regarding their functions erroneously deduced. According to Phrenology, then, the human faculties are the following. The organs are double, each faculty having two, lying in corresponding situations of the hemispheres of the brain. Their *situations* are indicated by the engravings.

Order I. FEELINGS.

Genus I. PROPENSITIES—*Common to Man with the Lower Animals.*

THE LOVE OF LIFE.—Organ not indicated on the bust.

1. AMATIVENESS—Produces sexual love.
2. PHILOPROGENITIVENESS.—*Uses:* Affection for young and tender beings.—*Abuses:* Pampering and spoiling children.
3. CONCENTRATIVENESS.—*Uses:* It renders permanent emotions and ideas in the mind.—*Abuses:* Morbid dwelling on internal emotions and ideas, to the neglect of external impressions.

3 a. INHABITIVENESS.—*Uses:* It produces the desire of permanence in place.—*Abuses:* Aversion to move abroad.

4. ADHESIVENESS.—*Uses:* Attachment friendship and society result from it.—*Abuses:* Clanship for improper objects, attachment to worthless individuals. It is generally strong in women.
5. COMBATIVENESS.—*Uses:* Courage to meet danger and overcome difficulties, tendency to oppose and attack whatever requires opposition, and to resist unjust encroachments.—*Abuses:* Love of contention, and tendency to provoke and assault. This feeling obviously adapts man to a world in which danger and difficulty abound.
6. DESTRUCTIVENESS.—*Uses:* Desire to destroy noxious objects, animate and inanimate, and to kill for food. It is very discernible in carnivorous animals.—*Abuses:* Cruelty, murder, desire to torment, tendency to passion, rage, and harshness and severity in speech and writing. This feeling places man in harmony with death and destruction, which are woven into the system of sublunary creation.

6 a. APPETITE FOR FOOD.—*Uses:* Nutrition.—*Abuses:* Gluttony and drunkenness.

7. SECRETIVENESS.—*Uses:* Tendency to restrain within the mind the various emotions and ideas that involuntarily present themselves, until the judgment has approved of giving them utterance; it is simply the propensity to conceal, and is an ingredient in prudence. *Abuses:* Cunning, deceit, duplicity, and lying.
8. ACQUISITIVENESS.—*Uses:* Desire to possess, and tendency to accumulate; the sense of property springs from it.—*Abuses:* Inordinate desire of property, selfishness, avarice, theft.
9. CONSTRUCTIVENESS.—*Uses:* Desire to build and construct works of art.—*Abuses:* Construction of engines to injure or destroy, and fabrication of objects to deceive mankind.

Genus II. SENTIMENTS.

I. *Sentiments common to Man with some of the Lower Animals.*

10. SELF-ESTEEM.—*Uses:* Self-respect, self-interest, love of independence, personal dignity.—*Abuses:* Pride, disdain, overweening conceit, excessive selfishness, love of dominion.
11. LOVE OF APPROBATION.—*Uses:* Desire of the esteem of others, love of praise, desire of fame or glory. —*Abuses:* Vanity, ambition, thirst for praise independently of praiseworthiness.
12. CAUTIOUSNESS.—*Uses:* It gives origin to the sentiment of fear, the desire to shun danger, and circumspection; and it is an ingredient in prudence. The sense of security springs from its gratification.—*Abuses:* Excessive timidity, poltroonery, unfounded apprehensions, despondency, melancholy.
13. BENEVOLENCE.—*Uses:* Desire of the happiness of others, compassion for the distressed, universal charity, mildness of disposition, and a lively sympathy with the enjoyment of all animated beings.—*Abuses:* Profusion, injurious indulgence of the appetites and fancies of others, prodigality, facility of temper.

II. *Sentiments Proper to Man.*

14. VENERATION.—*Uses:* Tendency to venerate or respect whatever is great and good; gives origin to religious adoration.—*Abuses:* Senseless respect for unworthy objects consecrated by time or situation, love of antiquated customs, abject subserviency to persons in authority, superstitious awe. To these Mr Scott adds, "undue deference to the opinions and reasonings of men who are fallible like ourselves; the worship of false gods, polytheism, paganism, idolatry."
15. FIRMNESS.—*Uses:* Determination, perseverance, steadiness of purpose.—*Abuses:* Stubbornness, infatuation, tenacity in evil.
16. CONSCIENTIOUSNESS.—*Uses:* It gives origin to the sentiment of justice, or respect for the rights of others, openness to conviction, the love of truth.—*Abuses:* Scrupulous adherence to noxious principles when ignorantly embraced, excessive refinement in the views of duty and obligation, excess in remorse or self-condemnation.
17. HOPE.—*Uses:* Tendency to expect future good; it cherishes faith.—*Abuses:* Credulity with respect to the attainment of what is desired, absurd expectations of felicity not founded on reason.
18. WONDER.—*Uses:* The desire of novelty; admiration of the new, the unexpected, the grand, the wonderful, and extraordinary.—*Abuses:* Love of the marvellous and occult; senseless astonishment; belief in false miracles, in prodigies, magic, ghosts, and other supernatural absurdities.—*Note.* Veneration, Hope, and Wonder, combined, give the tendency to religion; their abuses produce superstition.
19. IDEALITY.—*Uses:* Love of the beautiful and splendid, desire of excellence, poetic feeling.—*Abuses:* Extravagance and absurd enthusiasm, preference of the showy and glaring to the solid and useful, a tendency to dwell in the regions of fancy and to neglect the duties of life.
20. WIT—Gives the feeling of the ludicrous, and disposes to mirth.

21. IMITATION—Copies the manners, gestures, and actions of others, and appearances in nature generally.

Order II. INTELLECTUAL FACULTIES.

Genus I. EXTERNAL SENSES.

FEELING or TOUCH.
TASTE.
SMELL.
HEARING.
SIGHT.

Uses: To bring man into communication with external objects, and to enable him to enjoy them. —*Abuses:* Excessive indulgence in the pleasures arising from the senses, to the extent of impairing bodily health, and debilitating or deteriorating the mind.

Genus II. KNOWING FACULTIES WHICH PERCEIVE THE EXISTENCE AND QUALITIES OF EXTERNAL OBJECTS.

22. INDIVIDUALITY—Takes cognizance of existence and simple facts.
23. FORM—Renders man observant of form.
24. SIZE—Gives the idea of space, and enables us to appreciate dimension and distance.
25. WEIGHT—Communicates the perception of momentum, weight, and resistance; and aids equilibrium.
26. COLOURING—Gives perception of colours and their harmonies.

Genus III. KNOWING FACULTIES WHICH PERCEIVE THE RELATIONS OF EXTERNAL OBJECTS.

27. LOCALITY—Gives the idea of relative position.
28. NUMBER—Gives the talent for calculation.
29. ORDER—Communicates the love of physical arrangement.
30. EVENTUALITY—Takes cognizance of occurrences or events.
31. TIME—Gives rise to the perception of duration.
32. TUNE—The sense of Melody and Harmony arises from it.
33. LANGUAGE—Gives facility in acquiring a knowledge of arbitrary signs to express thoughts, readiness in the use of them, and the power of inventing and recollecting them.

Genus IV. REFLECTING FACULTIES, WHICH COMPARE, JUDGE, AND DISCRIMINATE.

34. COMPARISON—Gives the power of discovering analogies, resemblances, and differences.
35. CAUSALITY—Traces the dependences of phenomena, and the relation of cause and effect.

It has been ascertained by observation that each of these faculties is connected with a particular portion of the brain, and that, other conditions being the same, the power of manifesting each bears a relation to the size of its organ. The organs differ in relative size in different individuals, and hence arise differences in talents and dispositions. This fact is of great importance in the philosophy of man; and the circumstance of its having been unknown until Dr Gall's discovery of the functions of the brain, is sufficient to explain the past barrenness of mental science, and to render probable the assertion, that a great flood of light on this subject is now pouring forth on the world. These faculties are not all equal in excellence and authority; some are common to man with the lower animals, and others are peculiar to man. Before comparing the human mind, therefore, with its external condition, it becomes an object of importance to discover the relative rank and authority of these different powers.

SECT. IV.—THE FACULTIES OF MAN COMPARED WITH EACH OTHER; OR THE SUPREMACY OF THE MORAL SENTIMENTS AND INTELLECT.

According to the phrenological theory of human nature, the faculties are divided into Propensities common to man with the lower animals, Sentiments common to man with the lower animals, Sentiments proper to man, and Intellect. Almost every faculty stands in a definite relation to certain external objects: when it is internally active it desires these objects; when they are presented to it they excite it to activity, and delight it with agreeable sensations. Human happiness and misery are resolvable into the gratification, and denial of gratification, of one or more of our mental faculties, or of the feelings connected with our bodily frame. Every faculty is good in itself, but all are liable to be abused.

The faculties may be considered as acting in a variety of ways. First, The lower propensities may be viewed as acting by themselves, each seeking its own gratification, without transgressing the limits prescribed by enlightened intellect and the moral sentiments: this gratification is legitimate and proper, and the fountain of much enjoyment to human beings. Secondly, The propensities may be considered as acting in opposition to the dictates of the moral sentiments and intellect: A merchant, for instance, by misrepresentation of the real qualities of his commodities, may obtain a higher price for them than if he spoke the truth; or, by depreciating unjustly the goods of a rival, he may attract that rival's customers to himself: By such conduct he would apparently benefit himself, but he would infringe the dictates of the moral sentiments and intellect; in other words, he would do an injury to the interests of his rival, proportionate to the undue benefit which he attempted to secure to himself: All such manifestations of the propensities are abuses, and, when pursued systematically to their results, are seen to injure not only the individual against whom they are directed, but him also who practises them. Thirdly, The moral sentiments may be regarded as acting by themselves, each seeking its own gratification: thus Benevolence may prompt an individual to do acts of kindness, and Veneration to perform exercises of devotion. When the gratification sought by any one or more of the sentiments does not infringe the duties prescribed by all the other faculties, the actions are proper. But any one moral sentiment, acting by itself, may run into excess—Benevolence, for instance, may instigate to generosity at the expense of justice; Veneration may prompt a person to run after sermons abroad, when he should be discharging his domestic duties, or instructing his children at home,—which actions also are abuses.

Thus there is, 1st, a wide sphere of action provided for the propensities, in which each may seek its gratification in its own way, without transgressing the limits of morality; and this is a good and proper action: 2dly, There is ample scope for the exercise of each of the moral and intellectual faculties, without infringing the dictates of any of the other faculties; and this action also is good. But, on the other hand, the propensities, and also the moral and intellectual faculties, may act singly or in groups, in opposition to the dictates of all the other powers enlightened by knowledge and acting in combination; and all such actions are wrong. Hence right conduct is *that which is approved of by the whole faculties, fully enlightened, and acting in harmonious combination.* When conflict arises between the desires of the different faculties, the dictates of the moral and intellectual, as superior in kind to those of the animal faculties, must be obeyed, otherwise misery will ensue; and this I call the supremacy of the moral sentiments and intellect.

When conflict arises, I do not consider any of the moral sentiments and intellectual faculties singly, or even the whole of them collectively, as sufficient to direct conduct by their mere impulsive suggestions. To fit them to discharge this important duty, they must act in harmonious combination with each other, and be illuminated by knowledge of the nature and legitimate spheres of action of the propensities, and also of physical and moral science. The sources of knowledge are observation and reflection,—experience,—and instruction by books, teachers, and all other means by which the Creator has provided for the improvement of the human mind. Whenever their dictates, thus combined and enlightened, oppose the solicitations of the propen-

sities, the latter must yield,—otherwise, by the constitution of nature, evil will inevitably ensue. This is what I mean by nature being constituted in harmony with the whole faculties of man; the moral sentiments and intellect, in case of conflict, holding the supremacy.

Phrenology shews that different individuals possess the faculties in different degrees: I do not mean, therefore, to say, that in each individual, whatever the proportion of his organs may be, the dictates of *his* animal, moral, and intellectual powers, acting in harmonious combination, are rules of conduct not to be disputed. On the contrary, in most individuals one or several of the organs are so deficient, or so excessive, in size, in proportion to the others, that their perceptions of duty will differ from the highest standards. The dictates of the animal, moral, and intellectual powers, therefore, acting in harmonious combination, which constitute rules of conduct, are the collective dictates of the best endowed and best balanced minds, illuminated by the greatest knowledge.

Let us now consider the faculties themselves. First, I shall view the propensities acting alone, uninfluenced by the moral and intellectual powers. There is ample scope for their proper activity in this way; but the great distinction between the animal faculties and the powers proper to man is, that the former do not prompt us to seek the welfare of mankind at large: their object is chiefly the preservation of the individual himself, his family, or his tribe; while the latter have the general happiness of the human race, and our duties to God, as their ends.

The Love of Life, and The Appetite for Food, have clearly reference to the preservation of the individual alone.

Even the domestic affections, amiable and respectable as they undoubtedly are, have self as their chief object. The first three propensities, Amativeness, Philoprogenitiveness, and Adhesiveness, or the group of the domestic affections, desire a conjugal partner, offspring, and friends; the obtaining of these affords them delight—the removal of them occasions pain. But they do not take an interest in the welfare of their objects on their own account. He who loves from Amativeness alone is sensual, faithless, and negligent of the happiness of his partner. He who combines with this propensity, Benevolence, Veneration, Justice, and Intellect, will disinterestedly promote the real happiness of the object of his affection.

To realize happiness, the whole faculties must be gratified harmoniously, or at least the gratification of one or more of them must not offend any of the others. For example, suppose the group of the domestic affections to be highly interested in an individual, and strongly to desire an alliance with him, but that he is improvident and immoral, and altogether an object of whom the higher faculties, acting by themselves, cannot approve;—then bitter days of repentance will necessarily follow, when the lower feelings begin to languish, and his qualities give offence to the moral powers. If, on the other hand, the domestic affections be guided to an object pleasing to the higher sentiments, these themselves will be gratified; they will double the delights afforded by the inferior faculties, and render the enjoyment permanent.

The love of children, springing from Philoprogenitiveness, is the same in kind as that of the miser for his gold; an interest in the object, for the sake of the gratification which it affords to his own mind, without desiring, or being able to distinguish, what is good for the object on its own account. This truth is recognised by Sir Walter Scott. He says, "Elspat's ardent, though selfish affection for her son, incapable of being qualified by a regard for the true interests of the unfortunate object of her attachment, resembled the instinctive fondness of the animal race for their offspring; and, diving little farther into futurity than one of the inferior creatures, she only felt that to be separated from Hamish was to die."*

In man, this faculty generally acts along with Benevolence, and a disinterested desire of the happiness of the child mingles with, and elevates, the mere instinct of Philoprogenitiveness; but the sources of these two affections are different, their degrees vary in different persons, and their ends also are dissimilar. This is exemplified every day by the conduct of mothers, who, although actuated by an intense love of their offspring, nevertheless spoil them by vicious indulgence, and render them completely miserable. If Philoprogenitiveness were capable, singly, of desiring and perceiving the real welfare of children, the treatment of them would, in all cases, be rational and beneficial, in proportion to the degree in which this faculty was active; but this is not consistent with experience. Again, Christian mothers, who sincerely believe that, at death, their children pass into everlasting happiness, which is far better for them than sojourning on earth, nevertheless shew the highest indications of bereavement and sorrow on their loss;—thus affording evidence that their love was not a disinterested affection concerned exclusively for the happiness of the being itself which constituted its object.

The same observation applies to the affection proceeding from Adhesiveness. When this faculty acts alone, it desires, for its own satisfaction, a friend to love; but, from its own impulses, it is not interested in the welfare of its object. It feels attached to him as a sheep does to its fellows of the flock; but, if Benevolence do not act along with it, it does nothing for the happiness of that friend. Both Adhesiveness and Philoprogenitiveness tend to excite Benevolence towards their objects:—When this sentiment, however, is naturally very weak, the propensities cannot render it vividly active. The horse feels melancholy when his companion is removed; but the feeling appears to be simply one of uneasiness at the absence of an object which gratified his Adhesiveness. His companion may have been led to a richer pasture, or introduced to more agreeable society; yet this does not assuage the distress suffered by him at his removal: his tranquillity is restored only by time causing the activity of Adhesiveness to subside, or by the substitution of another object on which it may expend itself. In human nature, the effect of the faculty, when acting singly, is the same; and this accounts for the fact of the almost total indifference of many persons who were really attached by Adhesiveness to each other, when one falls into misfortune, and becomes a disagreeable object to the pride or vanity of the other. Suppose two persons, elevated in rank, and possessed of affluence, to have each Adhesiveness, Self-Esteem, and Love of Approbation large, with Benevolence and Conscientiousness moderate, it is obvious that, while both are in prosperity, they may really like each other's society, and feel a reciprocal attachment, because there will be mutual sympathy in their Adhesiveness, and the Self-Esteem and Love of Approbation of each will be gratified by the rank and circumstances of the other: but imagine one of them to fall into misfortune, and to cease to be an object gratifying to Self-Esteem and Love of Approbation; suppose that he becomes a poor friend instead of a rich and influential one; the harmony between their selfish faculties will be broken, and then Adhesiveness in the one who remains rich will transfer its affection to another individual who may gratify it, and also supply agreeable sensations to Self-Esteem and Love of Approbation—to a genteel friend, in short, who will look well in the eye of the world.

Much of this conduct occurs in society, and the complaint is very ancient, that the storms of adversity disperse friends, as the wintry blasts strip from the forest the leaves that gaily adorned it in the sunshine of sum-

* Chronicles of the Canongate, vol. i. p. 181.

ner; and, in consequence, many moral sentences have been pointed, and epigrams finely turned, on the selfishness and corruption of poor human nature. But such friendships were attachments founded on the lower feelings, which, by their constitution, do not regard the welfare of others; and the desertion complained of, is the legitimate result of the principles on which both parties acted during the gay hours of prosperity. If we look at a cast of the head of Sheridan, we shall perceive large Adhesiveness, Self-Esteem, and Love of Approbation, with deficient Causality, and moderate Conscientiousness. He had large Individuality, Comparison, Secretiveness, and Imitation, which gave him talents for observation and display. When these earned him a brilliant reputation, he was surrounded by friends, and he himself probably felt attachment in return. But he was deficient in morality, and not disposed to love his friends with a true, disinterested, and honest regard; he abused their kindness; and when he sank into poverty and wretchedness, and ceased to be an honour to them, all who were constituted like himself deserted him. But the whole connexion was founded on selfish principles: Sheridan honoured them, and they flattered Sheridan; and the abandonment was the natural consequence of the cessation of gratification to their selfish feelings. I shall by-and-by point out the sources of a loftier and purer friendship, and its effects. Those individuals only who acted from Adhesiveness combined with the higher feelings, remained attached to him through all his misfortunes.

Combativeness and Destructiveness also, when acting alone, or in combination with the other propensities, do not in their own nature seek the happiness of others. If aggression be committed against us, Combativeness shews the front of opposition and repels the attack; Destructiveness inflicts pain or injury, to make the aggressor desist, or it takes vengeance for the offence. Both feelings are obviously very different from Benevolence. I do not say that, in themselves, they are despicable or sinful; on the contrary, they are necessary, and, when legitimately employed, highly useful; but still their first and instinctive object is the preservation of self.

Secretiveness suppresses feelings that are improper to be manifested, and that might injure us with other individuals, and restrains the faculties generally. It also gives the desire to find out secrets that its possessor may guard himself against hostile plots or designs. In itself it does not desire, in any respect, the benefit of others.

The next organ is Acquisitiveness. It blindly desires to possess, is pleased with accumulating, and suffers great uneasiness in being deprived of possessions; but its object is not the happiness of others. Like all the other faculties, it is highly useful, for even Benevolence cannot give away until Acquisitiveness has acquired. There are friendships, particularly among mercantile men, founded on Adhesiveness and Acquisitiveness, just as in fashionable life they are founded on Adhesiveness and Love of Approbation. Two individuals fall into a course of dealing, by which each reaps profit from transactions with the other: this leads to intimacy; Adhesiveness mingles its influence, and a feeling of attachment is at last produced. The moment, however, that the Acquisitiveness of the one suffers the least inroad from that of the other, and their interests clash, they are apt, if no higher principle unite them, to become bitter enemies. It is probable that, while these fashionable and commercial friendships last, the parties may profess great reciprocal esteem and regard, and that, when a rupture takes place, the one who is depressed or disobliged, may recall these expressions, and charge the other with hypocrisy; but they really were not insincere. From Adhesiveness and gratified Love of Approbation or Acquisitiveness, each probably felt something which he believed to be disinterested friendship; but if each would honestly probe his own conscience, he would be obliged to acknowledge that the whole basis of the connexion was selfish—and hence, that the result is just what should be expected by every man who places his reliance for happiness chiefly on the lower feelings.

Self-Esteem is, in its very essence and name, selfish: it is the love of ourselves, and the esteem of ourselves *par excellence*.

Love of Approbation, although many think otherwise, does not in itself desire the happiness of others. Its object is applause to ourselves, to be esteemed ourselves; and if it prompt us to do services, or to say agreeable things to others, this is not from pure love of them, but for the sake of obtaining the self-gratification afforded by their good opinion.

Suppose, for example, that we are acquainted with a person who has committed an error in some official duty,—who has done or said something that the public disapproves of, and which we see to be really wrong,—Benevolence and Conscientiousness would prompt us to lay before our friend the very head and front of his offending, and conjure him to forsake his error, and make public amends:—Love of Approbation, on the other hand, would simply desire to gain his applause, by making ourselves agreeable to him, without looking farther. If unenlightened, it would either render us averse to speak to him at all on the subject, lest he should be offended; or prompt us to extenuate his fault, to gloss it over, and to represent it either as a simple mistake or as extremely trivial. If we analyze the motive which prompts to this course, we shall find that it is not love of our friend or consideration for his welfare—but fear lest, by our presenting to him disagreeable truths, he should feel offended with us, and deprive us of the gratification afforded by his good opinion.

Another illustration may be given. A manufacturer in a country-town, having acquired a considerable fortune by trade, applied part of it in building a princely mansion, which he furnished in the richest and most expensive style of fashion. He asked his customers, near and distant, to visit him, and introduced them into an apartment that dazzled them with splendour. This excited their curiosity and wonder, which was precisely the effect he desired; he then led them over his whole suite of rooms, and displayed before them his grandeur and taste. In doing so, he affected to act as if he were conferring a gratification on them, and believed that he was filling their minds with an intense admiration of his greatness; but the real effect was very different. The motive of his conduct was not love of them, or regard for their happiness or welfare; it was not Benevolence to others that prompted him to build the palace; it was not Veneration; it was not Conscientiousness. The fabric sprang from Self-Esteem and Love of Approbation, combined, no doubt, with considerable Intellect and Ideality. In leading his humble brethren in trade through the princely halls, over the costly carpets, and amidst the gilded mirrors and rich array that everywhere met their eyes, he exulted in the consciousness of his own importance, and asked for their admiration, not as an expression of respect for any real benefit conferred upon them, but as the much relished food of his own selfish vanity.

Let us attend, in the next place, to the effect which this display would produce on those to whom it was addressed. To gain their esteem or affection, it would have been necessary to manifest towards them Benevolence, respect, and justice; for, to cause another individual to love us, we must make him the object of our moral sentiments, which have his good and happiness for their end. Here, however, these were not the inspiring motives, and the want of them would be instinctively felt. The customers who possessed the least shrewdness would ascribe the whole exhibition to the vanity of the owner, and they would either pity, or envy and hate him: if their own moral sentiments pre-

dominated, they would pity him; if their Self-Esteem and Love of Approbation were paramount, they would envy his magnificence, yet be offended at his assumed superiority, and would hate him. It would be only the silliest and the vainest who would be at all gratified; and their satisfaction would arise from the feeling, that they could now return to their own circle, and boast how great a friend they had, and in how grand a style they had been entertained—this display being a direct gratification of their own Self-Esteem and Love of Approbation, by identifying themselves with him. Even this pleasure would exist only where the admirer was so humble in rank as to entertain no idea of rivalship, and so limited in intellect and morality as not to perceive the worthlessness of the qualities by which he was captivated.

In like manner, when persons, even of more sense than the manufacturer here alluded to, give entertainments to their friends, they sometimes fail in their object from the same cause. Their leading motive is a wish to shew off themselves, much more than to confer real happiness upon their acquaintances; and, by the unbending law of human nature, this must fail in exciting goodwill and pleasure in the minds of those to whom it is addressed, because it disagreeably affects their Self-Esteem and Love of Approbation. In short, to be really successful in gratifying our friends, we must keep our own selfish faculties in due subordination, and pour out copious streams of real kindness from the higher sentiments, animated and elevated by intellect; and all who have experienced the heartfelt joy and satisfaction attending an entertainment conducted on this principle, will never quarrel with the homeliness of the fare, or feel uneasy about the absence of fashion in the service.

Cautiousness is the next faculty, and is a sentiment instituted to prompt us to shun danger. Acting apart from the moral sentiments, it would seek first to protect self from evil; and this is its essential object.

This terminates the list of the Feelings common to man with the lower animals,* and which, as we have seen, when acting impulsively, either singly or in combination with each other, apart from the moral powers, do not seek the welfare of others as their aim, but have self-preservation and self-gratification as their leading objects. They are given for the protection and advantage of our individual nature, and, when manifested in their proper spheres, are highly useful, and also respectable, viewed with reference to that end. Their action is then also in harmony with the dictates of the moral sentiments; but they are sources of innumerable evils when allowed to usurp the ascendency over these powers, and to become the leading springs of our social conduct. Their action appears to be the same in kind, in man and in the lower animals. We do not regard a cow in suckling her calf, or a dog in defending his bone, as manifesting moral feelings. We approve of these and other manifestations of the propensities in the lower animals, because they are suited to their nature and circumstances; but the notion of morality springs from the higher sentiments, which are superior in kind to the propensities.

I proceed to notice the Moral Sentiments, and to point out their objects and relations.

Benevolence has direct reference to other beings. If they are miserable it feels compassion for them, and desires to relieve them. It purely and disinterestedly desires the happiness of its objects: it loves for the sake of the person beloved; if he be well, and the sunbeams of prosperity shine warmly around him, it exults and delights in his felicity. It desires a diffusion of joy, and renders the feet swift and the arms strong in the cause of charity and love. By the beneficence of the Creator, it is, when gratified, the source of great enjoyment to its possessor; insomuch that some authors have asserted, that men are benevolent for the sake of this pleasure. But this is not correct. The impulse is instinctive, and acts before the intellect has anticipated the result.

Veneration also has reference to others. It looks up with a pure and elevated emotion to the being to whom it is directed, whether God or our fellow-men, and delights in the contemplation of their great and good qualities. It renders self lowly, humble, and submissive. God is its highest object.

Hope spreads its gay wing in the boundless regions of futurity. It desires good, and expects it to come: "it incites us, indeed, to aim at a good which we can live without;" but its influence is soft, soothing, and happy. When combined with the propensities, it expects good to self; when with the moral sentiments, it anticipates universal happiness.

Ideality delights in perfection from the pure pleasure of contemplating it. So far as it is concerned, the picture, the statue, the landscape, or the mansion, on which it abides with the intensest rapture, is as pleasing, although the property of another, as if all its own. It is a spring that is touched by the beautiful wherever it exists; and hence its means of enjoyment are as unbounded as the universe.

Wonder seeks the new and the striking, and is delighted with change; but there is no desire of appropriation to self in its longings.

Conscientiousness stands in the midway between self and other individuals. It implies the existence of both selfish and social tendencies in man, for one of its functions is to regulate their contending solicitations. It is a regulator both of our animal and moral feelings, and aided by intellect, it serves to point out the limits which they must not pass. It desires to do to another as we would have another to do to us, and is the guardian of the welfare of our fellow-men, while it sanctions and supports our personal feelings within the bounds of justice. It is a noble feeling; and the mere consciousness of its being bestowed upon us, ought to bring home to our minds an intense conviction that the Author of the universe from whom it springs is at once wise and just.

The sentiments now enumerated may be erroneously directed, or may act in excess, and, in either case, may give rise to abuses, such as profusion, superstition, or extravagant refinement. But the grand distinction between them and the propensities is this: The propensities, acting even legitimately—singly, or in combination with each other, but not in combination with the moral sentiments—have individual interests for their direct objects, and do not actively desire the happiness of other beings for the sake of these beings themselves: the actions of the lower animals afford illustrations in point. The moral powers, on the other hand, acting in harmonious combination with each other, and directed by enlightened intellect, desire the welfare or honour of other beings as their direct object: the purest and the best of men afford in their conduct examples of the truth of this remark.* It is not this distinction alone, however, which confers the moral character on the latter sentiments. There is an inherent difference in kind between them and the pro-

* Benevolence is stated in the works on Phrenology as common to man with the lower animals; but in these creatures it appears to produce rather passive meekness and good nature, than actual desire for each other's happiness. In the human race, this last has its proper function; and, viewed in this light, I treat of it as exclusively a human faculty.

* The classification of the moral sentiments in the phrenological system is not perfect: It includes Wit, Imitation, Firmness, and Wonder, which are not necessarily or essentially moral. By "the moral sentiments," when used as a general expression, I mean Benevolence, Veneration, and Conscientiousness, aided by Hope, Ideality, and Firmness.

pensities, which is felt by those who possess both. In cases of conflict, the superiority is recognised as belonging to the moral faculties by their natural constitution.*

Intellect is universal in its applications. It may become the handmaid of any of the faculties; it may devise a plan to murder or to bless, to steal or to bestow, to rear up or to destroy; but, as its proper use is to observe the different objects of creation, to mark their relations, and to direct the propensities and sentiments to their proper and legitimate enjoyments, it has a boundless sphere of activity, and, when properly exercised and applied, is a source of high and inexhaustible delight.

The world is so constituted, that all necessary and really advantageous gratifications of the propensities, are compatible with the dictates of the moral sentiments and intellectual powers, so that scope is afforded to all the faculties to act in harmonious combination; while all gratifications of the propensities which are disapproved of by the higher powers, are, in their ultimate consequences, hurtful to the individual himself. In like manner, all manifestations of the moral sentiments, when acting in harmonious combination and directed by enlightened intellect, although they tend directly to the welfare of others, indirectly contribute, in a high degree, to the enjoyment of the virtuous agent.

Keeping in view the great difference now pointed out between the animal and moral faculties, the reader will perceive that three consequences follow from the constitution of these powers.

First, All the faculties, when in excess, are insatiable, and, from the constitution of the world, never can be satisfied. They indeed may be soon satisfied on any particular occasion. Food will soon blunt the appetite; success in a speculation will render Acquisitiveness quiescent for the moment; a triumph will satisfy for the time Self-Esteem and Love of Approbation; a long concert will fatigue Tune; and a tedious discourse will afflict Causality. But after repose they will all *renew their solicitations*. They must all, therefore, be regulated in their action, particularly the propensities and lower sentiments. These having self as their primary object, and being blind to consequences, do not set limits to their own indulgence; and, when allowed to exceed the boundaries prescribed by the superior sentiments and intellect, lead directly to misery to the individual, and injury to society.

As this circumstance attending the propensities is of great practical importance, I shall make a few observations in elucidation of it. The births and lives of children depend upon circumstances over which unenlightened men have but a limited control; and hence an individual, whose supreme happiness springs from the gratification of Philoprogenitiveness, may, by the predominance of that propensity and the inactivity of the higher powers, be led to neglect or infringe the natural laws on which the lives and welfare of his children depend, to treat them irrationally, and thus to defeat his own desires. He will be in constant danger of anguish and disappointment, from the death of his children, or from their undutiful conduct. Besides, Philoprogenitiveness, acting in each parent along with Self-Esteem and Love of Approbation, would desire that *his* children should possess the highest rank and greatest wealth, and be distinguished for the most splendid talents. But, the highest, the greatest, and the most splendid of any qualities, necessarily imply the existence of inferior degrees, and are attainable only by few. The animal faculties, therefore, must be restrained in their desires, and directed to their objects by the moral sentiments, and by intellect, otherwise they will inevitably lead to disappointment. In like manner, Acquisitiveness desires wealth; but as nature affords annually only a limited quantity of the articles from which wealth can be created, and as human labour and skill, the means of its creation, have limits, it is self-evident that, if all desire to acquire and possess a large amount, ninety-nine out of every hundred must be disappointed. This disappointment, from the very constitution of nature, is inevitable to the greater number; and when individuals form schemes of aggrandisement, originating from desires communicated by the animal faculties alone, they would do well to keep this law of nature in view. When we look around us, we see how few become rich; how few succeed in accomplishing all their lofty anticipations for the advancement of their children; and how few attain the summit of ambition, compared with the multitudes who fail. The animal faculties exist in all men, and when they act without regulation, they prompt one man to defeat the gratification of another. All this arises, not from error and imperfection in the institutions of the Creator, but from blindness in men to their own nature, to the nature of external objects, and to the relations established between them; in short, from blindness to the principles of the divine administration of the world.

Secondly, The animal propensities being inferior in their nature to the human faculties, their gratifications, when not approved of by the latter, leave a painful feeling of discontent and dissatisfaction in the mind, occasioned by the secret disavowal of their excessive action by the higher feelings. Suppose, for example, a young person to set out in life with ardent wishes to acquire wealth, and to attain honour and distinction. Imagine him to rise early and sit up late; to put forth all the energies of a powerful mind in buying, selling, and becoming rich; and to be successful: it is obvious, that Benevolence, Veneration, and Conscientiousness, had a small share in prompting him to this course of action; and that, in pursuing it, they have not received direct and intended gratification. They may have anxiously and constantly watched the animal faculties, longing for the hour when they should say Enough; their whole occupation, in the mean time, having been to restrain them from such gross excesses as would have defeated their own ends.

Suppose, then, this individual to have reached the

* See an able essay on this subject in the Phren. Journal, No. 12, entitled "On the Phrenological Theory of Virtue;" republished in the American Phren. Journal, vol. iii. No. 3, article 1. The author of the essay states clearly and correctly the distinction between *virtue* and *merit*. "We hold," says he, "*virtue* to be a term expressive of the relation of the sentiments of Benevolence, Veneration, and Conscientiousness, to certain actions contemplated by us, in which the enlightened exercise of these sentiments is involved." "The idea of *merit* emanates solely from the operation of the selfish feelings and desires." "It is evident that Conscientiousness can see no *merit* in being just, for inclination can never perceive merit in its own gratification. In the same way, Veneration can discover no *merit* in yielding that deferential homage to superiority which is its natural tribute. And Benevolence is equally blind to the perception of merit in being kind and charitable; yet merit is a word which, in reference to justice, veneration, and charity, conveys a distinct idea, and we are bound, therefore, to account for its existence." "When we contemplate the noble Regulus eloquently pleading for the very decree which must consign him to the fury of his enemies," "it is in virtue neither of Conscientiousness nor Veneration that his great merit is perceived, because these faculties discover nothing in the action beyond the simple obedience to their own dictates. But Cautiousness, with its dark forebodings of pain, and misery, and death, and Adhesiveness, with its yearning after the objects of its fond desire, tell us of the terrible assaults which Conscientiousness and Veneration must have sustained in maintaining their supremacy. And the different degrees of merit which different minds will discover in this action, will be in exact proportion to the vigour in these minds, of the two higher sentiments which produced the action, in relation to the power of the two selfish feelings by which it would have been opposed." "The clamorous outcries of these selfish feelings tell us of the snares with which Conscientiousness and Veneration were in this instance environed, and it is therefore we attach *merit* to the supremacy they maintained."

evening of life, and to look back on the pleasures and pains of his past existence: he must feel that there have been vanity and vexation of spirit,—or the want of a satisfying portion; because the highest of his faculties have not been the motives of his conduct, and have received no direct and adequate gratification. If an individual have, through life, aimed at acquiring reputation, he will find that the real affection and esteem of mankind which he has gained, will be great or small in proportion to the degree in which he has manifested, in his habitual conduct, the higher or the lower faculties. If men have seen him selfish in his pursuit of wealth, selfish in his domestic affections, selfish in his ambition; although he may have pursued his objects without positive encroachment on the rights of others, they will still look coldly on him—they will feel no glow of affection towards him, no elevated respect, and no sincere admiration. If he possess penetration, he will see and feel that this is the case; but the fault is his own: love, esteem, and sincere respect, arise, by the Creator's laws, from contemplating, not plodding selfish faculties, but Benevolence, Veneration, and Justice, as the motives and ends of our conduct; and the individual supposed will have reaped the natural and legitimate produce of the soil which he cultivated, and the seed which he sowed.

Thirdly, The higher feelings, when acting in harmonious combination, and directed by enlightened intellect, have a boundless scope for gratification: their least indulgence is delightful, and their highest activity is bliss; they cause no repentance, leave no void, but render life a scene at once of peaceful tranquillity and sustained felicity: and, what is of much importance, conduct proceeding from their dictates carries in its train the highest gratification to the animal propensities themselves, of which the latter are susceptible. At the same time, it must be remembered, that the sentiments err, and lead also to evil, when not regulated by enlightened intellect; that intellect in its turn must give due weight to the existence and desires of both the propensities and the sentiments, as elements in the human constitution, before it can arrive at sound conclusions regarding conduct; and that rational actions and true happiness flow from the gratification of all the faculties *in harmony* with each other,—the moral sentiments and intellect, only in cases of conflict, bearing the directing sway.

This proposition may be shortly illustrated. Imagine an individual to commence life, with the thorough conviction that the higher sentiments are the superior powers, and that they and the propensities ought to act harmoniously together—the first effect would be to cause him to look outward on other men and on his Creator, as well as inwardly on himself, as the objects of his regard. Benevolence would infuse into his mind the feeling that there are other human beings as dear to the Creator and as much entitled to enjoyment as himself; and that his duty is to seek no gratification to himself which is calculated to prove injurious to them, but, on the contrary, to act so as to confer on them, by his daily exertions, all the services in his power: Veneration would give a strong feeling of reliance on the power and wisdom of God, that such conduct would conduce to the highest gratification of all his faculties; it would add also an habitual respect for his fellow-men, as beings deserving his regard, and to whose reasonable wishes he was bound to yield a willing and sincere obedience: Lastly, Conscientiousness would prompt him habitually to restrain his animal desires, so as to prevent the slightest abuse of them which would prove injurious to his fellow-men.

Let us trace, then, the effect which these principles would produce in ordinary life. Suppose a friendship formed by such an individual: one of his fundamental principles being Benevolence, which inspires with a pure and disinterested regard for other men, he would desire his friend's welfare for his friend's sake. Next, Veneration, acting along with intellect, would reinforce this love, by the conviction that it was entirely conformable to the law of God, and would be acceptable in His sight. It would also add a habitual deference towards the friend himself, which would render his manner pleasing to him, and his deportment yielding and accommodating in all things proper to be forborne or done. Thirdly, Conscientiousness, ever on the watch, would proclaim the duty of making no unjust demands on the good nature of a friend, but of limiting the whole intercourse with him to an interchange of kindness, good offices, and reciprocal affection. Intellect, acting along with these principles, would point out, as an indispensable requisite to such an attachment, that the friend himself should be so far under the influence of the moral sentiments as to be able, in some degree, to satisfy them; for if he were immoral, selfish, vainly ambitious, or, in short, under the habitual influence of the propensities, the sentiments could not love and respect him: they might pity him as unfortunate, but love him they could not, because this is impossible by the very laws of their constitution.

Let us now attend to the degree in which such a friendship would gratify the lower propensities. In the first place, how would Adhesiveness rejoice in such an attachment? It would be filled with delight, because, if the intellect were convinced that the friend habitually acknowledged the supremacy of the higher sentiments, Adhesiveness might pour forth all its ardour, and cling to its object with the closest bonds of affection. The friend would not encroach on us for evil, because his Benevolence and Justice would oppose this; he would not lay aside restraint, and break through the bonds of affection by undue familiarity, because Veneration would forbid this; he would not injure us in our name, person, or reputation, because Conscientiousness, Veneration, and Benevolence, all combined, would prevent such conduct. Here, then, Adhesiveness, freed from the fear of evil, of deceit, and of dishonour (because such a friend could not possibly fall into dishonour), would be at liberty to take its deepest draught of affectionate attachment: it would receive a gratification which it is impossible it could attain while acting in combination with the purely selfish faculties. What delight, too, would such a friendship afford to Self-Esteem and Love of Approbation! There would be a legitimate approval of ourselves, arising from a survey of pure motives and just and benevolent actions. Love of Approbation, also, would be gratified in the highest degree; for every act of affection, every expression of esteem, from such a friend, would be so purified by Benevolence, Veneration, and Conscientiousness, that it would form the legitimate food on which Love of Approbation might feast and be satisfied: it would fear no hollowness beneath, no tattling in absence, no secret smoothing over for the sake of mere effect, no envyings, no jealousies. In a word, friendship founded on the higher sentiments as the ruling motives, would delight the mind with gladness and sunshine, and gratify all the faculties, animal, moral, and intellectual in harmony with each other.

By this illustration, the reader will understand more clearly what I mean by the harmony of the faculties. The fashionable and commercial friendships of which I spoke gratified the propensities of Adhesiveness, Love of Approbation, Self-Esteem, and Acquisitiveness, but left out, as fundamental principles, all the higher sentiments:—there was, therefore, in these instances, a want of harmonious gratification to the whole faculties, which want gave rise to a feeling of the absence of full satisfaction; it permitted only a mixed and imperfect enjoyment while the friendship lasted, and induced a feeling of painful disappointment, or of vanity and vexation, when a rupture occurred. The error, in such cases, consists in founding attachment on the lower fa-

culties, seeing that they, by themselves, are not calculated to form a stable basis of affection; instead of building it on them and the higher sentiments, which, acting together, afford a foundation for real, lasting, and satisfactory friendship. In complaining of the hollowness of attachments springing from the lower faculties exclusively, we are like men who should try to build a pyramid on its smaller end, and then speak of the unkindness of Providence, and lament the hardness of their fate, when it fell. A similar analysis of all other pleasures founded on the animal propensities chiefly, would exhibit similar results. Happiness, therefore, must be viewed as resulting from the harmonious activity of the three great classes of faculties: the moral sentiments and intellect, in cases of conflict, exercising the directing and controlling sway.

Many men, on arriving at the close of life, complain of all its pursuits and enjoyments having proved vanity and vexation of spirit; but, to my mind, this is just an intimation that the plan of their lives has been selfish, that they have missed the right method of doing good, and that they have sought for pleasure, not in legitimate uses, but in foolish abuses of their faculties. I cannot conceive that the hour of death should cause the mind to feel all acts of kindness done to others,—all exercises of devotion performed in a right spirit,—all deeds of justice executed,—all rays of knowledge disseminated,—during life, as vain, unprofitable, and unconsoling, even at the moment of our leaving for ever this sublunary scene. On the contrary, such actions appear to me to be those which the mind would then rejoice to pass in review, as having afforded real enjoyment, and as having conferred the greatest permanent benefits on our fellow-men.

SECT. V.—THE FACULTIES OF MAN COMPARED WITH EXTERNAL OBJECTS.

Having considered man as a *physical* being, and briefly adverted to the adaptation of his constitution to the physical laws of creation; having viewed him as an *organized* being, and traced the relations of his organic structure to his external circumstances; having taken a rapid survey of his *faculties* as an animal, moral, and intellectual being,—with their uses and the forms of their abuses; and having contrasted these faculties with each other, and discovered the supremacy in cases of conflict of the Moral Sentiments and Intellect, I proceed to compare his faculties with *external objects*, in order to discover what provision has been made for their gratification.

AMATIVENESS is a feeling obviously necessary for the continuance of the species; and one which, properly regulated, produces great enjoyment, in perfect harmony with reason:—opposite sexes exist to provide for its gratification.*

PHILOPROGENITIVENESS is given,—and offspring exist.

CONCENTRATIVENESS is conferred,—and the other faculties are its objects.

ADHESIVENESS is given,—and country and friends exist.

COMBATIVENESS is bestowed,—and physical and moral obstacles exist, to meet and subdue which, courage is necessary.

DESTRUCTIVENESS is given,—and man is constituted with a carnivorous stomach, and animals to be killed and eaten exist. Besides, the whole combinations of creation are in a state of decay and renovation. In the animal kingdom almost every species of creature is the prey of some other; and the faculty of Destructiveness places the human mind in harmony with this order of creation. Destruction makes way for renovation; the act of renovation furnishes occasion for the activity of our other powers; and activity is pleasure. That destruction is a natural institution is unquestionable. Not only has nature taught the spider to construct a web for the purpose of ensnaring flies that it may devour them, and constituted beasts of prey with carnivorous teeth; but she has formed even plants, such as the Drosera, to catch and kill flies, and use them for food. Destructiveness is also the source of resentment and indignation—a most important defensive as well as vindicatory purpose. It is a check upon undue encroachment, and tends to constrain mankind to pay regard to the rights and feelings of each other. When properly regulated, it is an able assistant to justice.

CONSTRUCTIVENESS is given,—and materials for constructing artificial habitations, raiment, ships, and various other fabrics that add to the enjoyment of life, are the objects which give it scope.

ACQUISITIVENESS is bestowed,—and property exists, capable of being collected, preserved, and applied to use.

SECRETIVENESS is given,—and the manifestations of our faculties require to be restrained, until fit occasions and legitimate objects present themselves for their gratification; which restraint is rendered not only possible but agreeable, by the propensity in question. While we suppress our emotions, ideas, designs, or opinions, and confine them within the limits of our own consciousness, we exercise and gratify this faculty in the very act of doing so.

SELF-ESTEEM is given,—and we have an individual existence and individual interests, as its objects.

LOVE OF APPROBATION is bestowed,—and we are surrounded by our fellow-men, whose good opinion is the object of its desire.

CAUTIOUSNESS is admirably adapted to the nature of the external world. The human body is combustible, is liable to be destroyed by violence, to suffer injury from extreme wet and winds, &c.; and it is necessary for us to be habitually watchful to avoid these sources of calamity. Accordingly, Cautiousness is bestowed on us as an ever-watchful sentinel, constantly whispering "Take care." There is ample scope for the legitimate and pleasurable exercise of all our faculties, without running into these evils, provided we know enough, and are watchful enough; and, therefore, Cautiousness is not overwhelmed with inevitable terrors. It serves merely as a warder to excite us to beware of sudden and unexpected danger; it keeps the other faculties at their posts, by furnishing a stimulus to them to observe and to trace consequences, that safety may be ensured; and, when these other faculties do their duty, the impulses of Cautiousness, instead of being painful, are the reverse: they communicate a feeling of safety, which is exceedingly agreeable. Hence this faculty appears equally benevolent in its design as the others which we have contemplated. It is clear that the gift of an organ of Cautiousness implied that man was to be placed in a field of danger. It is adapted to a world like the present, but would be at variance with a scene into which no evil could intrude.

Here, then, we perceive a beautiful provision made for supporting the activity of the lower propensities, and affording them legitimate gratification. Apparently, these powers are conferred on us to support our animal nature, and to place us in harmony with the external objects of creation. Far from being injurious or base in themselves, they possess the dignity of utility, and are sources of high enjoyment, when legitimately indulged. The phrenologist, therefore, would not seek to extirpate them, or to weaken them too much. He desires only to see their excesses prevented, and their exercise directed in accordance with the great institutions and designs of the Creator. Theologians who enforce the corruption of human nature, would do well to consider whether man, as originally constituted, possessed the organs of these propensities or not. If he did possess them, it

* The nature and sphere of activity of the phrenological faculties is explained at length in the "System of Phrenology," to which I beg leave to refer. Here I can only indicate general ideas.

will be incumbent on them to shew the objects of them in a world where there was no sorrow, sin, death, or danger. If these organs were bestowed only after the fall, the question will remain to be solved, whether man with new organs added to his brain, and new propensities to his mind, continued the same being as when these did not form parts of his constitution. Or, finally, they may consider whether the existence of these organs, and of an external world adapted to them, does not prove that man, as he now exists, is actually the same being as when he was created, and that his corruption consists in his tendency to abuse his faculties, and not in any inherent viciousness attributable to his nature itself.

The next class of faculties is that embracing the Moral Sentiments proper to man. These are the following:

Benevolence is given,—and sentient and intelligent beings are created, whose happiness we may increase, and whose sufferings we are able to alleviate, thereby affording it scope and delight. It is an error to imagine that creatures in misery are the only objects of benevolence, and that it has no function but to experience pity. It is a wide-spreading fountain of generous feeling, desiring for its gratification not only the removal of pain, but the maintenance and augmentation of positive enjoyment; and the happier it can render its objects, the more complete are its satisfaction and delight. Its exercise, like that of all the other faculties, is a source of great pleasure to the individual himself; and the system of things established on earth seems well adapted for affording it exercise. From the nature of the human faculties, each individual has it in his power to confer benefits, or, in other words, to pour forth copious streams of benevolence on others, by legitimately gratifying their various feelings and intellectual faculties, without injuring himself.

Veneration.—The highest object of this faculty is the Divine Being; and I here assume the existence of God as a fact capable of demonstration. The very essay in which I am now engaged is an attempt at an exposition of some of his attributes, manifested in this world. If we find wisdom and benevolence in his works, unchangeableness and no shadow of turning in his laws, harmony in each department of creation; and if we shall discover that the evils which afflict us are much less the direct objects of his arrangements than the consequences of our ignorant neglect of institutions really calculated to promote our enjoyment,—then we shall acknowledge in the Divine Being an object whom we may love with all our soul, and reverence with the deepest emotions of veneration, and on whom Hope and Conscientiousness may repose with a perfect and unhesitating reliance. The exercise of this sentiment is attended with great positive enjoyment, when the object is in harmony with our other faculties. Farther, its activity disposes us to yield obedience to the Creator's laws, which increases our own happiness; and hence its exercise is largely provided for.

Hope is given,—and our understanding, by discovering the laws of nature, is enabled to penetrate into the future. This sentiment is gratified by the absolute reliance which Causality convinces us we may place on the stability and wisdom of the divine arrangements: its legitimate exercise, in reference to this life, is to give us a vivifying faith that good is attainable if we use the proper means. It is a powerful alleviator of our afflictions. The exercise of Veneration and Hope in relation to God and a future state of existence is prescribed in the Scriptures.

Ideality is bestowed,—and not only is external nature invested with the most exquisite loveliness, but a capacity for moral and intellectual refinement is given to us, by which we may rise in the scale of improvement, and, at every step of our progress, reap direct enjoyment from this sentiment. Its constant desire is for "something more exquisite still." In its own immediate impulses it is delightful, and external nature and our other faculties respond to its call.

Wonder prompts us to admiration, and desires something new. When we contemplate man endowed with intellect to discover the existence of a Deity and to comprehend his works, we cannot doubt that Wonder is provided with objects for its intensest exercise; and when we view him placed in a world where old things are constantly passing away, and a system of renovation is incessantly proceeding, we see at once how vast a provision is made for the gratification of his desire of novelty, and how admirably it is calculated to impel his other faculties to action.

Conscientiousness exists,—and it has a wide field of exercise in regulating the rights and interests of the individual in relation to other men and to society. The existence of selfish propensities and disinterested emotions demands a power to arbitrate between them, and to regulate both, and such is the sentiment of Conscientiousness. To afford it full satisfaction, it is necessary to prove that all the divine institutions are founded in justice. This is a point which many regard as involved in much obscurity; I shall endeavour in this Essay to lift the veil in part; for to me justice appears to flow through every divine institution that is sufficiently understood.

One difficulty, in regard to Conscientiousness, long appeared inexplicable; it was, how to reconcile with benevolence the institution by which this faculty visits us with remorse, *after* offences are actually committed, instead of arresting our hands by an irresistible veto before sinning, so as to save us from the perpetration altogether. The problem is solved by the principle, That happiness consists in the activity of our faculties, and that the arrangement of punishment after the offence is far more conducive to activity than the opposite. For example, if we desired to enjoy the highest gratification in exploring a new country, replete with the most exquisite beauties of scenery and the most captivating natural productions; and if we found in our path precipices that gratified Ideality, but which endangered life when, neglecting the law of gravitation, we advanced too near; whether would it be more bountiful in Providence to send an invisible attendant with us, who, whenever we were about to approach the brink, should interpose a barrier, and fairly cut short our advance, without requiring us to bestow one thought upon the subject, and without our knowing when to expect it and when not;—or to leave all open, but to confer on us, as he has done, eyes fitted to see the precipice, faculties to comprehend the law of gravitation, and Cautiousness to make us fear the infringement of it,—and then to leave us to enjoy the scene in perfect safety if we used these powers, but to fall over and suffer pain or death if we neglected to exercise them? It is obvious that the latter arrangement would give far more scope to our various powers; and if active faculties are the sources of pleasure, as will be shewn in the next chapter, then it would contribute more to our enjoyment than the other. Now, Conscientiousness punishing after the fact is analogous, in the moral world, to what this arrangement would be in the physical. If Intellect, Benevolence, Veneration, and Conscientiousness, do their parts, they will give intimations of disapprobation before the commission of offences, just as Cautiousness will give intimations of danger at the sight of the cliff; but if these are disregarded, and we fall over the moral precipice, remorse will follow as a punishment, just as pain is the chastisement for tumbling over the physical brink. The object of both institutions is to permit and encourage the most vigorous and unrestrained exercise of our faculties, in accordance with the physical, moral, and intellectual laws of nature, and to punish us only when we transgress these limits.

Firmness is bestowed,—and the other faculties of

the mind are its objects. It supports and maintains their activity, and gives determination to our purposes.

IMITATION is bestowed,—and every where man is surrounded by beings and objects whose actions and appearances it may benefit him to copy. It is highly useful to the young in enabling them rapidly to learn.

The next Class of Faculties is the Intellectual.

The provisions in external nature for the gratification of the *Senses* of Hearing, Seeing, Smelling, Taste, and Feeling, are so obvious that it is unnecessary to enlarge upon them.

INDIVIDUALITY and EVENTUALITY, or the powers of observing things that exist, and occurrences, are given,—and "all the truths which Natural Philosophy teaches, depend upon *matter of fact*, and that is learned by observation and experiment, and never could be discovered by reasoning at all." Here, then, is ample scope for the exercise of these powers.

FORM, SIZE, WEIGHT, LOCALITY, ORDER, and NUMBER, are bestowed,—and the sciences of Geometry, Arithmetic, Algebra, Geography, Navigation, Botany, Mineralogy, Zoology, Anatomy, and various others, are the fields of their exercise. The first three sciences are almost the entire products of these faculties; the others result chiefly from them, when applied on external objects.

COLOURING, TIME, and TUNE, are given,—and these, aided by Constructiveness, Form, Size, Ideality, and other faculties, find scope in Painting, Sculpture, Poetry, Music, and the other fine arts.

LANGUAGE is given,—and our faculties inspire us with lively emotions and ideas, which we desire to communicate by its means to other individuals.

COMPARISON and CAUSALITY exist, and these faculties, aided by Individuality, Form, Size, Weight, and the others already enumerated, find ample gratification in Natural Philosophy, and in Moral, Political, and Intellectual Science. The general objects and affairs of life, together with our own feelings, conduct, and relations, are also the objects of the knowing and reflecting faculties, and afford them opportunities for exercise.

CHAPTER III

ON THE SOURCES OF HUMAN HAPPINESS, AND THE CONDITIONS REQUISITE FOR MAINTAINING IT.

All enjoyment arises from activity of the different parts of the human constitution—Creation so arranged as to invite and encourage exercise of the bodily and mental powers—The acquisition of knowledge agreeable—Would intuitive knowledge be more advantageous to man, than the mere capacity which he has received to acquire knowledge by his own exertions?—Reasons for answering this question in the negative—To reap enjoyment in the greatest quantity, and maintain it most permanently, the faculties must be gratified in harmony with each other—Reasons for believing that the laws of external creation will, in the progress of discovery, be found accordant with the dictates of all the faculties of man acting in harmonious combination.

HAVING now presented a rapid sketch of the constitution of man, and its relations to external objects, we are prepared to inquire into the sources of his happiness, and the conditions requisite for maintaining it.

The *first* circumstance which attracts attention is, that all enjoyment must necessarily arise from *activity* of the various systems of which the human constitution is composed. The bones, muscles, nerves, and digestive and respiratory organs, when exercised in conformity with nature, furnish pleasing sensations, directly or indirectly; while the external senses and internal faculties supply the whole remaining perceptions and emotions, which constitute life and rational existence. If these were habitually buried in sleep, or constitutionally inactive, life, to all purposes of enjoyment, might as well be extinct: Existence would be reduced to mere vegetation, without consciousness.

If, then, wisdom and benevolence have been employed in constituting man, we may expect the arrangements of creation, in regard to him, to be calculated, *as a leading object, to excite* his various powers, corporeal and mental, to *activity*. This, accordingly, appears to me to be the case; and the fact may be illustrated by a few examples. A certain portion of nervous and muscular energy is infused by nature into the human body every twenty-four hours, which it is delightful to expend. To provide for its expenditure, the stomach has been constituted so as to demand regular supplies of food, which can be obtained only by nervous and muscular exertion; the body has been created destitute of covering, yet standing in need of protection from the elements of heaven; and nature has been so constituted, that raiment can be procured by moderate exercise of the mental and corporeal powers. It is delightful to repair exhausted nervous and muscular energy by wholesome aliment; and the digestive organs have been so constituted as to afford us frequent opportunities of enjoying the pleasures of eating. In these arrangements, the design of supporting the various systems of the body in activity, for the enjoyment of the individual, is abundantly obvious. A late writer justly remarks, that "a person of feeble texture and indolent habits has the bone smooth, thin, and light; but nature, solicitous for our safety, and in a manner which we could not anticipate, combines with the powerful muscular frame a dense and perfect texture of bone, where every spine and tubercle is completely developed." "As the structure of the parts is originally perfected by the action of the vessels, the function or operation of the part is made the stimulus to those vessels. The cuticle on the hand wears away like a glove; but the pressure stimulates the living surface to force successive layers of skin under that which is wearing, or, as anatomists call it, desquamating; by which they mean that the cuticle does not change at once, but comes off in squamæ or scales."

Directing our attention to the Mind, we discover that Individuality and the other Perceptive Faculties desire, as *their* means of enjoyment, to become acquainted with external objects; while the Reflecting Faculties long to know the dependences and relations of all objects and beings. "There is something," says an eloquent writer, "positively agreeable to all men, to all at least whose nature is not most grovelling and base, in gaining knowledge for its own sake. When you see any thing for the first time, you at once derive some gratification from the sight being new; your attention is awakened, and you desire to know more about it. If it is a piece of workmanship, as an instrument, a machine of any kind, you wish to know how it is made; how it works; and what use it is of. If it is an animal, you desire to know where it comes from; how it lives; what are its dispositions, and, generally, its nature and habits. This desire is felt too, without at all considering that the machine or the animal may ever be of the least use to yourself practically; for, in all probability, you may never see them again. But you feel a curiosity to learn all about them, *because they are new and unknown to you*. You accordingly make inquiries; you *feel a gratification* in getting answers to your questions, that is, *in receiving information*, and in knowing more,—in being better informed than you were before. If you ever happen again to see the same instrument or animal, you find it agreeable to recollect having seen it before, and to think that you know something about it. If you see another instrument or animal, in some respects like, but differing in other particulars, you find it pleasing to *compare them together*, and to note in what they agree, and in what they differ. Now, all this kind of gratification is of a pure and disinterested nature,

and has no reference to any of the common purposes of life; yet it is a pleasure—an enjoyment. You are nothing the richer for it; you do not gratify your palate, or any other bodily appetite; and yet it is so pleasing that you would give something out of your pocket to obtain it, and would forego some bodily enjoyment for its sake. The pleasure derived from science is exactly of the like nature, or rather it is the very same."* This is a correct and forcible exposition of the pleasures attending the active exercise of our intellectual faculties. In the Introduction, pages 1 to 7, I have given several illustrations of the manner in which the external world is adapted to the mental faculties of man, and of the extent to which it is calculated to maintain them in activity.

Supposing the human faculties to have received their present constitution, two arrangements for their gratification may be fancied: 1*st*, Infusing into the intellectual powers at birth, *intuitive knowledge* of every object which they are fitted ever to comprehend; and directing every propensity and sentiment by an infallible instinct to its best mode and degree of gratification: Or, 2*dly*, Constituting the intellectual faculties only as *capacities* for gaining knowledge by exercise and application, and surrounding them with objects bearing such relations towards them, that, when these objects and relations are observed, appreciated, and properly applied, high gratification will be obtained, but when they are unobserved and neglected, the result will be uneasiness and pain; giving at the same time to each propensity and sentiment a wide field of action, comprehending both use and abuse, and leaving the intellect to direct each to its proper objects, and to regulate its degrees of indulgence. And the question occurs, Which of these modes would be more conducive to enjoyment? The general opinion will be in favour of the first; but the second appears to me to be preferable. If the first meal we had eaten had prevented the recurrence of hunger, it is obvious that all the pleasures of satisfying a healthy appetite would have been for ever at an end; and that this apparent bounty would have greatly abridged our enjoyment. In like manner, if (our faculties being constituted as at present) unerring desires had been impressed on the propensities and sentiments, and intuitive knowledge had been communicated to the understanding, so that, when an hour old, we should have been, morally, as wise and virtuous, and, intellectually, as thoroughly instructed as we could ever become, a great provision for the sustained activity of our faculties would have been wanting. When wealth is acquired, the miser's pleasure in it is diminished. He grasps after *more* with increasing avidity. He is supposed irrational in doing so; but he obeys the law of his nature. What he possesses no longer satisfies Acquisitiveness. The miser's pleasure arises from the *active state* of this faculty, and only the pursuit and obtaining of *new treasures can maintain that condition.* The same law is exemplified in the case of Love of Approbation. The enjoyment which it affords depends on its *active state*; hence the necessity for *new incense*, and for *mounting higher* in the scale of ambition, is constantly felt by its victims. Napoleon, in exile, said, "Let us live upon the past;" but he found this impossible: his predominant desires originated in Love of Approbation and Self-Esteem, and the past did not stimulate them, or maintain them in constant activity. In like manner, no musician, artist, poet, or philosopher, however extensive his attainments, would reckon himself happy, if informed, "Now you must stop and live upon the past;" and the reason is still the same; the pursuit of new acquirements, and the discovery of new fields of investigation, excite and maintain the faculties in activity; and activity is enjoyment.

If these views be correct, the consequences of imbuing the mind, as at present constituted, with intuitive knowledge, and instinctive direction, would not have been unquestionably beneficial. The limits of our experience and acquirements would have been speedily reached; our first step would have been our last; every object would have become old and familiar; Hope would have had no object of expectation, Cautiousness no object of fear, Wonder no gratification in novelty; and monotony, insipidity, and mental satiety, would apparently have been the lot of man.

According to the view now advanced, creation, in its present form, is more wisely and benevolently adapted to our constitution than if instinctive direction and intuitive instruction had been given to the mind at birth. By the actual arrangement, numerous noble faculties are bestowed, and their objects are presented: these objects, when properly used, are endowed with qualities fitted to benefit and delight us; and, when misunderstood or misapplied, to injure and punish us; but we are left to find out their qualities by the exercise of our own powers. Provision is thus made for ceaseless activity of the mental faculties, and this constitutes delight. Wheat is produced by the earth, and adapted to the nutrition of the body; but it may be rendered more grateful to taste, more salubrious to the stomach, and more stimulating to the nervous and muscular systems, by being stripped of its external skin, ground into flour, and baked. Now, when the Creator endowed wheat with it properties, and the human body with its qualities and functions, he pre-arranged all these relations. In withholding congenital and intuitive knowledge of them, but in bestowing faculties fitted to find them out; in rendering the exercise of these faculties agreeable; and in leaving man, in this condition, to act for himself,—he appears to me to have conferred on him the highest boon. The earth produces also hemlock and foxglove; and, by the organic law, these substances, if taken in certain moderate quantities, remove diseases; if in excess, they occasion death: but man's observing faculties, when acting under the guidance of Cautiousness and Reflection, are fitted to make this discovery; and he is left to make it, or to suffer the consequences of neglect.

Water, when elevated in temperature, becomes steam; steam expands with prodigious power; and this power, confined by metal and directed by intellect, is the grand element of the steam-engine, the most efficient yet most humble servant of man. All this was clearly pre-arranged by the Deity, and man's faculties were adapted to it at creation; but he was left to observe and discover the qualities and relations of water for himself. This duty, however, must be acknowledged to have been benevolently imposed, the moment we perceive that the Creator has made the very exercise of the faculties agreeable, and arranged the qualities and relations of matter so beneficially, that, when known, they carry a double reward to the discoverer,—the pleasure of mental exercise, and positive advantage derived from the objects themselves.

The Knowing Faculties, as we have seen, observe merely the qualities of bodies, and their simpler relations. The Reflecting Faculties observe relations also, but of a higher order. The former, for example, discover that the soil is clay or gravel; that it is tough or friable; that it is dry or wet; that excess of water impedes vegetation; that in one season the crop is large, and in the next deficient. The reflecting faculties take cognizance of the *causes* of these phenomena; and acting along with the knowing powers, they discover the *means* by which wet soil may be rendered dry, clay pulverized, light soil invigorated, and all of them made more productive; and also the relationship of particular soils to particular kinds of grain. Nations that exert their knowing faculties in observing the qualities of the soil, and their reflecting faculties in discovering its capabilities, and its relations to water, lime, manures, and the various species of grain,—and who put forth

* Objects, Advantages, and Pleasures of Science, p. 1.

their muscular and nervous energies in accordance with the dictates of these powers,—receive a rich reward in a climate improved in salubrity, and in an abundant supply of food, besides much positive enjoyment attending the exercise of the powers themselves. Those communities, on the other hand, who neglect to use their mental faculties, and muscular and nervous energies, are punished by ague, fever, rheumatism, and a variety of painful affections arising from damp air; they are stinted in food, and in wet seasons are brought to the very brink of starvation by serious failures of their crops. This punishment is a benevolent admonition from the Creator, that they are neglecting a great duty, and omitting to enjoy a great pleasure; and it will cease as soon as, by obeying the Divine laws, they have fairly redeemed the blessings lost by their negligence.

The winds and waves appear, at first sight, to present insurmountable obstacles to man's leaving the island or continent on which he happens to be born, and to his holding intercourse with distant climes: But, by observing the relations of water to timber, he is enabled to construct a ship; by observing the influence of the wind on a body placed in a fluid medium, he discovers the use of sails; and, lately, he has found out the expansive quality of steam, and traced its relations until he has produced a machine that enables him almost to set the roaring tempest at defiance, and to sail straight to the stormy north, although its loudest and its fiercest blasts oppose. All these capabilities were conferred on nature and on man, long before they were practically applied; but, now that we have advanced so far in our career of discovery and improvement, we perceive the scheme of creation to be admirably adapted to support the mental faculties in habitual activity, and to reward us for the exercise of them.

In surveying external nature with this principle in view, we perceive in many qualities of physical objects indications of benevolent design, which otherwise would have been regarded as defects. The Creator obviously intended that man should discover and use coal-gas in illuminating dwelling-houses; and yet it emits an abominable odour. The bad smell, viewed abstractedly from its consequences, would appear to be an unfortunate quality in it; but when we recollect that gas is invisible, extremely subtle and liable to escape; that when mixed in a certain proportion with atmospheric air, it is prone to explode,—the nauseous and penetrating smell appears like a voice attached to it, proclaiming its escape, and warning us, in louder and louder tones, to attend to our safety by confining it,—and then it presents the aspect of wise and benevolent design. Gas stood in this relation to the olfactory nerves from the creation downwards, although it was long unknown to men. We cannot doubt that the discovery and application of it by them was contemplated by the Creator from the first. A few years ago, on hearing Paganini play on the violin, the subject of wonder with me was the exquisite fineness of his notes. The sounds fell on the ear as if their cause had been purely ethereal. No indication of their material origin could be traced. An angel might be imagined to send forth such strains to mortal ears. The extraordinary development of Paganini's organs of Tune and Time, with the extreme sensibility of his nervous system, strongly indicated in his countenance and figure, seem to have been the causes of his attaining this exquisite power. In reflecting on his performance, the idea forcibly struck me, that until a being constituted like Paganini appeared, we had no means of discovering that the material substances composing a violin and bow were capable of emitting such pure and dulcet sounds; and that a similar reflection may probably be applicable to the entire sublunary creation. This world may be full of divine qualities and delicious harmonies, if we had only superior men to evoke them! And if the case be so, how truly admirable is that constitution of nature which furnishes us with every possible inducement not only to study itself, but to improve our own qualities; and which presents us with richer treasures, the farther we advance in the discharge of our most pleasing and profitable duties!

It is objected to this argument, that it involves an inconsistency. Ignorance of the natural laws, it is said, is here represented as necessary to happiness, in order that the faculties may obtain exercise in discovering and obeying them;—nevertheless happiness is held to be impossible till these laws shall have been discovered and obeyed: here, then, it is argued, ignorance is represented as at once *essential to*, and *incompatible with*, enjoyment. But this is not an accurate statement of the doctrine. I do not say that, in any individual man, ignorance of the natural laws is essential to enjoyment; I merely maintain, that with his present constitution it was more beneficial for him to be left to learn these laws from his parents or his own experience, than at birth to have received intuitive knowledge of all the objects of creation. A similar objection might be stated to the constitution of the bee. Honey is necessary to its enjoyment; yet it has been left to gather honey for itself. The fallacy originates from losing sight of the natural constitution both of the bee and of man. The bee has been furnished with instinctive tendencies to roam about the fields and flowery meadows, and to exert its energies in labour; and it is obviously beneficial to it to be provided with opportunities of doing so. And so it is with man. Gathering knowledge is to the human mind what gathering honey is to the bee. Communicating intuitive knowledge of the natural laws to man, *while his present constitution continues*, would be the exact parallel of naturally gorging the bee with honey during the whole summer, when its energies are at their height. When the bee has completed its store, winter benumbs its powers, which resume their vigour only when its stock is exhausted, and when spring returns to afford them exercise. No torpor resembling that of winter seals up the faculties of the human race; but their ceaseless activity is amply provided for by other arrangements: *First*, Every individual of the race is born in utter ignorance, and starts from zero in the scale of knowledge, so that he has the laws to learn for himself either from his predecessors or from experience; *Secondly*, The laws of nature, compared with the mental capacity of any individual, are of boundless extent, so that every one may learn something new to the end of the longest life; *Thirdly*, By the actual constitution of man, he must make use of his acquirements habitually, otherwise he will lose them.

These circumstances remove the apparent inconsistency. If man had possessed intuitive knowledge of all nature, he could have had no scope for exercising his faculties in *acquiring* knowledge, in *preserving* it, or in *communicating* it. The infant would have been as wise as the most revered sage, and forgetfulness would have been necessarily excluded.

Some who object to these views, imagine that after the human race has acquired knowledge of all the natural laws if such a result be possible, they *will be in the same condition as if they had been created with intuitive knowledge*. But this does not follow. Although the *race* should acquire the knowledge supposed, it is not an inevitable consequence that *each individual* will necessarily enjoy it all; which, however, would follow from intuition. The entire soil of Britain belongs to the landed proprietors as a class; but each does not possess it *all*, and hence every one has opportunities of adding to his territories—with this disadvantage, however, in comparison with knowledge, that the acquisitions of one necessarily diminish the possessions of another. Farther, although the race should have learned all the natural laws, their children would not intuitively inherit their ideas, and thus the activity of every one, as he appeared on the stage, would be provided for; whereas, by intuition, every child would be as wise as his grand-

father,—and parental protection, filial piety, and all the delights that spring from difference in knowledge between youth and age, would be excluded. Lastly, By the actual state of man, the *using* of acquirements is essential to the preservation as well as the enjoyment of them. By intuition, all knowledge would be habitually present to the mind without effort or consideration. On the whole, therefore, it appears that (man's nature being what it is) the arrangement by which he is endowed with powers to acquire knowledge, but left to find it for himself, is both wise and benevolent.

It has been asked, "But is there no pleasure in science except that of discovery? Is there none in using the knowledge we have attained? Is there no pleasure in playing at chess after we know the moves?" In answer, I observe, that if we knew beforehand all the moves that our antagonist intended to make and all our own, which must be the case if we knew *every thing* by intuition, we could have no pleasure. The pleasure really consists in discovering the intentions of our antagonist, and in calculating the effects of our own play; a certain degree of ignorance of both of which is indispensable to gratification. In like manner, it is agreeable first to discover the natural laws, and then to study the *moves* that we ought to make, in consequence of knowing them. So much, then, for the *sources* of human happiness.

In the *second* place, To reap enjoyment in the *greatest quantity* and to maintain it *most permanently*, the faculties must be gratified *harmoniously*. For example, in pursuing wealth or fame as the leading object of existence, full gratification is not afforded to Benevolence, Veneration, and Conscientiousness, and consequently complete satisfaction cannot be enjoyed; whereas, by seeking knowledge, and dedicating life to the discharge of our duties to ourselves, to our relatives, to our country, to mankind, and to God, in our several vocations, all the faculties will be gratified, and wealth, fame, health, and other advantages, will follow in their train, so that the whole mind will rejoice, and its delights will remain permanent.

Thirdly, To place human happiness on a secure basis, the laws of external creation must themselves accord with the dictates of the whole faculties of man acting in harmonious combination, and intellect must be fitted to discover the nature and relations of both, and to direct the conduct in harmony with them.

Much has been written concerning the extent of human ignorance: but we should discriminate between absolute incapacity to know, and mere want of information, arising from not having used this capacity to its full extent. In regard to the first—our capacity to know—it appears probable that, in this world, we shall never know the essence, beginning, or end of things; because these are points which we have no faculties calculated to discover: But the same Creator who made the external world constituted our faculties; and if we have sufficient data for inferring it to be His intention that we should *enjoy* existence here while preparing for the ulterior ends of our being,—and if it be true that we can be happy here, only by becoming thoroughly conversant with those natural laws which are pre-arranged to contribute, when observed, to our enjoyment, and which, when violated, visit us with suffering,—then we may safely conclude that our mental capacities are wisely adapted to the attainment of these objects, whenever we shall do our own duty in bringing them to their highest condition of perfection, and in applying them in the best manner.

Sir Isaac Newton observed that all bodies which refracted the rays of light, were combustible, except one, the diamond, which he found to have this quality, but which he was not able, by any powers he possessed, to consume by burning. He did not conclude, however, from this, that the diamond was an exception to the uniformity of nature. He inferred that, as the same Creator had made the diamond and the refracting bodies which he was able to burn, and proceeded by uniform laws, the diamond also would, in all probability, be found to be combustible, and that the reason of its resisting his power was ignorance on his part of the means of raising a temperature sufficiently high to produce its conflagration. A century afterwards, chemists made the diamond blaze with as much vivacity as Sir Isaac Newton had done a wax-candle. Let us proceed, then, on an analogous principle. If the intention of our Creator be, that we should enjoy existence while in this world, then He knew what was necessary to enable us to do so; and He will not be found to have failed in conferring on us powers fitted to accomplish His design, provided we do our duty in developing and applying them. The great motive to exertion is the conviction, that increased knowledge will furnish us with increased means of happiness and well-doing, and with new proofs of benevolence and wisdom in the Great Architect of the Universe.

In pleading thus earnestly for the wise and benevolent constitution of the human mind, and the admirable adaptation of external nature to its qualities, I may be causing uneasiness to some readers who have been educated in the belief that human nature is inherently corrupt, and that physical creation is essentially disordered; but, in doing so, I yield to the imperative dictates of what appears to me to be truth. If the views now expounded shall be shewn to be fallacious, I shall be most anxious to abandon them; but if they shall prove to be correct interpretations of nature, they will of necessity stand forth in all the might and majesty of divine appointments, and it will be criminal either to conceal or oppose them. If they be true, they will carry vast consequences in their train. I am not rearing a system from ambitious motives, neither is it my object to attack the opinions of other men. It is simply to lift up the veil of ignorance, and, in all humility, to exhibit the Creator's works in their real colours, in so far as I imagine myself to have been permitted to perceive them.

CHAPTER IV.

APPLICATION OF THE NATURAL LAWS TO THE PRACTICAL ARRANGEMENTS OF LIFE.

Suggestion of a scheme of living and occupation for the human race—Every day ought to be so apportioned as to permit of (1) bodily exercise; (2) useful employment of the intellectual powers; (3) the cultivation and gratification of the moral and religious sentiments; (4) the taking of food and sleep—Gratification of the animal faculties included in these—Why has man made so little progress towards happiness?—A reply to this question very difficult—Dr Chalmers quoted on the subject—Has man advanced in happiness in proportion to the increase of his knowledge?—His progress retarded by ignorance of his constitution, and its adaptation to external objects—The experience of past ages affords no sufficient reason for limiting our estimate of man's capability of civilization—Recent date of some of the most important scientific discoveries, and imperfect condition of most branches of human knowledge.

If a system of living and occupation were to be devised for human beings, founded on the exposition of their nature now given, something like the following might be presented.

First, So many hours a-day should be dedicated by every individual in health, to the exercise of his nervous and muscular systems, in labour calculated to give scope to their functions. The reward of obeying this requisite of his nature would be health, and a joyous animal existence; the punishment of neglect is disease, low spirits, and premature death.

Secondly, So many hours a-day should be spent in the sedulous employment of the knowing and reflecting fa-

culties; in studying the qualities of external objects, and their relations; also the nature of animated beings, and their relations; with the view not of accumulating mere abstract and barren knowledge, but of enjoying the positive pleasure of mental activity, and of turning every discovery to account, as a means of increasing happiness or alleviating misery. The leading object should always be, to find out the relationship of every object to our own nature, organic, animal, moral, and intellectual, and to keep that relationship habitually in mind, so as to render our acquirements directly gratifying to our various faculties. The reward of this conduct would be an incalculable increase of pleasure, in the very act of acquiring a knowledge of the real properties of external objects, together with a great accession of power in reaping ulterior advantages and avoiding disagreeable affections.

Thirdly, So many hours a-day should be devoted to the cultivation and gratification of our moral and religious sentiments; that is to say, in exercising these in harmony with intellect, and especially in acquiring the habit of admiring, loving, and yielding obedience to the Creator and his institutions. This last object is of vast importance. Intellect is barren of practical fruit, however rich it may be in knowledge, until it be fired and prompted to act by moral sentiment. In my view, knowledge by itself is comparatively worthless and impotent, compared with what it becomes when vivified by lofty emotions. It is not enough that the Intellect be informed; the moral faculties must co-operate, in yielding obedience to the precepts which the intellect recognises to be true. As creation is one great system, of which God is the author and preserver, we may fairly presume that there must be harmony among all its parts, and between it and its Creator. The human mind is a portion of creation, and its constitution must be included in this harmonious scheme. The grand object of the moral and intellectual faculties of man, therefore, ought to be, the study of God and of his works. Before philosophy can rise to its highest dignity, and shed on the human race its richest benefits, it must become religious; that is to say, its principles and their consequences must be viewed as proceeding directly from the Divine Being, and as a revelation of his will to the faculties of man, for the guidance of his conduct. Philosophy, while separated from the moral feelings, is felt by the people at large to be cold and barren. It may be calculated to interest individuals possessing high intellectual endowments; but as, in men in general, the moral and religious sentiments greatly predominate in energy over the intellectual powers, it fails to interest the mass of mankind. On the other hand, before natural religion can appear in all its might and glory, it must become philosophical. Its foundations must be laid in the system of creation; its authority must be deduced from the principles of that system; and its applications must be enforced by a demonstration of the power of Providence operating in enforcing the execution of its dictates. While reason and religion are at variance, both are obstructed in producing their full beneficial effects. God has placed harmony between them, and it is only human imperfection and ignorance that have introduced discord. One way of cultivating the sentiments would be for men to meet and act together, on the principles which I am now endeavouring to unfold, and to exercise, in mutual instruction, and in united adoration of the great and glorious Creator, the several faculties of Benevolence, Veneration, Hope, Ideality, Wonder, and Conscientiousness. The reward of acting in this manner would be a communication of direct and intense pleasure to each other; for I refer to every individual who has ever had the good fortune to pass a day or an hour with a really benevolent, pious, honest, and intellectual man, whose soul swelled with adoration of his Creator, whose intellect was replenished with knowledge of His works, and whose whole mind was instinct with sympathy for human happiness,—whether such a day did not afford him the most pure, elevated, and lasting gratification he ever enjoyed. Such an exercise, besides, would invigorate the whole moral and intellectual powers, and fit them to discover and obey the Divine institutions.

Phrenology is highly conducive to this enjoyment of our moral and intellectual nature. No faculty is bad, but, on the contrary, each has a legitimate sphere of action, and, when properly gratified, is a fountain of pleasure; in short, man possesses no feeling, of the right exercise of which an enlightened and ingenuous mind need be ashamed. A party of thoroughly practical phrenologists, therefore, meet in the perfect knowledge of each other's qualities; they respect these as the gifts of the Creator; and their great object is to derive the utmost pleasure from their legitimate use, and to avoid every approximation to abuse of them. The distinctions of country and education are broken down by unity of principle; the chilling restraints of Cautiousness, Self-Esteem, Secretiveness, and Love of Approbation, which stand as barriers of eternal ice between human beings in the ordinary intercourse of society, are gently removed; the directing sway is committed to Benevolence, Veneration, Conscientiousness, and Intellect; and then the higher principles of the mind operate with a delightful vivacity unknown to persons unacquainted with the qualities of human nature.

Intellect also ought to be regularly exercised in arts, science, philosophy, and observation.

I have said nothing of dedicating hours to the direct gratification of the animal powers; not that they should not be exercised, but that full scope for their activity is included in the employments already mentioned. In muscular exercises, Combativeness, Destructiveness, Constructiveness, Acquisitiveness, Self-Esteem, and Love of Approbation, may all be gratified. In contending with and surmounting physical and moral difficulties, Combativeness and Destructiveness obtain vent; in working at a mechanical employment requiring the exertion of strength, these two faculties, and also Constructiveness and Acquisitiveness, will be exercised; in emulation who shall accomplish most good, Self-Esteem and Love of Approbation will obtain scope. In the exercise of the moral faculties, several of these, and others of the animal propensities, are employed; Amativeness, Philoprogenitiveness, and Adhesiveness, for example, acting under the guidance of Benevolence, Veneration, Conscientiousness, Ideality, and Intellect, receive direct enjoyment in the domestic circle. From their being properly directed also, and from the superior delicacy and refinement imparted to them by the higher powers, they do not infringe the moral law, and leave no sting or repentance in the mind.

Finally, a certain portion of time should be dedicated to the taking of food and to sleep.

All systems hitherto practised have been deficient in providing for one or more of these branches of enjoyment. In the community at Orbiston, formed on Mr Owen's principles, music, dancing, and theatrical entertainments were provided; but the people soon tired of these. They had not corresponding moral and intellectual instruction. The novelty excited them, but there was nothing substantial behind. In common society, very little of either rational instruction or amusement is provided. The neglect of innocent amusement is a great error.

If there be truth in these views, they will throw some light on two important questions that have embarrassed philosophers, in regard to the progress of human improvement. The first is, Why should man have existed so long, and made so small an advance on the road to happiness? It is obvious that the very scheme of creation which I have described, implies that man is a progressive being; and progression necessarily supposes lower and higher conditions of attainment and enjoy-

ment. While men are ignorant, there is great individual suffering. This distresses sensitive minds, and seems inexplicable: they cannot conceive how improvement should so slowly advance. I confess myself incapable of affording any philosophical explanation why man should have been so constituted; neither can I give a reason why the whole earth was not made temperate and productive, in place of being partially covered with barren sand and eternal snow. The Creator alone can explain these points. When the inhabitants of Britain wore the skins of animals, and lived in huts, we may presume that, in rigorous winters, many of them suffered severe privations, and that some would perish from cold. If there had been among the sufferers a gifted philosopher, who observed the talents that were inherent in the people, although then latent, and who, in consequence, foresaw the splendid palaces and warm fabrics with which their descendants would one day adorn this island, he might well have been led to deplore the slow progress of improvement, and been grieved at the prevalence of so much intermediate misery. Yet the explanation that man is a progressive being is all that philosophy can offer; and if this satisfy us as to the past, it must be equally satisfactory in regard to the present and the future. The difficulty is eloquently adverted to by Dr Chalmers in his Bridgewater Treatise. "We might not know the reason," says he, "why, in the moral world, so many ages of darkness and depravity should have been permitted to pass by, any more than we know the reason why, in the natural world, the trees of a forest, instead of starting all at once into the full efflorescence and stateliness of their manhood, have to make their slow and laborious advancement to maturity, cradled in storms, and alternately drooping or expanding with the vicissitudes of the seasons. But though unable to scan all the cycles either of the moral or natural economy, yet we may recognise such influences at work as, when multiplied and developed to the uttermost, are abundantly capable of regenerating the world. One of the likeliest of these influences is the power of education, to the perfecting of which so many minds are earnestly directed at this moment, and for the general acceptance of which in society we have a guarantee in the strongest affections and fondest wishes of the fathers and mothers of families." (Vol. i. p. 186.)

Although, therefore, we cannot explain why man was constituted a progressive being, and why such a being advances slowly, I have endeavoured to point out that there is at least an adaptation of his faculties to his condition. If I am right in the fundamental proposition, that harmonious activity of the faculties is synonymous with enjoyment of existence,—it follows that it would have been less wise and less benevolent towards man, constituted as he is, to have communicated to him intuitively perfect knowledge, thereby leaving his mental powers with diminished motives to activity, than to bestow on him faculties endowed with high susceptibility of action, and to surround him with scenes, objects, circumstances, and relations, calculated to maintain them in ceaseless excitement; although this latter arrangement necessarily subjects him to suffering while ignorant, and renders his first ascent in the scale of improvement difficult and slow. It is interesting to observe, that, according to this view, although the first pair of the human race had been created with powerful and well-balanced faculties, but of the same nature as at present; if they were not also intuitively inspired with knowledge of the whole creation, and its relations, their first movements as *individuals* would have been *retrograde*; that is, as *individuals*, they would, through pure want of information, have infringed many natural laws, and suffered evil; while, as *parts of the race*, they would have been decidedly *advancing*: for every pang they suffered would have led them to a new step in knowledge, and prompted them to advance towards a much higher condition than that which they at first occupied. According to the hypothesis now presented, not only is man really benefited by the arrangement which leaves him to discover the natural laws for himself, although, during the period of his ignorance, he suffers much evil from want of acquaintance with them; but the progress which he has already made towards knowledge and happiness must, from the very extent of his experience, *be actually greater* than can at present be conceived. Its extent will become more obvious, and his experience itself more valuable, after he has obtained a view of the real theory of his constitution. He will find that past miseries have at least exhausted countless errors, and he will know how to avoid thousands of paths that lead to pain: in short, he will then discover that errors in conduct, like errors in philosophy, give additional importance and practicability to truth, by the demonstration which they afford of the evils attending departures from its dictates. The grand sources of human suffering at present are bodily disease and mental anxiety, and, in the next chapter, these will be traced to infringement, through ignorance or otherwise, of physical, organic, moral, or intellectual laws, which, when understood, appear in themselves calculated to promote the happiness of the race. It may be supposed that, according to this view, as knowledge accumulates, enjoyment will decrease; but, as formerly observed, ample provision is made against this event, by withholding intuition from each generation as it appears on the stage. Each successive age must acquire knowledge for itself; and, provided ideas are new and suited to the faculties, the pleasure of acquiring them from instructors is second only to that of discovering them ourselves. It is probable, moreover, that many ages will elapse before *all* the facts and relations of nature shall have been explored, and the possibility of discovery exhausted. If the universe be infinite, knowledge can never be complete.

The second question is, Has man really advanced in happiness, in proportion to his increase in knowledge? We are apt to entertain erroneous notions of the pleasures enjoyed in past ages. Fabulists have represented men as then peaceful, innocent, and gay; but if we look narrowly into the conditions of savage and barbarian life in the present day, and recollect that these were the states of all nations before they acquired scientific knowledge, we shall not much or long regret the pretended diminution of enjoyment by civilization.* Phrenology renders the superiority of the latter condition certain, by shewing it to be a law of nature, that, until the intellect is extensively informed, and the moral sentiments assiduously exercised, the animal propensities bear the predominant sway; and that wherever these are supreme, misery is an inevitable concomitant. Indeed, the answer to the objection that happiness has not increased with knowledge, appears to me to be found in the fact, that until Phrenology was discovered, the nature of man was not scientifically known, and that, in consequence, very few of his institutions, civil or domestic, were founded on principles accordant with the laws of his constitution. Owing to the same cause, also, much of his knowledge has necessarily remained partial, and inapplicable to use; but after this science shall have been appreciated and applied, clouds of darkness, accumulated through long ages that are past, may be expected to roll away, as if touched by the rays of the meridian sun,—and with them many of the miseries that attend total ignorance or imperfect information to disappear.†

* See on this subject a very elaborate and philosophical volume in the Library of Entertaining Knowledge, entitled *The New Zealanders*, p. 360.

† Readers who are strangers to Phrenology and the evidence on which it rests, may regard the observations in the text as extravagant and enthusiastic; but I respectfully remind them, that, while they judge in comparative ignorance

It ought also to be kept constantly in remembrance that man is a *social being*, and that the precept "love thy neighbour as thyself" is imprinted in his constitution. That is to say, so much of the happiness of each individual depends on the habits, practices, and opinions of the society in which he lives, that he cannot reap the full benefits of his own advancement, until similar principles have been embraced and realized in practice by his fellow-men. This renders it his interest, as it is his duty, to communicate his knowledge to them, and to carry them forward in the career of improvement. At this moment, there are thousands of persons who feel their enjoyments, physical, moral, and intellectual, impaired and abridged by the mass of ignorance and prejudice which every where surrounds them. They are men living before their age, and whom the world neither understands nor appreciates. Let them not, however, repine or despair; but let them dedicate their best efforts to communicating the truths which have opened up to themselves the prospect of happiness, and they will not be disappointed. The law of our constitution which has established the superiority of the moral sentiments, renders it impossible for individuals to attain the full enjoyment of their rational nature, until they have rendered their fellow-men virtuous and happy; and in the truth and power of this principle, the ignorant and the wretched have a guarantee for being raised in their condition by the efforts of their more fortunate brethren. If all ranks of the people were taught the philosophy which I am now advocating, and if, in so far as it is true, it were acted on by their legislators, and enforced by their religious instructors as the will of the Creator communicated to man through His natural institutions, the progress of general improvement would be greatly accelerated.

If the views now advocated shall ever prevail, it will be seen that the experience of past ages affords no sufficient reason for limiting our estimate of man's capabilities of civilization. In the introductory chapter, I mentioned the opinions of some philosophers about the slow and gradual preparation of the globe for man; and remarked that he also appears to be destined to advance only by stages to the highest condition of his moral and intellectual nature. At present he is obviously only in the beginning of his career. Although a knowledge of external nature, and of himself, is indispensable to his advancement towards his true station as a rational being, yet four hundred years have not elapsed since the arts of printing and engraving were invented, without which knowledge could not be disseminated through the mass of mankind; and, even now, the art of reading is by no means general over the world—so that the *means* of calling man's rational nature into activity, although discovered, are but very imperfectly applied. It is only five or six centuries since the mariner's compass was known in Europe, without which even philosophers could not ascertain the most common facts regarding the size, form, and productions of the earth. It is but three hundred and forty-three years since one-half of the habitable globe, America, became known to the other half; and considerable portions of it are still unknown even to the best informed inquirers. It is little more than two hundred years since the circulation of the blood was discovered; previously to which it was impossible even for physicians to form any correct idea of the uses of many of man's corporeal organs, and of their relations to external nature. Haller, who flourished in the early part and middle of the last century, may be regarded as the founder of human physiology as a science of observation. It is only between forty and fifty years since the true functions of the brain and nervous system were discovered; before which we possessed no adequate means of becoming acquainted with our mental constitution and its adaptation to external circumstances and beings. It is no more than sixty-one years since the study of Chemistry, or of the constituent elements of the globe, was put into a philosophical condition by Dr Priestley's discovery of oxygen; and hydrogen was discovered so lately as 1766, or sixty-nine years ago. Before that time, people in general were comparatively ignorant of the qualities and relations of the most important material agents with which they were surrounded. At present this knowledge is still in its infancy, as will appear from an enumeration of the dates of several other important discoveries. Electricity was discovered in 1728, galvanism in 1794, gas-light about 1798; and steam-boats, steam-looms, and the safety-lamp, in our own day.

It is only of late years that the study of Geology has been seriously begun; without which we could not know the past changes in the physical structure of the globe, a matter of much importance as an element in judging of our present position in the world's progress. This science also is still in its infancy. An inconceivable extent of territory remains to be explored, from the examination of which the most interesting and instructive conclusions will probably present themselves. In astronomy, too, the discoveries of the two Herschels promise to throw additional light on the early history of the globe.

The mechanical sciences are at this moment in full play, putting forth vigorous shoots, and giving the strongest indications of youth, and none of decay.

The sciences of morals and of government are still in many respects in a crude condition.

In consequence, therefore, of his profound ignorance, man, in all ages, has been directed in his pursuits by the mere impulse of his strongest propensities, formerly to war and conquest, and now to accumulating wealth; without having framed his habits and institutions in conformity with correct and enlightened views of his own nature, and its real interests and wants. During past ages Nature has been constantly operating on man, but in consequence of his ignorance of her laws, he has not generally accommodated his conduct to her influence, and hence has suffered countless evils. This condition of things still continues to exist. Up to the present day, the mass of the people in every nation have remained essentially ignorant, the tools of interested leaders, or the creatures of their own blind impulses, unfavourably situate for the development of their rational nature; and they, constituting the great majority, necessarily influence the condition of the rest. But at last, the arts and sciences seem to be tending towards abridging human labour, so as to force leisure on the mass of the people; while the elements of useful knowledge are so rapidly increasing, the capacity of the operatives for instruction is so generally recognised, and the means of communicating it are so powerful and abundant, that a new era may fairly be considered as having commenced.

From the want of a practical philosophy of human nature, multitudes of amiable and talented individuals are at present anxious only for preservation of the attainments which society possesses, and dread retrogression in the future. If the views now expounded be correct, this race of moralists and politicians will in time become extinct; because, progression being the law of our nature, the proper education of the people will render the desire for improvement universal.

it has been my endeavour to subject it to the severest scrutiny. Having found its proofs irrefragable, and being convinced of its importance, I solicit their indulgence in speaking of it as it appears to my own mind. As many persons continue ignorant of the progress which Phrenology has made, I have added, in the Appendix No. III., a note on this subject.

CHAPTER V.

TO WHAT EXTENT ARE THE MISERIES OF MANKIND REFERABLE TO INFRINGEMENT OF THE LAWS OF NATURE?

I. *Calamities arising from infringement of the physical laws*—These laws of great utility to animals who act in accordance with them, and productive of injury only when disregarded—Example of law of gravitation—Man and the lower animals constitutionally placed in certain relations to that law—Calamities suffered from it by man, to what referable?—The objection considered, That the great body of mankind are not sufficiently moral and intellectual to act in conformity with the natural laws—The more ignorant and careless men are, the more they suffer.——II. *Evils that befall mankind from infringement of the organic laws*—Necessity of so enlightening the intellect as to enable it to curb and direct the blind feelings which naturally and spontaneously arise in the mind—Organised being defined—To enjoy a constitution as perfect as possible, it must spring from a sound and complete germ; be supplied with food, light, and air; and duly exercise its functions—The human frame so constituted as to admit of the *possibility* of health and vigour during a long life—Remarkable health of the New Zealanders—The sufferings of women in childbed apparently not inevitable—The organic laws hitherto neglected and little known—Miseries resulting from this cause to INDIVIDUALS—Description of the brain—Necessity for its regular exercise—To provide for this, we must (1) educate and train the mental faculties in youth, and (2) place individuals in circumstances habitually demanding the discharge of useful and important duties—Answer to the question, What is the use of education?—The whole body improved by exercise of the brain—Misery of idleness—Instances of evils produced by neglect of the natural laws: The great plague in London; fever and ague in marshy districts; explosions in coal-mines—Answer to the objection, That men are unable to remember the natural laws, and to apply the knowledge of them in practice—Advantage of teaching scientific *principles*—Farther examples of disease and premature death consequent on neglect of the organic laws—Eminent success of Captain Murray in preserving the health of his crew—Erroneous views of divine dispensations, in the works of religious writers—SOCIAL miseries from neglect of the organic laws—(1.) *Domestic* miseries—Marriage of persons with discordant minds a fertile source of unhappiness—Phrenology affords the means of avoiding this error—Different forms of head, and the concomitant dispositions, exemplified by the cases of Hare, Williams, Sheridan, Melanethon, Pope Alexander VI., and Vitellius—Crabbe and Dr Johnson quoted—Hereditary transmission of bodily and mental qualities from parents to children—Transmission of diseases well known—Transmission of character remarked by many writers—Horace, Drs John and James Gregory, Voltaire, Dr King, Dr Mason Good, Haller, &c., quoted on this subject—Hereditary descent of forms of brain obvious in nations—The offspring of an American or Asiatic and a European superior to the offspring of two Americans or Asiatics—The extent to which children resemble their parents, considered—Reasons for concluding that the mental character of each child is determined by the qualities of the stock, combined with the faculties predominant in the parents at the commencement of its existence—Transmission of factitious or temporary conditions of the body—Transmission of acquired habits—Appearance of peculiarities in children, in consequence of impressions made on the mind of the mother—Descent of temporary mental and bodily qualities—These subjects still in many respects obscure—General neglect of the organic laws in the formation of marriages—Dr Caldwell quoted—Marriage prohibited in Wurtemberg before certain ages—Advantages arising from the law of hereditary descent, and bad effects which would follow its abolition—Why do children of the same marriage differ from each other?—Cases illustrative of the evils resulting from neglect of the law of hereditary transmission—Marriage between blood-relations forbidden by the natural law—(2.) Hurtful consequences of neglect of the organic laws in the *ordinary relations of society*—Misconduct of servants, clerks, partners, and agents—Utility of Phrenology in enabling us to avoid this source of misery—DEATH—A natural and useful institution—Views of theologians respecting it—Death considered as it affects the lower animals and mankind—Nature does not seem to intend the death of human beings, except in old age—Untimely death the result of infringement of the organic laws—Means provided by nature to relieve men from the fear of death—Death not revolting to the moral sentiments—Frequency of premature death decreasing.——III. *Calamities arising from infringement of the moral law*—Cause of the diversity of moral and religious codes and opinions in different nations and among philosophers—Advantages secured by cultivating and acting under the dictates of the moral sentiments and intellect; and evils induced by the opposite conduct—(1) Sufferings of individuals from neglect of the moral and intellectual laws—(2) Calamities arising to individuals and communities from infringement of the social law—Malthus's principle of population—The inhabitants of Britain too much engrossed by manufacturing and mercantile pursuits—Misery produced by overstocking the markets—Times of "commercial prosperity" are seasons of the greatest infringements of the laws of nature—Injustice and inexpediency of the combination laws—Necessity of abridging the periods of labour of the operative population, and cultivating their moral and rational faculties—This rendered possible by the use of machinery in manufactures—Ought government to interfere with industry?—Miseries endured by the middle and upper ranks in consequence of departure from the moral law in the present customs of society—(3) Effect of the moral law on national prosperity—The highest prosperity of one nation perfectly compatible with that of every other—Necessity that nations, in order to secure it, should act towards each other on the principles dictated by the moral sentiments—Evil produced by disregard of these principles—Illustrations in the slave-trade, the American war, and the project of Themistocles to burn the Spartan ships—The national debt of Britain the result of unprincipled wars—Other evils from the same source—Bad effects anticipated from the existence of negro slavery in the United States—The Spaniards punished under the natural laws for their cruelties in America—The civilisation of savages more easy by pacific than by forcible measures—Moral science far outstripped by physical—Necessity of cultivating the former.

IN the present chapter, I propose to consider some of the evils that have afflicted the human race; and to inquire whether they have proceeded from neglect of laws, benevolent and wise in themselves, and calculated, when observed, to promote the happiness of man; or from a defective or vicious constitution of nature. The following extract from the Journal of John Locke, contains a forcible statement of the principle which I intend to illustrate: "Though justice be also a perfection which we must necessarily ascribe to the Supreme Being, yet we cannot suppose the exercise of it should extend farther than his goodness has need of it for the preservation of his creatures in the order and beauty of the state that he has placed each of them in; for since our actions cannot reach unto him, or bring him any profit or damage, the punishments he inflicts on any of his creatures, *i. e.* the misery or destruction he brings upon them, can be nothing else but to preserve the greater or more considerable part, and so being only for preservation, his justice is nothing but a branch of his goodness, which is fain by severity to restrain the irregular and destructive parts from doing harm."—*Lord King's Life of Locke*, p. 122.

SECT. I.—CALAMITIES ARISING FROM INFRINGEMENT OF THE PHYSICAL LAWS.

The proper way of viewing the Creator's institutions, is to look, first, to their uses, and to the advantages that flow from using them aright; and, secondly, to their abuses, and the evils that proceed from this source.

In Chapter II., some of the benefits conferred on man by the law of gravitation have been enumerated; and I may here advert to some of the evils originating from that law, when human conduct is in opposition to it. For example, men are liable to fall from horses, carriages, stairs, precipices, roofs, chimneys, ladders, and masts, and also to slip in the street—by which accidents life is sometimes suddenly cut short, or rendered miserable from lameness and pain; and the question arises, Is human nature provided with any means of protection against these evils, commensurate with their frequency and extent?

The lower animals are subject to this law as well as man; and the Creator has bestowed on them external senses, nerves, muscles, bones, an instinctive sense of equilibrium, the sense of danger, or cautiousness, and other faculties, to place them in accordance with it. These appear to afford sufficient protection to animals placed in ordinary circumstances; for we very rarely discover any of them, in their natural condition, killed or mutilated by accidents referrible to gravitation. Where their mode of life exposes them to extraordinary danger from this law, they are provided with additional securities. The monkey, which climbs trees, enjoys great muscular energy in its legs, hands, and tail, far surpassing, in proportion to its gravitating tendency, (its bulk and weight), that which is bestowed on the legs and arms of man; so that, by this means, it springs from branch to branch, and supports itself, in almost complete security against the law in question. The goat, which browses on the brinks of precipices, has received a hoof and legs that give precision and stability to its steps. Birds, which are destined to sleep on branches of trees, are provided with a muscle passing over the joints of each leg and stretching down to the foot, and which, being pressed by their weight, produces a proportionate contraction of their claws, so as to make them cling the faster, the greater their liability to fall. The fly, which walks and sleeps on perpendicular walls and the ceilings of rooms, has a hollow in its foot, from which it expels the air, and the pressure of the atmosphere on the outside of the foot holds it fast to the object on which the inside is placed. The walrus, or seahorse, which is destined to climb up the sides of icebills, is provided with a similar apparatus. The camel, whose native region is the sandy desert of the torrid zone, has broad spreading hooves to support it on the loose soil. Fishes are furnished with air-bladders, by dilating and contracting which they can accommodate themselves with perfect precision to the law of gravitation.

In these instances, the lower animals appear to be placed by their natural endowments, admirably in harmony with gravitation, and guaranteed against its injurious effects. Is man, then, less an object of love with the Creator? Is he alone left exposed to the evils that spring inevitably from neglecting its operation? His means of protection are different, but when understood and applied, they will probably be found not less complete. Man also has received bones, muscles, nerves, an instinct of equilibrium,* and the faculty of Cautiousness; but not in equal perfection, in proportion to his figure, size, and weight, with those bestowed on the lower animals:—The difference, however, is far more than compensated by other faculties, particularly those of Constructiveness and Reflection, in which he greatly surpasses them. Keeping in view that the external world, in regard to man, is arranged on the principle of the supremacy of the moral sentiments and intellect in cases of conflict between the faculties, we shall probably find that the calamities suffered by him from the law of gravitation, are referrible to predominance of the animal propensities, or to neglect of proper exercise of his intellectual powers. For example, when coaches break down, ships sink, or men fall from ladders, how generally may the cause be traced to decay in the vehicle, the vessel, or the ladder, which a predominating Acquisitiveness alone allowed to remain unrepaired; or when men fall from houses and scaffolds, or slip on the street, how frequently should we find their muscular, nervous, and mental energies impaired by preceding debaucheries—in other words, by predominance of the animal faculties, which for the time diminished their natural means of accommodating themselves to the law from which they suffer. The slater, in using a ladder, assists himself by the reflective powers; but, in walking along the ridge of a house, or standing on a chimney, he takes no aid from these faculties; he trusts to the mere instinctive power of equilibrium, in which he is inferior to the lower animals,—and, in so doing, clearly violates the law of his nature that requires him to use reflection where instinct is deficient. Causality and Constructiveness could invent and fashion means, by which, if he slipped from a roof or chimney, his fall might be arrested. A small chain, for instance, attached by one end to a girdle round his body, and having the other end fastened by a hook and eye to the roof, might leave him at liberty to move, and might break his fall in case he slipped. How frequently, too, do these accidents happen after disturbance of the mental faculties and corporeal functions by intoxication!

The objection will probably occur, that in the gross condition in which the mental powers exist, the great body of mankind are incapable of exerting habitually that degree of moral and intellectual energy, which is indispensable to observance of the natural laws; and that, therefore, they are, in point of fact, less fortunate than the lower animals. I admit that, at present, this representation is to a considerable extent just; but nowhere do I perceive the human mind instructed, and its powers exercised, in a degree at all approaching to their limits. Let any person recollect how much greater capacity for enjoyment and security from danger he has experienced, at a particular time, when his whole mind was filled with, and excited by, some mighty interest, not only allied to, but founded in, morality and intellect, than in that languid condition which accompanies the absence of elevated and ennobling emotions; and he may form some idea of what man may achieve, when his powers shall have been cultivated to the extent of their capacity. At the present moment, no class of society is systematically instructed in the constitution of the mind and body, in the relations of these to external objects, in the nature of these objects, in the principle that activity of the faculties is the true source of pleasure, and that the higher the powers the more intense the delight; and, if such views be to the mind what light is to the eyes, air to the lungs, and food to the stomach, there is no wonder that a mass of inert *mentality*, if I may use such a word, should every where exist around us, and that numberless evils should spring from its continuance in that condition. If active faculties, harmoniously gratified, are the natural fountains of enjoyment, and the external world is created with reference to this state; it is as obvious that misery must result from animal supremacy and intellectual torpidity, as that flame, which is constituted to burn only when supplied with oxygen, must inevitably become extinct when exposed to carbonic acid gas. Finally, if the arrangement by which man is left to discover and obey the laws of his own nature, and of the physical world, be more conducive to activity than intuitive knowledge, the calamities now contemplated may have been instituted to force him to do his duty; and his duty, when executed, will constitute his delight.

While, therefore, we lament the fate of individual victims to the law of gravitation, we cannot condemn that law itself. If it were suspended, to save men from the effects of negligence, not only might the proud creations of human skill totter to their base, and the human body rise from the earth and hang midway in the air; but our highest enjoyments would be terminated, and our faculties become positively useless, by being deprived of their field of action. Causality, for instance, teaches that the same cause will always, *cæteris paribus*, produce similar effects; and, if the physical laws were suspended or varied to accommodate themselves to man's negligence or folly, it is obvious that this faculty would be without an object, and that no definite course of action could be entered upon with confidence in the result. If, on the other hand, this view of the constitution of nature were kept steadily in mind, the occurrence of one accident of this kind would stimulate reflection to discover means of avoiding others.

* Vide Essay on Weight, Phren. Journ. vol. ii. p. 412.

Similar illustrations and commentaries might be given, in regard to the other physical laws to which man is subject; but the object of the present essay being merely to evolve principles, I confine myself to gravitation, as the most obvious and best understood.

I do not mean to say, that, by the mere exercise of intellect, man may absolutely guarantee himself against all accidents; but only that the more ignorant and careless he is, the more will he suffer,—and the more intelligent and vigilant, the less; and that I can perceive no limits to this rule. The law of most civilized countries recognises this principle, and subjects owners of ships, coaches, and other vehicles, in reparation of damage arising from gross infringements of the physical laws. It is unquestionable that the enforcement of this liability has given increased security to travellers to no trifling extent.

SECT. II.—ON THE EVILS THAT BEFALL MANKIND FROM INFRINGEMENT OF THE ORGANIC LAWS.

It is a very common error, to imagine that the *feelings* of the mind are communicated to it through the medium of the *intellect*; and, in particular, that if no indelicate objects reach the eyes, or expressions penetrate the ears, perfect purity will necessarily reign within the soul: and, carrying this mistake into practice, some persons are prone to object to all discussion of the subjects treated of under the "Organic Laws," in works designed for general use. But their principle of reasoning is fallacious, and the result has been highly detrimental to society. The *feelings* exist and possess activity distinct from the *intellect*; they spur it on to obtain their own gratification; and it may become either their guide or their slave, according as it is, or is not, enlightened concerning their constitution and objects, and the laws of nature to which they are subjected. The most profound philosophers have inculcated this doctrine, and by phrenological observation it is demonstratively established. The organs of the feelings are distinct from those of the intellectual faculties; they are larger; and, as each faculty, *cæteris paribus*, acts with a vigour proportionate to the size of its organs, the feelings are obviously the more active or impelling powers. The cerebellum, or organ of Amativeness, is the largest of the whole mental organs; and, being endowed with natural activity, it fills the mind spontaneously with emotions and suggestions, which cannot be prevented from arising, or eradicated after they exist; but the outward manifestations of which may be directed, controlled, or resisted, by intellect and moral sentiment. The whole question, therefore, resolves itself into this, Whether is it more beneficial to enlighten the understanding, to enable it to control and direct that feeling,—or (under the influence of an error in philosophy, and false delicacy founded on it) to permit the propensity to riot in all the fierceness of a blind animal instinct, withdrawn from the eye of reason, but not thereby deprived of its vehemence and importunity? The former course appears to me to be the only one consistent with reason and morality; and I shall adopt it in reliance on the good sense of my readers, that they will at once discriminate between practical instruction concerning this feeling addressed to the intellect, and lascivious representations addressed to the mere propensity itself—with the latter of which the enemies of all improvement may attempt to confound my observations. To the pure, all things are pure; in other words, every function of the mind and body is instituted by the Creator: each has a legitimate sphere of activity: but all may be abused; and it is impossible regularly to avoid the abuse of them, except by being instructed in their nature, objects, and relations. This instruction is science of the most beneficial description. The propriety, nay necessity, of acting on this principle, becomes more and more apparent, when it is considered that, to individuals in whom the feeling in question is naturally weak, such discussions suggest only intellectual ideas, and that they perceive no indelicacy in knowledge which is calculated to be useful; while, on the other hand, persons in whom the feeling is naturally strong, and in whom they may excite emotion, are precisely those who, of all others, stand most in need of instruction.

An organized being is one which derives its existence from a previously existing organized being—which subsists on food, grows, attains maturity, decays, and dies. Whatever the ultimate object of the Creator, in constituting organized beings, may be, it will scarcely be denied, that part of His design is, that they should enjoy their existence here; and, if so, the object of every part of their structure should be to conduce to this end. To render an organized being perfect in its kind, the first law that must be observed is, that the germ from which it springs shall be complete in all its parts, and sound in its whole constitution; the second is, that the moment it is ushered into life, and as long as it continues to live, it shall be supplied with food, light, air, and every other aliment necessary for its support; and the third law is, that it shall duly exercise its functions. When all these laws are obeyed, the being should enjoy pleasure from its organized frame, if its Creator be benevolent; and its constitution should be so adapted to its circumstances, as to admit of obedience to them, if its Creator be wise and powerful. Is there, then, no such phenomenon on earth, as a human being existing in full possession of organic vigour, from birth till advanced age, when the organic system is fairly worn out? Numberless examples of this kind have occurred, and they shew to demonstration, that the corporeal frame of man is so constituted as to admit of the *possibility* of his enjoying health and vigour during the whole period of a long life. It is mentioned in the Life of Captain Cook, that "one circumstance peculiarly worthy of notice is the perfect and uninterrupted health of the inhabitants of New Zealand. In all the visits made to their towns, where old and young, men and women, crowded about our voyagers, they never observed a single person who appeared to have any bodily complaint; nor among the numbers that were seen naked, was once perceived the slightest eruption upon the skin, or the least mark which indicated that such an eruption had formerly existed. Another proof of the health of these people is the facility with which the wounds they at any time receive are healed. In the man who had been shot with the musket-ball through the fleshy part of his arm, the wound seemed to be so well digested, and in so fair a way of being perfectly healed, that if Mr Cook had not known that no application had been made to it, he declared that he should certainly have inquired, with a very interested curiosity, after the vulnerary herbs and surgical art of the country. An additional evidence of human nature being untainted with disease in New Zealand, is the great number of old men with whom it abounds. Many of them, by the loss of their hair and teeth, appeared to be very ancient, and yet none of them were decrepit. Although they were not equal to the young in muscular strength, they did not come in the least behind them with regard to cheerfulness and vivacity. Water, as far as our navigators could discover, is the universal and only liquor of the New Zealanders. It is greatly to be wished that their happiness in this respect may never be destroyed by such a connection with the European nations, as shall introduce that fondness for spirituous liquors which hath been so fatal to the Indians of North America."—*Kippis's Life of Captain Cook.* Dublin, 1788, p. 100.

In almost every country, individuals are to be found, who have been free from sickness during the whole course of a protracted life.

Now, as a natural law never admits of an exception, this excellent health could not occur in any individuals unless it were fairly within the capabilities of the race.

The sufferings of women in childbed have been cited as evidence that the Creator has not intended the human being, under any circumstances, to execute all its functions entirely free from pain. But, besides the obvious answer, that the objection applies only to one sex, and is therefore not to be too readily presumed to have its origin in nature, there is good reason to deny the assertion, and to ascribe the suffering in question to departures from the natural laws, in either the structure or the habits of the individuals who experience it.*

The advantage of studying the finest models of the human figure, as exhibited in painting and sculpture, is to raise our ideas of the excellence of form and proportion to which our nature is capable of attaining; for, other conditions being equal, the most perfect forms and proportions are always the best adapted for health and activity.

Let us hold, then, that the organized system of man, in itself, admits of the *possibility* of health, vigour, and organic enjoyment, during the full period of life; and proceed to inquire into the causes why these advantages are not universal.

One organic law, I have stated, is, that the germ of the infant being must be complete in all its parts, and perfectly sound in its condition, as an indispensable requisite to vigorous development and full enjoyment of its powers. If an agriculturist sow corn that is weak, wasted, and damaged, the plants that spring from it will be feeble, and liable to speedy decay. The same law holds in the animal kingdom; and I would ask, has it hitherto been observed by man? Notoriously it has not. Indeed, its existence has been either nearly unknown, or in a very high degree disregarded by human beings. The feeble, the sickly, the exhausted with age, and the incompletely developed through extreme youth, marry, and without the least compunction regarding the organization which they may transmit to their offspring, bring into the world miserable beings, the very rudiments of whose existence are tainted with disease. If we trace such conduct to its source, we shall find it to originate either in the supremacy of animal propensity, or in ignorance, or more frequently in both. The inspiring motives are generally mere sensual appetite, avarice, or ambition, operating in the absence of all just conceptions of the impending evils. The punishment of this offence is debility and pain transmitted to the children, and reflected back in anxiety and sorrow on the parents. Still the great point to be kept in view is, that these miseries are not legitimate consequences of *observance* of the organic laws, but the direct chastisement of their *infringement*. These laws are unbending, and admit of no exception; they must be fulfilled, or the penalties of disobedience will follow. On this subject profound ignorance reigns in society. From such observations as I have been able to make, I am convinced that the union of certain temperaments and combinations of mental organs in the parents, is highly conducive to health, talent, and morality in the offspring, and *vice versa*; and that these conditions may be discovered and taught with far greater certainty, facility, and advantage, than is generally imagined. It will be time enough to conclude that men are naturally incapable of obedience to the organic laws, when, after their intellectual faculties and moral sentiments have been trained to observance of the Creator's institutions, as at once their duty, their interest, and a grand source of their enjoyment, they shall be found continually to resist them.

A second organic law regards nutriment, which must be supplied of a suitable kind, and in due quantity. This law requires also free air, light, cleanliness, and attention to every physical arrangement by which the functions of the body may be strengthened or impaired. Have mankind, then, acted in accordance with, or neglected, *this* institution? I need scarcely answer the question. To be able to conform to institutions, we must first know them. Before we can know the organic constitution of our body, we must study it; and the study of the human constitution is anatomy and physiology. Before we can become acquainted with its relations to external objects, we must learn the existence and qualities of these objects (unfolded by chemistry, natural history, and natural philosophy), and compare them with the constitution of the human body. When we have fulfilled these conditions, we shall be better able to discover the laws which the Creator has instituted in regard to our organic system.*

It will be said, however, that such studies are impracticable to the great bulk of mankind, and, besides, do not appear much to benefit those who pursue them. They are impracticable only while mankind prefer resting their public and private conduct on the basis of the propensities, instead of on that of the propensities and the moral sentiments harmoniously combined. I have mentioned, that exercise of the nervous and muscular systems is required of *all* the race by the Creator's fiat; that if all who are capable would obey this law, a moderate amount of exertion agreeable and salutary in itself would suffice to supply our wants, and to surround us with every beneficial luxury; and that a large portion of unemployed time would remain. The Creator has bestowed on us Knowing Faculties, fitted to explore the facts of science, Reflecting Faculties to trace their relations, and Moral Sentiments calculated to feel interest in such investigations, and lead us to reverence and obey the laws which they unfold; and, finally, He has made this occupation, when entered upon with the view of tracing His power and wisdom in the subjects of our studies, and of discovering and obeying His institutions, the most delightful and invigorating of all occupations. Instead, then, of such a course of education being impracticable, every arrangement of the Creator appears to be prepared in direct anticipation of its actual accomplishment.

The second objection, that those who study these sciences are not more healthy and happy, as organized beings, than those who neglect them, admits of an easy answer. They may have inherited feeble frames from their parents. Besides, only parts of these sciences have been communicated to a few individuals, whose main design in studying them has been to apply them as means of acquiring wealth and fame; but they have not been generally taught as connected parts of a great system of natural arrangements, fraught with the highest influences on human enjoyment; and in almost no instance have the intellect and moral sentiments been systematically directed to the natural laws, as the grand fountains of happiness and misery to the race, and trained to observe and obey them as the institutions of the Creator. In cases where physiology, natural history, and natural philosophy have been properly studied, the objection alluded to is at variance with experience and fact.

A third organic law is, that all our functions shall be duly exercised; and is this law observed by mankind? Many persons are able, from experience, to attest the severity of the punishment that follows from omitting to exercise the *muscular system*, in the lassitude, indigestion, irritability, debility, and general uneasiness that attend a sedentary and inactive life: But the penalties that attach to neglect of exercising the *brain* are much less known, and therefore I shall notice them more at length. The following is the description of the brain given by Dr A. Combe, in his work on Phy-

* See Appendix, No. IV.

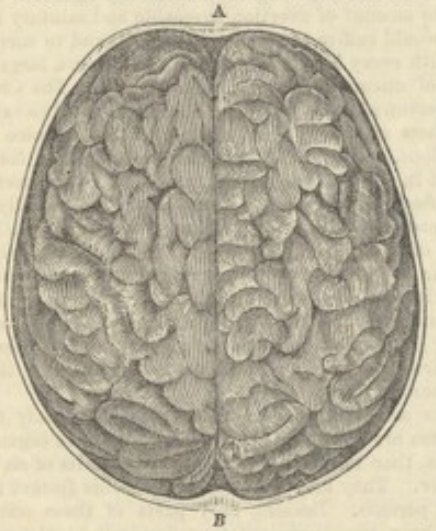
* In "Physiology applied to Health and Education," and in "A Treatise on the Physiological and moral management of Infancy," by Dr A. Combe, to which I refer, the organic laws are expounded in detail, and many striking examples are given of the infringement of these laws, and of its injurious consequences.

siology applied to Health and Education already alluded to.

"The brain is that large organized mass which, along with its enveloping membranes, completely fills the cavity of the skull. It is the seat of thought, of feeling, and of consciousness, and the centre towards which all impressions made on the nerves distributed through the body are conveyed, and from which the commands of the will are transmitted to put the various parts in motion.

"The structure of the brain is so complicated, that less is known of its true nature than that of almost any other organ. It would therefore be entirely out of place to attempt to describe it here, farther than by stating generally its principal divisions. On sawing off the top of the skull, and removing the firm tough membrane called *dura mater* (hard mother), which adheres closely to its concave surface, the *cerebrum* or *brain proper* presents itself, marked on the surface with a great variety of undulating windings or *convolutions*, and extending from the fore to the back part of the head, somewhat in the form of an ellipse. The annexed cut, Fig. 1. repre-

FIG. 1.—UPPER SURFACE OF THE BRAIN.



sents the convolutions as seen on the upper surface of the brain. In the middle line, from A to B, a deep cleft or fissure is perceived, separating the brain, in its whole length, into two halves, or *hemispheres*, as they are called. Into this cleft dips a tight stiff membrane, resembling a scythe in shape, and hence called the *falx* (scythe), or sometimes, from its being a mere fold of the *dura mater*, the *falciform* (*scythe-like*) *process* of the *dura mater*. From its dipping down between the two halves of the brain, the chief purpose of this membrane seems to be to relieve the one side from the pressure of the other, when we are asleep, for example, or have the head reclining to either side. The membrane does not descend to the bottom of the brain, except in a small part, at the front and back, G G in Fig. 2. It descends about two-thirds of the depth of the whole brain. At the point where it terminates, a mass of fibres, named the *corpus callosum*, passes between and connects the two hemispheres. The convolutions represented in Fig. 1. belong chiefly to the coronal region, and manifests the moral sentiments."

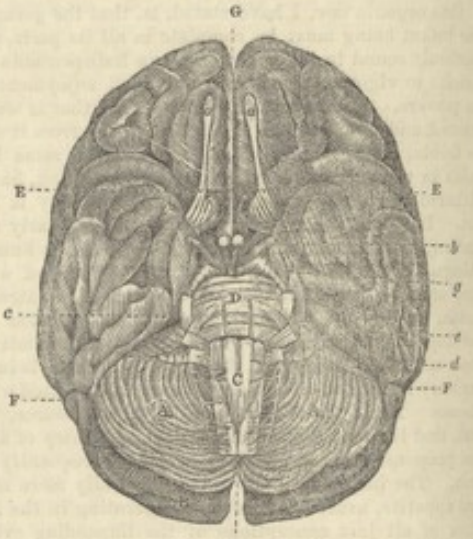
The cut, Fig. 2, represents the convolutions lying at the base of the brain.

"Each half or *hemisphere* of the brain is, in its turn, divided,—but in a less marked way, as the divisions are observable only on its inferior surface,—into three portions, called, from their situations, the *anterior*, *middle*, and *posterior lobes*, each occupying nearly a third of the whole length of the brain. The anterior lobe, being the portion lying before the dotted line E E, occupies the forehead; the middle is all the portion lying between the two transverse lines E E and F F, above and a little in front of the ears; and the posterior lobe is that portion lying behind the transverse line F F, and corresponding to the back part of the head.

"Beneath the posterior lobe, a strong fold of the dura mater, called the *tentorium*, is extended horizontally to support and separate it from the *cerebellum* A A, or little brain, lying below it. The cerebellum forms the last great division of the contents of the skull. Its surface is marked by convolutions, differing, however, in size and appearance from those observed in the brain.

"Adhering to the surface of the convolutions, and consequently dipping down into, and lining the sulci or furrows between them, another membrane, of a finer texture, and greater vascularity, called *pia mater*, is found. The bloodvessels going to the brain branch out so extensively on the pia mater, that, when a little inflamed, it seems to constitute a perfect vascular network. This minute subdivision is of use in preventing the blood from being impelled with too great force against the delicate tissue of the brain.

Fig. 2.—UNDER SURFACE OF THE BRAIN.



"A third covering, called the *arachnoid* membrane, from its fineness resembling that of a spider's web, is interposed between the other two, and is frequently the seat of disease.

"On examining the convolutions in different brains, they are found to vary a good deal in size, depth, and general appearance. In the various regions of the same brain they are also different, but preserve the same general aspect. Thus they are always small and numerous in the anterior lobe, larger and deeper in the middle, and still larger in the posterior lobe. The thick cord or root C, springing from the base of the brain, is named the *medulla oblongata*, or oblong portion of the spinal marrow, which is continued downwards, and fills the cavity of the spine or back-bone. At one time the brain has been regarded as proceeding from, and at another as giving rise to, the spinal marrow; but, in reality, the two are merely connected, and neither grows from the other. The false analogy of a stem growing from a root has led to this abuse of language.

"The small round filaments or cords seen to proceed from the sides of the medulla oblongata, and from near the base of the brain, are various *nerves* of sensation and motion, some of them going to the organs of sense, and others to the skin and muscles of the face, head, and other more distant parts. The long flat-looking nerve *a a*, lying on the surface of the anterior lobe, is the *olfactory*, or nerve of smell, going to the nose. The round thick nerve 4 4, near the roots of the former, is the *optic*, or nerve of vision, going to the eye. That marked

b is the motor nerve which supplies the muscles of the eyeball. A little farther back, the fifth pair *c*, is seen to issue apparently from the arch D, called *Pons Varolii*, or *bridge of Varolius*. It is a large compound nerve, and divides into three branches, which are ramified on almost all the parts connected with the head and face, and the upper and under jaw. It is a nerve of both sensation and motion, and one branch of it ramified on the tongue is the nerve of taste. Other branches supply and give sensibility to the teeth, glands, and skin. The seventh or *auditory* nerve *e*, is distributed on the internal ear, and serves for hearing. The eighth, or *pneumogastric* nerve *d*, sends filaments to the windpipe, lungs, heart, and stomach, and is one of great importance in the production of the voice and respiration. It also influences the action of the heart, and the process of digestion.

"Such are the principal nerves more immediately connected with the brain, but which it is impossible to describe more minutely here. Those which supply the trunk of the body and the extremities, issue chiefly from the spinal marrow; but they also must, for the present, be passed over in silence, that we may return to the consideration of the brain.

"The brain receives an unusually large supply of blood, in comparison with the rest of the body; but the nature of its circulation, although a very interesting subject of study, being only indirectly connected with our present purpose, cannot now be discussed."

The brain is the fountain of nervous energy to the whole body, and many individuals are habitual invalids, without actually labouring under any ordinary recognised disease, solely from defective or irregular exercise of the nervous system. In such cases, not only the mind suffers debility in its feelings and intellectual capacities, but all the functions of the body participate in its languor, because all of them receive a diminished and vitiated supply of the nervous stimulus, a due share of which is essential to their healthy action. The best mode of increasing the strength and energy of any organ and function, is to exercise them regularly and judiciously, according to the laws of their constitution.* The brain is the organ of the mind; different parts of it manifest distinct faculties; and the power of manifestation in regard to each is proportionate, *cæteris paribus*, to the size and activity of the organ. The brain partakes of the general qualities of the organized system, and is strengthened by the same means as the other organs. When the muscles are called into vivacious activity, an increased influx of blood and of nervous stimulus takes place in them, and their vessels and fibres become at once larger, firmer, and more susceptible of action. Thought and feeling are to the brain what bodily exercise is to the muscles; they are accompanied by increased action in its bloodvessels, and an augmented elaboration of nervous energy. In a case reported by Dr Pierquin, observed by him in one of the hospitals of Montpelier in 1821, he saw, in a female patient, part of whose skull had been removed, the brain motionless and lying within the cranium when she was in a dreamless sleep; in motion and protruding without the skull when she was agitated by dreams; more protruded in dreams reported by herself to be vivid; and still more so when perfectly awake, and especially if engaged in active thought or sprightly conversation. Similar cases are reported by Sir Astley Cooper and Professor Blumenbach.†

Those parts of the brain which manifest the feelings, constitute by far the largest portion of it, and they are best exercised by discharging the active duties of life and of religion; the parts which manifest the intellect are smaller, and are exercised by the application of the understanding in practical business, and in the arts, sciences, or literature.

The first step, therefore, towards establishing the regular exercise of the brain, is to educate and train the mental faculties in youth; and the second is to place the individual habitually in circumstances demanding the discharge of useful and important duties.

I have often heard the question asked, What is the use of education? The answer might be illustrated by explaining to the inquirer the nature and objects of the limbs, lungs, and eyes, and then asking him, if he could conceive how a being thus constituted could be benefited by obtaining access to earth, air, and light? He would perceive that these elements would be of high utility to him, as affording means by which his organs could obtain scope for action, which action we suppose him to know to be pleasure. To those, then, who know the functions of the brain as the organ of the moral and intellectual powers of man, I need only say, that the objects presented by education to the mind, bear to it the same relation that the physical elements of nature do to the nerves and muscles; they afford the faculties scope for action, and yield them delight. The meaning commonly attached to the word *education* in such cases, is the acquisition of the Greek and Latin languages; but I employ it to signify knowledge of nature and science in all its departments. Again, the signification generally attached to the word *use* in such questions, is, how much *money*, *influence*, or *consideration*, will education bring?—these being the only objects of strong desire with which uncultivated minds are acquainted; and it is not perceived in what way education can greatly promote their attainment. But when the mind is opened to the perception of its own constitution and to the natural laws, the advantage of moral and intellectual cultivation, as a means of exercising and invigorating the brain and mental faculties, and also of directing the conduct in obedience to these laws, becomes apparent.

But there is an additional benefit arising from healthy activity of the brain, which is little known. Certain modifications of the nervous energy elaborated by the brain, appear to take place, according to the mode in which the faculties and organs are affected. For example, when misfortune and disgrace impend over us, the organs of Cautiousness, Self-Esteem, and Love of Approbation are painfully excited, and appear to transmit an impaired, or positively noxious nervous influence to the heart, stomach, intestines, and thence to the rest of the body; digestion is deranged, the pulse becomes feeble and irregular, and the whole corporeal system wastes. When, on the other hand, the cerebral organs are agreeably affected, a benign and vivifying nervous influence pervades the frame, and the functions of the body are performed with increased pleasure and success. The quantum of nervous energy increases with the number of cerebral organs roused into action, and with the degree of the activity itself. In the retreat of the French from Moscow, for example, when no enemy was near, the soldiers became depressed in courage and enfeebled in body, and nearly sank to the earth through exhaustion and cold; but no sooner did the fire of the Russian guns sound in their ears, or the gleam of their bayonets flash in their eyes, than new life seemed to pervade them. They wielded powerfully the arms, which, a few moments before, they could scarcely carry or drag on the ground. Scarcely, however, was the enemy repulsed, when their feebleness returned. The theory of this is, that the approach of the combat called into activity a variety of additional faculties; these sent new energy through every nerve; and, while their vivacity was maintained by the external stimulus, they rendered the soldiers strong beyond their merely physical condition. Many persons have probably experienced the operation of the same principle. If, when

* See Dr A. Combe's Physiology, &c. 7th edition.

† See American Annals of Phrenology, No. I. p. 37. Sir A. Cooper's Lectures on Surgery, by Tyrrel, vol. i. p. 279. Elliotson's Blumenbach, 4th edition, p. 283. Phren. Journ vol. ix. p. 223.

sitting feeble and listless by the fire, we hear of an accident having occurred to some beloved friend who requires our instantaneous aid, or if an unexpected visitor has arrived, in whom our affections are bound up,—in an instant our lassitude is gone, and we move with an alertness and animation that seem surprising to ourselves. The cause is the same; these events rouse Adhesiveness, Benevolence, Love of Approbation, Intellect, and a variety of faculties which were previously dormant, and their influence invigorates the limbs. Dr Sparrman, in his Voyage to the Cape, mentions a striking illustration of the principle. "There was now again," says he, "a great scarcity of meat in the waggon; for which reason my Hottentots began to grumble, and reminded me that we ought not to waste so much of our time in looking after insects and plants, but give a better look out after the game. At the same time, they pointed to a neighbouring dale overrun with wood, at the upper edge of which, at the distance of about a mile and a quarter from the spot where we then were, they had seen several buffaloes. Accordingly, we went thither; but, though our fatigue was lessened by our Hottentots carrying our guns for us up a hill, yet we were quite out of breath, and overcome by the sun, before we got up to it. Yet, what even now appears to me a matter of wonder is, *that as soon as we got a glimpse of the game, all this languor left us in an instant.* In fact, we each of us strove to fire before the other, so that we seemed entirely to have lost sight of all prudence and caution."

It is part of the same law, that the more agreeable the mental stimulus, the more benign is the nervous influence transmitted to the body.

An individual who has received from nature a large and tolerably active brain, but who, from possessing wealth sufficient to remove the necessity for labour, is engaged in no profession, and who has not enjoyed the advantages of a scientific or extensive education, and takes no interest in moral and intellectual pursuits for their own sake, is in general a victim to the natural laws. Persons of this description, ignorant of these laws, will, in all probability, neglect nervous and muscular exercise, and suffer the miseries arising from impeded circulation and impaired digestion. In want of objects on which the energy of their minds may be expended, the due stimulating influence of their brains on their bodies will be withheld, and the effects of muscular inactivity will be aggravated: all the functions will, in consequence, become enfeebled; lassitude, uneasiness, anxiety, and a thousand evils, will arise; and life will become a mere endurance of punishment for infringement of institutions calculated in themselves to promote happiness and afford delight when known and obeyed. This fate frequently overtakes uneducated females, whose early days have been occupied with business or the cares of a family, but whose occupations have ceased before old age has diminished corporeal vigour: It overtakes men also, who, uneducated, retire from active business in the prime of life. In some instances, these evils accumulate to such a degree that the brain at length gives way, and insanity is the consequence.

It is worthy of remark, that the more elevated the objects of our study, the higher in the scale are the mental organs which are exercised; and that the higher the organs, the more pure and intense is the pleasure: hence, a vivacious and regularly supported excitement of the moral sentiments and intellect, is, by the organic law, highly favourable to health and corporeal vigour.

No reasonable person, after having his intellect imbued with a perception of, and belief in, the natural laws, as now explained, can desire continued idleness as a source of pleasure; nor can he regard muscular exertion and mental activity, when not carried to excess, as any thing else than enjoyments, kindly vouchsafed to him by the benevolence of the Creator. The notion that moderate labour and mental exertion are evils, can originate only from ignorance, or from viewing the effects of over-exhaustion as the result of the natural law, and not as the punishment for infringing it.

If, then, we sedulously inquire, in each particular instance, into the *cause* of the sickness, pain, and premature death, or the derangement of the corporeal frame in youth and middle life, which we see so common around us; and endeavour to discover whether it originated in obedience to the physical and organic laws, or sprang from infringement of them, we shall be able to form some estimate as to how far bodily suffering is justly attributable to imperfections of nature, and how far to our own ignorance and neglect of divine institutions.

The foregoing principles being of much practical importance, may, with propriety, be elucidated by a few examples. Two or three centuries ago, various cities in Europe were depopulated by the plague, and, in particular, London was visited by an awful mortality from this cause, in the reign of Charles the Second. Most people of that age attributed the scourge to the inscrutable decrees of Providence, and some to the magnitude of the nation's moral iniquities. According to the views now presented, it must have arisen from infringement of the *organic laws*, and have been intended to enforce stricter obedience to them in future. There was nothing inscrutable in its causes or objects. These, when clearly analyzed, appear to have had no direct reference to the moral condition of the people; I say *direct* reference to the moral condition of the people—because it would be easy to shew that the physical, the organic, and all the other natural laws, are connected indirectly, and act in harmony with the moral law; and that infringement of the latter often leads to disobedience of other laws, and brings a double punishment on the offender. The facts recorded in history exactly correspond with the theory now propounded. The following is a picture of the condition of the cities of Western Europe in the 15th century:—"The floors of the houses being commonly of clay, and strewed with rushes or straw, it is loathsome to think of the filth collected in the hovels of the common people, and sometimes in the lodgings even of the superior ranks, from spilled milk, beer, grease, fragments of bread, flesh, bones, spittle, excrements of cats, dogs, &c. To this Erasmus, in a letter 432, c. 1815, ascribes the plague, the sweating sickness, &c. in London, which, in this respect, resembled Paris and other towns of any magnitude in those times."—*Ranken's History of France*, vol. v. p. 416. The streets of London were excessively narrow, the habits of the people dirty, their food poor, and no adequate provision was made for introducing a plentiful supply of water, or removing the filth unavoidably produced by a dense population. The great fire in that city, which happened soon after the pestilence, afforded an opportunity for remedying in some degree the narrowness of the streets, while habits of increasing cleanliness abated the filth: These changes brought the condition of the people more into accordance with the laws of health, and the plague has not since returned. Again, till very lately, thousands of children died yearly of the small-pox; but, in our day, vaccine inoculation saves ninety-nine out of every hundred, who, under the old system, would have died.

A gentleman who died about twenty years ago at an advanced period of life, told me that, in his youth, the country six miles west from Edinburgh was so unhealthy, that every spring the farmers and their servants were seized with fever and ague, and needed to undergo bleeding, and a course of medicine, to prevent attacks or remove their effects. At that time these visitations were believed to be sent by Providence, and to be inherent in the constitution of things. After, however, said my informant, an improved system of agriculture and drainage was established, and the na-

merous pools of stagnant water formerly left between the ridges of the fields were removed, after dunghills were carried to a distance from the doors, and the houses themselves made more spacious and commodious, every symptom of ague and marsh-fever disappeared from the district, and it became highly salubrious. In other words, as soon as the gross infringement of the organic laws was abated by a more active exertion of the muscular and intellectual powers of man, the punishment ceased. Another friend informed me that, about fifty years ago, he commenced farming in a high and uncultivated district of East Lothian; that at first the crops suffered severely in the spring from cold fogs; but that, since the region has been reclaimed and drained, the climate has greatly improved, and, in particular, the destructive mists have disappeared. The same results have followed in Canada and the United States of America, from similar operations.

In like manner, many calamities occurred in coal-pits, in consequence of introducing lighted candles and lamps into places filled with hydrogen gas, which had emanated from seams of coal, and which exploded, scorched, and suffocated the men and animals within its reach; until Sir Humphrey Davy discovered that the Creator had established such a relation between flame, wire-gauze, and hydrogen gas, that, by surrounding the flame with gauze, its power of exploding hydrogen was suspended. By the simple application of a covering of wire-gauze over and around the flame, it is prevented from igniting gas beyond it; and colliers are now able to carry, with safety, lighted lamps into places highly impregnated with inflammable air. I have been informed, that the accidents from explosion, which still occasionally occur in coal-mines, arise from neglecting to keep the lamps in perfect condition.

It is needless to multiply examples in support of the proposition, that the organized system of man, in itself, admits of a healthy existence from infancy to old age, provided its germ has been healthy, and its subsequent condition uniformly in harmony with the physical and organic laws. But it has been objected, that, although the human faculties may perhaps be adequate to discover these laws, and to record them in books, they are totally incapable of retaining them in the memory, and of formally applying them in every act of life. If, it is said, we could not move a step without calculating the effects of the law of gravitation, and adjusting the body to its influence, and could never eat a meal without squaring our appetite by the organic laws, life would be oppressed by the pedantry of knowledge, and rendered miserable by the observance of trivial details. The answer to this objection is, that our faculties are adapted by the Creator to the external world, and act spontaneously when their objects are properly placed before them. In walking during the day on a foot-path in the country, we adjust our steps to the inequalities of the surface, without being overburdened by mental calculation. Indeed, we perform this adjustment with so little trouble, that we are not aware of having made *any particular* mental or muscular effort. But, on returning by the same path at night, when we cannot see, we stumble; and discover, for the first time, how important a duty our faculties had been performing during day, without our having adverted to their labour. Now, the simple medium of light is sufficient to bring clearly before our eyes the inequalities of the ground; but to make the mind equally familiar with the countless objects which abound in external nature, and their relations, an intellectual light is necessary, which can be struck out only by exercising and applying the knowing and reflecting faculties;—when that light is obtained, and the qualities and relationships in question are clearly perceived, our faculties, so long as the light lasts, will act spontaneously in adapting our conduct to the nature of the objects, just as they do in accommodating our movements to the unequal surface of the earth. After the poisonous qualities of hemlock are known, it is no more necessary for us to go through a course of reasoning on physical, botanical, and chemical objects, in order to be able to abstain from eating it, than it is to go through a course of mathematical investigations before lifting the one foot higher than the other, in ascending a stair. At present, physical and political science, morals, and religion, are not taught as parts of one connected system; nor are the relations between them and the constitution of man pointed out to the world. Consequently, theoretical and practical knowledge are often widely separated. This ought not to be the case; for many advantages would flow from scientific education, some of which may now be mentioned.

In the *first* place, the physical and organic laws, when thoroughly known, appear to the mind as institutions of the Creator; wise and salutary in themselves, unbending in their operation, and universal in their application. They interest our intellectual faculties, and strongly impress our sentiments. The duty of obeying them comes home to us with the authority of a mandate from God. While we confine ourselves to mere recommendations to beware of damp, to observe temperance or to take exercise, without explaining the *principle*, the injunction carries only the weight due to *the authority of the individual* who gives it, and is addressed to only two or three faculties,—Veneration and Cautiousness, for instance, or Self-love, in him who receives it. But if we be instructed in the elements of the physical world, and in those of our organized system,—in the uses of the different parts of the human body, and the conditions necessary to their healthy action,—in the causes of their derangement, and the pains consequent thereon; and if the obligation to attend to these conditions be enforced on our moral sentiments and intellect, as a duty imposed on us by the Creator, which we cannot neglect without suffering punishment; then the motives to observe the physical and organic laws, as well as *the power of doing so*, will be greatly increased. Before we can dance well, not only must we *know the motions*, but our muscles must be trained *to execute them*; and, in like manner, to enable us to act on precepts, not only must we comprehend their meaning, but our intellects and sentiments must be disciplined into the habit of actual performance. The act of acquiring and practically using scientific information concerning the natural world, its qualities, and their relations, is to the intellect and sentiments what dancing is to the muscles: it *invigorates them*; and, as obedience to the natural laws must spring from them, exercise renders it easy and delightful.

Secondly, Dr Johnson defines "principle" to be "fundamental truth; original postulate; first position from which others are deduced;" and in these senses of the word I remark, that it is only by comprehending the *principle* on which consequences depend, that we become thoroughly impressed with the *invariableness* of the physical and organic laws, acquire confidence in, and respect for, them, and fairly endeavour to accommodate our conduct to their operation. The human faculties are spontaneously active, and desire gratification; but Intellect must have fixed data on which to reason, otherwise it is itself a mere impulse. The man in whom Constructiveness and Weight are powerful will naturally betake himself to constructing machinery; but, if he be ignorant of the principles of mechanical science, he will not direct his efforts to such important ends, nor attain them with so much success, as if his intellect had been stored with this kind of knowledge. Scientific principles are deduced from the *laws* of nature. A man may compose music by the impulses of Tune and Time; but as there are immutable laws of harmony, he will not compose so correctly and in such good taste if he be ignorant of them, as he would do if he knew them. In every art and science, there are

principles referable solely to the constitution of nature, which admit of countless applications. A musician may produce gay, grave, solemn, or ludicrous tunes, all good of their kind, by following the laws of harmony; but he will never produce one good piece by violating them. While the inhabitants west of Edinburgh allowed the stagnant pools to deface their fields, some seasons would be more healthy than others; and, while the cause of the disease was unsuspected, this would confirm them in the notion that health and sickness were dispensed by an overruling Providence, on inscrutable principles, which they could not comprehend: but the moment the cause was known, it would be found that the most healthy seasons were those which were cold and dry, and the most sickly those which were warm and moist;—they would then discover, that the salubrity of one year, and unwholesomeness of another, were clearly referable to *one principle;* and after perceiving this truth, they would both be more strongly prompted to apply the remedy, and be rendered morally and intellectually more capable of doing so. If some intelligent friend had merely told them to drain their fields, and remove their dunghills, they would probably not have complied with his recommendation; but whenever their intellects were led to the perception that the evil would continue until they acted in this manner, the improvement would become easy.

The truth of these views may be still farther illustrated by examples. A young gentleman of Glasgow, whom I knew, went out, as a merchant, to North America. Business required him to sail from New York to St Domingo. The weather was hot, and he, being very sick, found the confinement below deck, in bed, as he said, intolerable; that is, this confinement was, for the moment, more painful than the course which he adopted, of laying himself down at full length on the deck, in the open air. He was warned by his fellow-passengers, and the officers of the ship, that he would inevitably induce fever by his proceeding; but he was utterly ignorant of the physical and organic laws: his intellect had been trained to regard only wealth and present pleasure as objects of real importance; it could perceive no necessary connexion between exposure to the mild grateful sea-breeze of a warm climate, and fever; and he obstinately refused to quit his position. The consequence was, that he was soon taken ill, and died the day after arriving at St Domingo. Knowledge of chemistry and physiology would have enabled him, in an instant, to understand that the sea air, in warm climates, holds a prodigious quantity of water in solution, and that damp and heat, operating together on the human organs, tend to derange their healthy action, and ultimately to destroy them entirely: and if his sentiments had been deeply imbued with a feeling of the indispensable duty of yielding obedience to the institutions of the Creator, he would have actually enjoyed not only a *greater desire*, but a *greater power*, of supporting the temporary inconvenience of the heated cabin, and might, by possibility, have escaped death.

The late Dr Robert Macnish, well known to the literary world, favoured me with the following particulars, suggested by a perusal of the second edition of the present work:—"On four several occasions I have nearly lost my life from infringing the organic laws. When a lad of fifteen, I brought on, by excessive study, a brain fever which nearly killed me; at the age of nineteen I had an attack of peritonitis (inflammation of the lining membrane of the abdomen), occasioned by violent efforts in wrestling and leaping; while in France nine years ago, I was laid up with pneumonia (inflammation of the lungs), brought on by dissecting in the great galleries of La Pitié, with my coat and hat off in the month of December, the windows next to me being constantly open; and in 1829 I had a dreadful fever, occasioned by walking home from a party at which I had been dancing, in an exceedingly cold morning, without a cloak or greatcoat. I was for four months on my back, and did not recover perfectly for more than eighteen months. All these evils were entirely of my own creating, and arose from a foolish violation of laws which every sensible man ought to observe and regulate himself by. Indeed, I have always thought—and your book confirms me more fully in the sentiment—that, by proper attention, crime and disease, and misery of every sort, could, in a much greater measure than is generally believed, be banished from the earth, and that the true method of doing so is to instruct people in the laws which govern their own frame."

Captain Murray, R. N., mentioned to Dr A. Combe, that, in his opinion, most of the bad effects of the climate of the West Indies might be avoided by care and attention to clothing; and that so satisfied was he on this point, that he had petitioned to be sent there in preference to the North American station, and had no reason to regret the change. The measures which he adopted, and their effects, are detailed in the following interesting and instructive letter:—

"My Dear Sir, Assynt, *April* 22. 1827.

"I should have written to you before this, had I not been anxious to refer to some memorandums, which I could not do before my return home from Coul. I attribute the great good health enjoyed by the crew of his Majesty's ship Valorous, when on the West India station, during the period I had the honour of commanding her, to the following causes: 1*st*, To the keeping the ship perfectly *dry* and *clean;* 2*d*, To habituating the men to the wearing of flannel *next* the *skin;* 3*d*, To the precaution I adopted, of giving each man a proportion of his allowance of cocoa *before* he left the ship in the *morning*, either for the purpose of watering, or any other duty he might be sent upon; and, 4*th*, To the cheerfulness of the crew.

"The Valorous sailed from Plymouth on the 24th December 1823, having just returned from the coast of Labrador and Newfoundland, where she had been stationed two years, the crew, including officers, amounting to 150 men. I had ordered the purser to draw two pairs of flannel drawers and two shirts extra for each man, as soon as I knew that our destination was the West Indies; and, on our sailing, I issued two of each to every man and boy in the ship, making the officers of each division responsible for the men of their respective divisions wearing these flannels during the day and night; and, at the regular morning nine o'clock musters, I inspected the crew personally; for you can hardly conceive the difficulty I have had in *forcing* some of the men to use flannel at first; although I never yet knew one who did not, from choice, adhere to it, when once fairly adopted. The only precaution after this was to *see* that, in bad weather, the watch, when relieved, did not turn in in their wet clothes, which the young hands were apt to do, if not looked after; and their flannels were shifted every Sunday.

"Whenever fresh beef and vegetables could be procured at the contract price, they were always issued in preference to salt provisions. Lime juice was issued whenever the men had been fourteen days on ship's provisions; and the crew took all their meals on the main deck, except in very bad weather.

"The quarter and main decks were scrubbed with sand and water, and wet holy-stones, every morning at day-light. The lower deck, cock-pit, and store-rooms were scrubbed every day after breakfast, with dry holy-stones and hot sand, until quite *white*, the sand being carefully swept up, and thrown overboard. The pump-well was also swabbed out dry, and then scrubbed with holy-stones and hot sand; and here, as well as in every part of the ship which was liable to damp, Brodie-stoves were constantly used, until every appearance of humidity vanished. The lower-deck and cock-pit were wash-

en once every week in dry weather; but Brodie-stoves were constantly kept burning in them, until they were quite dry again.

"The hammocks were piped up and in the nettings, from 7 A. M. until dusk, when the men of each watch took down their hammocks alternately; by which means, only one-half of the hammocks being down at a time, the 'tween decks were not so crowded, and the watch relieved were sure of turning into a dry bed on going below. The bedding was aired every week once at least. The men were not permitted to go on shore in the heat of the sun, or where there was a probability of their getting *spirituous liquors*; but all hands were indulged with a run on shore, when out of reach of such temptation.

"I was employed on the coast of Caraccas, the West India Islands, and Gulf of Mexico; and, in course of service, I visited Trinidad, Margarita, Cocha, Cumana, Nueva Barcelona, Laguira, Porto Cabello, and Maracaibo, on the coast of Caraccas; all the West India Islands from Tobago to Cuba, both inclusive; as also Caraçoa and Aruba, and several of these places repeatedly; also Vera Cruz and Tompico, in the Gulf of Mexico, which you will admit must have given a trial to the constitutions of my men, after two years among the icebergs of Labrador, without an intervening summer between that icy coast and the coast of Caraccas: yet I arrived in England on June 24th, without having buried a single man or officer belonging to the ship, or indeed having a single man on the sick list; from which I am satisfied that a *dry* ship will always be a healthy one in any climate. When in command of the Recruit, of 18 guns, in the year 1809, I was sent to Vera Cruz, where I found the — 46, the — 42, the — 18, and — gun-brig; we were joined by the — 36, and the — 18. During the period we remained at anchor (from 8 to 10 weeks), the three frigates lost from 30 to 50 men each, the brigs 16 to 18, the — most of her crew, with two different commanders; yet the Recruit, although moored in the middle of the squadron, and constant intercourse held with the other ships, did not lose a man, and had none sick. Now, as some of these ships had been as long in the West Indies as the Recruit, we cannot attribute her singularly healthy state to *seasoning*, nor can I to superior cleanliness, because even the breeches of the carronades, and all the pins, were polished bright in both — and —, which was not the case with the Recruit. Perhaps her healthy state may be attributed to cheerfulness in the men; to my never allowing them to go on shore in the morning on an empty stomach; to the use of dry sand and holy-stone for the ship; to never working them in the sun; perhaps to accident. Were I asked my opinion, I would say that I firmly believe that cheerfulness contributes more to keep a ship's company healthy, than any precaution that can be adopted; and that, with this attainment, combined with the precautions I have mentioned, I should sail for the West Indies with as little anxiety as I would for any other station. My Valorous fellows were as cheerful a set as I ever saw collected together."

Suppose that two gentlemen were to ascend one of the Scottish mountains, in a hot summer day, and to arrive at the top, bathed in perspiration, and exhausted with fatigue; that one of them knew intimately the physical and organic laws, and that, all hot and wearied as he was, he should button up his coat closer about his body, wrap a handkerchief about his neck, and continue walking, at a quick pace, round the summit, in the full blaze of the sun; but that the other, ignorant of these laws, should eagerly run to the base of a projecting cliff, stretch himself at full length on the turf under its refreshing shade, open his vest to the grateful breeze, and give himself up entirely to the present luxuries of coolness and repose: the former, by warding off the rapid chill of the cold mountain air, would descend with health unimpaired; while the latter would most probably carry with him the seeds of rheumatism, consumption, or fever, from permitting perspiration to be instantaneously checked, and the surface of the body to be cooled with an injurious rapidity. The death of the young Duke de Leuchtenberg, husband of Donna Maria, Queen of Portugal, affords a striking example of the operation of these principles. On Monday, the 23d of March 1835, being in perfect health, he went out to shoot. On returning to the palace, he imprudently threw off his coat and waistcoat, while in a state of profuse perspiration. This brought on a cold; slight at first, but which soon began to assume a serious character. On Friday the 27th, inflammation appeared; and, on Saturday the 28th, at twenty minutes past two P. M., he expired.

The following case, also illustrative of the points under consideration, is one which I have had too good an opportunity of observing in all its stages.

An individual in whom it was my duty as well as pleasure to be greatly interested, resolved on carrying Mr Owen's views into practical effect, and set on foot an establishment on his principles, at Orbiston, in Lanarkshire. The labour and anxiety which he underwent at the commencement of the undertaking, gradually impaired an excellent constitution; and, without perceiving the change, he, by way of setting an example of industry, took to digging with the spade, and actually wrought for fourteen days at this occupation, although previously unaccustomed to labour. This produced hæmoptysis or spitting of blood. Being now unable for such severe exertion, he gave up his whole time to directing and instructing the people,—about 250 in number,—and for two or three weeks *spoke the whole day*, the effusion of blood from his lungs continuing. Nature sank rapidly under this irrational treatment, and at last he came to Edinburgh for medical advice. When the structure and uses of his lungs were explained to him, and when it was pointed out that his treatment of them had been equally injudicious as if he had thrown lime or dust into his eyes after inflammation, he was struck with the extent and consequences of his ignorance, and exclaimed, "How greatly should I have been benefited, if one month of the five years which I was forced to spend in a vain attempt to acquire a mastery over the Latin tongue, had been dedicated to conveying to me information concerning the structure of my body, and the causes which preserve and impair its functions!" He had departed too widely from the organic laws to admit of an easy return: he was seized with inflammation of the lungs, and with great difficulty survived that attack; but it impaired his constitution so grievously, that he died after a lingering illness of eleven months. He acknowledged, however, even in his severest pain, that he suffered under a just law. The lungs, he perceived, were of prime importance to life, and a motive to their proper treatment was provided in this tremendous punishment, inflicted for neglecting the conditions requisite to their health. Had he given them rest, and returned to obedience to the organic law, at the first intimation of departure from it, the way to health was open and ready to receive him; but in utter ignorance, he persevered for weeks in direct opposition to that law, till the fearful result ensued.

This last case affords a striking illustration of a principle already noticed, namely, *the independence of the different natural laws*, and of the necessity of obeying *all* of them, as the only condition of safety and enjoyment. The individual here alluded to, was deeply engaged in a most benevolent and disinterested experiment for promoting the welfare of his fellow-creatures; and superficial observers would say that this was just an example of the inscrutable decrees of Providence, which visited him with sickness, and ultimately with death, in the very midst of his most virtuous exertions. But the institutions of the Creator are wiser than the imaginations of such men. The first condition on which exist-

ence on earth and all its advantages depend, is obedience to the physical and organic laws. The benevolent Owenite, in his zeal to obey the moral law, neglected these, and suffered the punishment of his omission; if it were possible to dispense with one law by obeying another, the whole field of man's existence would speedily be involved in inextricable disorder.

The following case was communicated to me by an actual observer. A gentleman far advanced in years fell into a state of bodily weakness, which rendered necessary the constant presence of an attendant. A daughter, in whom the organs of Adhesiveness, Benevolence, and Veneration were largely developed, devoted herself to this service with ceaseless assiduity. She was his companion for month after month, and year after year—happy in cheering the last days of her respected parent, and knowing no pleasure equal to that of solacing and comforting him. For months in succession she never went abroad from the house; her duty became dearer to her the longer she discharged it, till at length her father became the sole object on earth of her feelings and her thoughts. The superficial observer would say that this conduct was admirable, and that she would receive from Heaven a rich reward for such becoming and virtuous devotion. But Providence rules on other principles. Her enjoyment of mental happiness and vigour depended on the condition of her brain, and her brain was subject to the organic laws. These laws demand, as an indispensable condition of health, exercise in the open air, and variety of employment, suited to maintain all the faculties in activity. She neglected the first in her constant attendance in her father's chamber; and she overlooked the second in establishing him as the exclusive object of her regard. The result was, that she fell into bad health, accompanied by weakness of the brain, extreme irritability and susceptibility of mind, excessive anxiety and hysteria, bordering on symptoms even of insanity. At last, some judicious friends interfered, and by forcing her (for it was much against her inclination) to leave for a time the object of her solicitude, they rescued her from death, or confirmed mental derangement. If this case had been allowed to proceed uninterruptedly to its natural termination, many pious persons would have marvelled at the mysterious dispensations of Providence in afflicting so dutiful a daughter; whereas, when the principle of the divine government is understood, the result appears neither wonderful nor perplexing.

In the works of religious authors may be found many erroneous views of divine dispensations, traceable to ignorance of the natural laws. The Reverend Ebenezer Erskine, speaking of the state of his wife's mind, says, "For a month or two the arrows of the Almighty were within her, the poison whereof did drink up her spirits; and the terrors of God did set themselves in array against her." He called in the assistance of some neighbouring clergymen to join in prayers on her behalf, and she was induced to pray with them; but "she still continued to charge herself with the unpardonable sin, and to conclude that she was a cast-away." Such feelings occurring in a woman of blameless life, clearly indicated diseased action in the organs of Cautiousness. "Before she fell into these depths," he continues, "she told me that the Lord gave her such a discovery of the glory of Christ as darkened the whole creation, and made all things appear as dung and dross in comparison of him." These expressions indicate morbid excitement of the organs of Wonder and Veneration. She subsequently recovered her mental serenity; and her husband treats of the whole phenomena as purely mental and religious. He, however, afterwards incidentally mentions that she was subject to bad health, and that "melancholy was a great ingredient in her disease." We now know that melancholy is a diseased affection of the organs of Cautiousness.

At the time when Mr Erskine lived and wrote, the physiology of the brain was unknown: the occurrences which he describes had a real existence; and he had been taught to attribute them to the agency of the Divine Spirit, or the devil, according to their different characters. He is, therefore, not deserving of censure for the errors into which he unavoidably fell; but now when the facts which he describes, and analogous occurrences in our own day, can be traced to diseased action of the organs of the mind, we are authorized to view the providence of God in a different light. While it would be subversive of all religion to throw any doubt whatever on the reality and importance of religious feelings, sound in their character and directed to proper objects, it is nearly equally injurious to the sacred cause, to mistake the excitement and depression of disease for the influence of the Holy Spirit, or the agency of the enemy of mankind.

It is farther mentioned in the Life of Mr Erskine, that his wife bore several children to him while in precarious health, and that the situation "of the manse, or parsonage-house, was *unwholesome*." We are told, also, that in the year 1713, three of his children died; that one died in 1720; and that, in 1723, a fifth was on the brink of death, but recovered.* He treats of all these events as "severe trials," and "sore afflictions," without having the least glimpse of their true causes, or their relation to the natural laws.

Another illustration may be added. Hannah More, in a letter to the Rev. John Newton, dated Cowslip Green, 23d July 1788, says, "When I am in the great world, I consider myself as in an enemy's country, and as beset with snares, and this puts me upon my guard." "Fears and snares seem necessary to excite my circumspection; for it is certain that my mind has more languor, and my faith less energy here, where I have no temptations from without, and where I live in the full and constant perusal of the most beautiful objects of inanimate nature, the lovely wonders of the munificence and bounty of God. Yet, in the midst of his blessings, I should be still more tempted to forget him, were it not for frequent nervous headachs and low fevers, which I find to be wonderfully wholesome for my moral health."†

This passage contains several propositions that merit attention. First, in all well constituted and rightly instructed minds, "the most beautiful objects of inanimate nature," and "the lovely wonders of the munificence and bounty of God," are calculated, according to the natural laws, to invigorate the moral, religious, and intellectual faculties; yet Hannah More's mind "had more languor, and her faith less energy," amidst such objects, than "when beset with snares:" Secondly, according both to the natural laws and scripture, "evil communications corrupt good manners;" but "when in the great world," and "in an enemy's country," her faith was improved: And, thirdly, "nervous headachs and low fevers" are the consequences of departures from the organic laws, and are intended to reclaim the sufferer to obedience that the pain may cease; yet she "found them wonderfully wholesome for her moral health," and they prevented her from "forgetting God!"

Only disease, or errors in education, could have induced a woman so talented, so pious, and so excellent, as Hannah More, to present to the world such a series of absurd propositions. Can we wonder that the profane should sneer, and that practical religion should advance slowly, when piety exhibits itself in such lamentable contradiction to the divine institutions? And still more so, when, from proceeding on a false theory, it contradicts itself? Hannah More, in her Journal in 1794, says, "Confined this week with four days' headach—an unprofitable time—thoughts wandering—little communion with God. *I see by every fresh trial, that the time*

* Life and Diary of the Rev. Ebenezer Erskine. Edinburgh, 1831, pp. 266, 301, 286, 290, 320.

† Memoirs of H. More, vol. ii. p. 110, 111.

of sickness is seldom the season for religious improvement. This great work should be done in health, or it will seldom be done well." Vol. ii. p. 418. This passage is full of sound sense; but it contradicts her previous assertion, that "nervous headachs and low fevers are wonderfully wholesome for moral health."

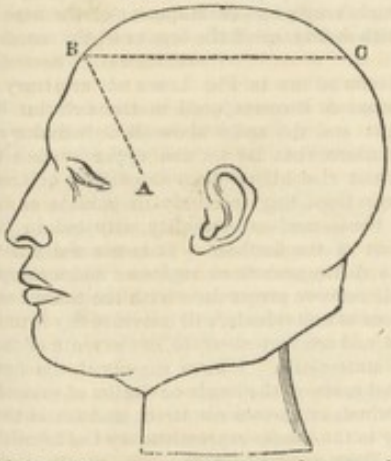
These examples, to which many more might be added, may serve as illustrations of the proposition, That without a philosophy of human nature, even religious authors, when treating of sublunary events, cannot always preserve consistency either with reason or with themselves; and that hence religion can never become thoroughly practical, or put forth its full energies for human improvement, until it be wedded to philosophy. In proportion as men shall become acquainted with the natural laws, and apply them as tests to theological writings relative to this world, they will become convinced of the truth of this observation.

Having traced bodily suffering, in the case of individuals, to neglect of, or opposition to, the organic laws, by their progenitors or by themselves, I next advert to another order of calamities, which may be called SOCIAL MISERIES, and which obviously spring from the same causes. And first, in regard to evils of a *domestic* nature:—

One fertile source of unhappiness arises from persons uniting in marriage, whose tempers, talents, and dispositions do not harmonize. If it be true that natural talents and dispositions are connected by the Creator with particular configurations of the brain, then it is obviously one of His institutions, that, in forming a compact for life, these configurations should be attended to. The following facts I regard to be fully established by competent evidence. The portion of the brain before the line AB, Fig. 1, manifests the intellect, that above BC manifests the moral sentiments, and all the rest the animal sentiments and propensities; and each part acts, *cæteris paribus*, with a degree of energy corresponding to its size. The following figures exhibit these regions of the head existing in different proportions in different individuals; and the lives of the persons represented bear testimony to their possessing the corresponding dispositions.

The first is a view of the head of William Hare, the associate of Burke, who, acting in concert with him, strangled sixteen individuals in Edinburgh for the purpose of selling their bodies for dissection.

FIG. 1.—HARE.

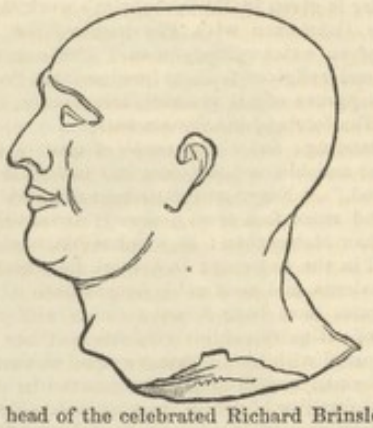


In this head the organs of the animal propensities decidedly preponderate over those of the moral sentiments and intellect.

Another example of the same kind is afforded by the head of Williams, who was executed along with the notorious Bishop, in London, for the same crime as that of Hare.*

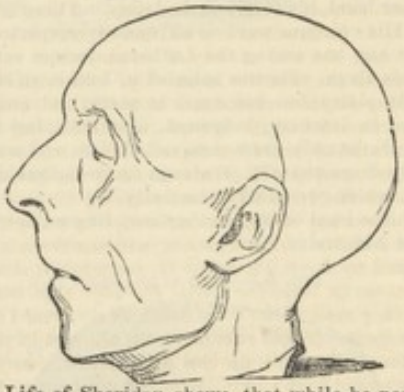
* See Phrenological Journal, vol. vii. p. 446.

FIG. 2.—WILLIAMS.



In the head of the celebrated Richard Brinsley Sheridan (of which a cast was taken after death) we find an example of the three regions of the brain in question, existing nearly in a state of equilibrium. The natural tendencies of such an individual are equally strong towards vice and virtue; and his actual conduct is generally determined by the influence of external circumstances.

FIG. 3.—SHERIDAN.



The Life of Sheridan shews, that while he possessed some high intellectual qualities, he was also the slave of degrading and discreditable vices.

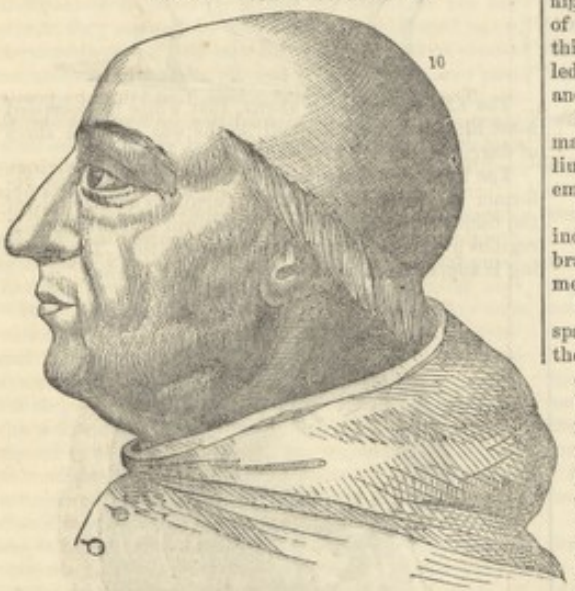
The head of Philip Melancthon, the illustrious reformer and associate of Luther, furnishes an example of the decided predominance of the moral and intellectual regions over that of the animal propensities. The drawing is copied from a portrait by Albert Durer.

FIG. 4.—MELANCTHON.

The following description of Melancthon's head and character is given in Dr Spurzheim's work on Phrenology in Connexion with Physiognomy. "It is the brain of an extraordinary man. The organs of the moral and religious feelings predominate greatly, and will disapprove of all violence, irreverence, and injustice. The forehead betokens a vast and comprehensive understanding; and the *ensemble* a mind the noblest, the most amiable, and the most intellectual that can be conceived." "Never was any man more civil and obliging, and more free from jealousy, dissimulation, and envy, than Melancthon: he was humble, modest, disinterested in the extreme; in a word, he possessed wonderful talents, and most noble dispositions. His greatest enemies have been forced to acknowledge that the annals of antiquity exhibit very few worthies who may be compared with him, whether extent of knowledge in things human and divine, or quickness of comprehension and fertility of genius, be regarded. The cause of true Christianity derived more signal advantages, and more effectual support, from Melancthon, than it received from any of the other doctors of the age. His mildness and charity, perhaps, carried him too far at times, and led him occasionally to make concessions that might be styled imprudent. He was the sincere worshipper of truth, but he was diffident of himself, and sometimes timorous without any sufficient reason. On the other hand, his fortitude in defending the right was great. His opinions were so universally respected, that scarcely any one among the Lutheran doctors ventured to oppose them. He was inferior to Luther in courage and intrepidity, but his equal in piety, and much his superior in learning, judgment, meekness, and humanity. He latterly grew tired of his life, and was particularly disgusted with the rage for religious controversies, which prevailed universally."*

With the head of Melancthon may be contrasted that of Pope Alexander VI.

FIG. 5.—POPE ALEXANDER VI.



"This cerebral organization," says Dr Spurzheim, "is despicable in the eyes of a phrenologist. The animal organs compose by far its greatest portion. Such a brain is no more adequate to the manifestation of Christian virtues, than the brain of an idiot from birth to the exhibition of the intellect of a Leibnitz or a Bacon. The cervical and whole basilar region of the head are particularly developed; the organs of the perceptive faculties are pretty large; but the sinciptal (or coronal) region is exceedingly low, particularly at the organs of Benevolence, Veneration, and Conscientiousness. Such a head is unfit for any employment of a superior kind, and never gives birth to sentiments of humanity. The sphere of its activity does not extend beyond those enjoyments which minister to the animal portion of human nature.

"Alexander VI. was, in truth, a scandal to the papal chair: from the earliest age he was disorderly and artful, and his life to the last was infamous. He is said to have bought the tiara by bribing a certain number of cardinals, or rather by making large promises, which he never fulfilled. It is well known that, when he became pope, he had a family of five children, four boys and one daughter. He made a regular practice of selling bishoprics and other ecclesiastical benefices, to enrich himself and his family. Though profane and various religious writers do not all agree in their judgment concerning the disorderly conduct of this man, many atrocities committed by him are well-ascertained facts. History will always accuse him of the crimes of poisoning, simony, and false-swearing, of reckless debauchery, nay, of incest with his own daughter. In political matters, he formed alliances with all the princes of his time, but his ambition and perfidy never failed to find him a pretext for breaking his word, and disturbing the peace." "As a singular example of Alexander's arrogance, his bull may be mentioned, by which he took upon him to divide the new world between the kings of Spain and Portugal, granting to the former all the territory on the west of an imaginary line passing from north to south, at one hundred leagues distance from the Cape de Verd Islands. Alexander possessed eloquence and address; but a total lack of noble sentiments rendered him altogether unfit for his sacred station. Poisoned wine, which had been prepared for certain cardinals whose riches tempted the cupidity of his holiness, was given him by mistake, and ended his profligate career. Some writers have questioned the truth of this account of Alexander's death, but there is nothing in the relation inconsistent with the acknowledged character of this pontiff. Lowness of feelings and lowness of brain are seen together."*

As an additional illustration of this concluding remark, I subjoin a representation of the head of Vitellius, one of the most cruel and depraved of the Roman emperors.—(*See next page.*)

This head is very broad in proportion to its height; indicating a very great development of the base of the brain, with deficiency of the organs of the moral sentiments.

The demarcations in Fig. 1. are not arbitrary. The space before A B corresponds to the anterior lobe of the brain; and the space above B C includes all the convolutions that lie on the upper surface of the brain, and rise higher than the organs of Cautiousness, corresponding to nearly the middle of the parietal bones, and of Causality, situated in the upper part of the forehead. It is generally not difficult to distinguish these regions; and a comparison of their relative proportions with the talents and dispositions of individuals, will convince any intelligent, honest, and accurate observer, of the truth of the foregoing statements. I have examined the heads or skulls, and casts of the heads or skulls, of several hundred criminals of various countries, and found them all to belong to the classes represented by the figures of the heads of Hare or of Sheridan; and I never saw one of them with a brain like that of Melancthon. Neither have I ever seen a man distinguished by moral and intellectual qualities like those of Melancthon, presenting a brain like that of Hare. The figures represent nature—not a casual appearance, but forms which

* Phrenology in Connexion with the Study of Physiognomy, p. 163.

* Op. cit. p. 71.

are found constantly in combination with the qualities here named; and I ask why Nature, when she speaks to a geologist or chemist, should be listened to with profound attention, and her revelations treasured for human improvement,—but scouted and despised when she speaks to and is interpreted by phrenologists? It is God who speaks from nature in all its departments: and the brain is as assuredly his workmanship as the Milky Way, with all its myriads of suns. If the doctrine before expounded be true, that every faculty is good in itself, that the folly and crime which disgrace human society spring from abuses of the faculties, and that two great causes of the tendency to abuse them are the disproportion of certain parts of the brain to each other, and ignorance of the proper mode of manifesting them, how strikingly do these considerations go to the root of theology and morals! At present, the effect of organization in determining the natural dispositions is altogether neglected or denied by many divines, moralists, and philosophers; yet it is of an importance exceeding all other terrestrial influences.

If, under the excitement of youthful passion, an individual endowed with the splendid cerebral development of Melancthon, should unite himself for life to a female possessing a head like that of Hare, Williams, or Vitellius, the effects could not fail to be most disastrous, with respect both to his own happiness and to the qualities of his offspring. In the first place, after the animal feelings were gratified, and their ardour had subsided, the two minds could not by any possibility sympathize. Many marriages are unhappy in consequence of an instinctive discord between the modes of feeling and thinking of the husband and wife, the cause of which they themselves cannot explain. The mental differences will be found to arise from different configurations and qualities of brain. Thus, if the husband be deficient in the organ of Conscientiousness, and the wife possess it in a high degree, she will be secretly disgusted with the dishonesty and inherent falsehood of his character, which she will have many opportunities of observing, even when they are unknown to the world; while, on the other hand, few conditions are more lamentable than that of a moral, intellectual, and well educated man, irretrievably doomed to the society of an ignorant, jealous, narrow-minded wife. The following picture, in Crabbe's *Tales of the Hall*, is evidently drawn from nature:—

Five years had passed, and what was Henry then?
The most repining of repenting men;
With a fond, teasing, anxious wife, afraid
Of all attention to another paid:
Yet powerless she her husband to amuse,
Lives but t' entreat, implore, resent, accuse:
Jealous and tender, conscious of defects,
She merits little, and yet much expects;
She looks for love that now she cannot see,
And sighs for joy that never more can be.
On his retirements her complaints intrude,
And fond reproof endears his solitude:
While he her weakness (once her kindness) sees,
And his affections in her languor freeze.
Regret, unchecked by hope, devours his mind;
He feels unhappy, and he grows unkind.
"Fool! to be taken by a rosy cheek,
And eyes that cease to sparkle or to speak;
Fool! for this child my freedom to resign,
When one the glory of her sex was mine;
While from this burthen to my soul I hide,
To think what Fate has dealt, and what denied,
What fiend possessed me when I tamely gave
My forced assent to be an idiot's slave?
Her beauty vanished, what for me remains?
Th' eternal clicking of the galling chains."

FIG. 6.—VITELLIUS.

"What," says Dr Johnson, "can be expected but disappointment and repentance from a choice made in the immaturity of youth, in the ardour of desire, without judgment, without foresight, without inquiry after conformity of opinions, similarity of manners, rectitude of judgment, or purity of sentiment? Such is the common process of marriage. A youth and maiden meeting by chance, or brought together by artifice, exchange glances, reciprocate civilities, go home, and dream of one another. Having little to divert attention, or diversify thought, they find themselves uneasy when they are apart, and therefore conclude that they shall be happy together. They marry, and discover what nothing but voluntary blindness before had concealed; they wear out life in altercations, and charge nature with cruelty."—(*Rasselas*, ch. 29.)

Until Phrenology was discovered, no natural index to mental qualities, that could be safely relied on, was possessed, and each individual, in directing his conduct, was left to the guidance of his own sagacity. But the natural law never bended to accommodate itself to that state of ignorance. Men suffered from unsuitable alliances; and they will continue to suffer, until they avail themselves of the means of judging afforded by Phrenology, and give effect to its dictates. In the play of the Gamester, Mrs Beverly is represented as a most excellent wife, acting habitually under the guidance of the moral sentiments and intellect, but married to a being who, while he adores her, reduces her to beggary and misery. His sister exclaims:—Why did just Heaven unite such an angel to so heartless a creature! The parallel of this case occurs too often in real life; only it is not "just Heaven" that makes such matches,—but ignorant and thoughtless human beings, who imagine themselves absolved from all obligation to study and obey the laws of Heaven, as announced in the general arrangements of the world.

The justice and benevolence of rendering the individuals themselves, who disregard natural qualities in marriage, unhappy, will become more striking when, in the next place, we consider *the effects of ill-assorted unions on the children*.

Physiologists, in general, are agreed, that a vigorous and healthy constitution of body in the parents, communicates existence in the most perfect state to the offspring, and *vice versa*. The transmission of various dis-

cases from parents to children is a matter of universal notoriety: thus consumption, gout, scrofula, hydrocephalus, rheumatism, and insanity, are known to descend from generation to generation. Strictly speaking, it is not *disease* which is transmitted, but organs of such imperfect structure that they are liable to be thrown into a morbid condition by causes which sound organs easily resist. Blindness is often, though not uniformly, a hereditary defect. There is a family in North America, some individuals of which have been affected with blindness for the last hundred years.* A medical friend writes:—"I have known more than one instance of blindness descending in families; and have also known instances where the parents were blind without the children labouring under this infliction.

Form, size, and quality of the brain, like those of other parts of the body, are transmissible from parents to children; and hence dispositions and talents are transmissible also, as has been long remarked, not only by medical authors, but by attentive observers in general:—

> Fortes creantur fortibus et bonis;
> Est in juvencis, est in equis patrum
> Virtus: nec imbellem feroces
> Progenerant aquilæ columbam.
>
> Hor. l. iv. od. 4.

The following remarks, by Professor John Gregory, are extracted from his comparative View of the State and Faculties of Man with those of the Animal World. "By a proper attention we can preserve and improve the breed of horses, dogs, cattle, and indeed all other animals. Yet it is amazing this observation was never transferred to the human species, where it would be equally applicable. It is certain that, notwithstanding our promiscuous marriages, many families are distinguished by peculiar circumstances in their character. This family character, like a family face, will often be lost in one generation, and appear again in the succeeding. Without doubt, education, habit, and emulation, may contribute greatly in many cases to keep it up; but it will be generally found, that, independent of these, Nature has stamped an original impression on certain minds, which education may greatly alter or efface, but seldom so entirely as to prevent its traces being seen by an accurate observer. How a certain character or constitution of mind can be transmitted from a parent to a child, is a question of more difficulty than importance. It is indeed equally difficult to account for the external resemblance of features, or for bodily diseases being transmitted from a parent to a child. But we never dream of a difficulty in explaining any appearance of nature which is exhibited to us every day. A proper attention to this subject would enable us to improve not only the constitutions but the characters of our posterity. Yet we every day see very sensible people, who are anxiously attentive to preserve or improve the breed of their horses, tainting the blood of their children, and entailing on them not only the most loathsome diseases of the body, but madness, folly, and the most unworthy dispositions, and this too when they cannot plead being stimulated by necessity, or impelled by passion."†

Dr James Gregory also, in treating of the temperaments in his *Conspectus Medicinæ Theoreticæ*, says, "Hujusmodi varietates non corporis modò, verùm et animi quoque, plerumque congenitæ, nonnunquam hæreditariæ, observantur. Hoc modo parentes sæpe in prole reviviscunt; certè parentibus liberi similes sunt, non vultum modò et corporis formam, sed animi indolem, et virtutes, et vitia. Imperiosa gens Claudia diu Romæ floruit, impigra, ferox, superba; eadem illachrymabilem Tiberium, tristissimum tyrannum, produxit; tandem in immanem Caligulam, et Claudium, et Agrippinam, ipsumque demum Neronem, post sexcentos annos, desitura."*—Cap. i. sect. 16.

A celebrated French writer, who has written much sound as well as false philosophy, observes, that "physical organization, of which moral is the offspring, transmits the same character from father to son through a succession of ages. The Apii were always haughty and inflexible, the Catos always severe. The whole line of the Guises were bold, rash, factious; compounded of the most insolent pride and the most seductive politeness. From Francis de Guise to him who alone and in silence went and put himself at the head of the people of Naples, they were all, in figure, in courage, and in turn of mind, above ordinary men. I have seen whole-length portraits of Francis de Guise, of the Balafré, and of his son: they are all six feet high, with the same features, the same courage and boldness in the forehead, the eye, and the attitude. This continuity, this series of beings alike, is still more observable in animals; and if as much care were taken to perpetuate fine races of men, as some nations still take to prevent the mixing of the breeds of their horses and hounds, the genealogy would be written in the countenance and displayed in the manners."†

Dr King, in speaking of the fatality which attended the House of Stuart, says, "If I were to ascribe their calamities to another cause (than an evil fate), or endeavour to account for them by any natural means, I should think they were chiefly owing to a certain *obstinacy of temper*, which appears to have *been hereditary and inherent* in all the Stuarts, except Charles II."

It is well known that, of all the castes in Hindostan, that of the Brahmins is the highest in point of intelligence as well as rank; and it is mentioned by the missionaries as an ascertained fact, that *their* children are naturally more acute, intelligent, and docile, than the children of the inferior castes, age and other circumstances being equal.

Dr John Mason Good observes, that "stupidity, like wit, is propagable; and hence we frequently see it run from one generation to another, and not unfrequently it forms a distinctive mark in the mental character of districts or nations—in many cases, indeed, where they border closely on each other."‡

The character of the mother seems to have great influence in determining the qualities of the children, particularly when she has much force of character, and is superior in mental energy to her husband. There is perhaps no instance of a man of distinguished vigour and activity of mind whose mother did not display a considerable amount of the same qualities; and the fact of eminent men having so frequently children far inferior to themselves, is, in most cases, explicable by the circumstance that men of talent often marry women whose minds are comparatively weak. When the mother's brain is very defective, the minds of the children are inevitably feeble. "We know," says Haller, "a very remarkable instance of two noble females, who got husbands on account of their wealth, although they were nearly idiots, and from whom this mental defect has extended for a century into several families, so that some of all their descendants still continue idiots in the fourth and even in the fifth generation."§ In many families, the qualities of both father and mother are seen blended in the children. "In my own case," says a medical friend, "I can trace a very marked combination of the qualities of both parents. My father is a large chested, strong, healthy man, with a large but not active brain;—my mother was a spare, thin woman,

* New York Medical Repository, vol. iii. No. 1.

† Comparative View, &c. 3d edit. Lond. 1766, pp. 18, 19.

* Parents frequently live again in their offspring. It is quite certain that children resemble their parents, not only in countenance and the form of their body, but also in their mental dispositions, in their virtues and vices, &c.

† Voltaire's Philosophical Dictionary, Art. Cato.

‡ Study of Medicine, 2d edit. vol. iv. p. 187.

§ Elem. Physiol. lib. xxix. sect. 2, § 8.

with a high nervous temperament, a rather delicate frame, and a mind of uncommon activity. Her brain I should suppose to have been of moderate size. I often think that to the father I am indebted for a strong frame and the enjoyment of excellent health, and to the mother for activity of mind and an excessive fondness for exertion. These things, and a hundred more, have been brought to my mind by the perusal of the Constitution of Man." Finally, it often happens that the mental peculiarities of the father are transmitted to some of the children, and those of the mother to others.

Mental qualities, then, are determined by the size, form, and constitution of the brain; and these are transmitted by hereditary descent. This law, however faint or obscure it may appear in individual cases, becomes absolutely undeniable in nations. When we place the collection of Hindoo, Carib, Esquimaux, Peruvian, and Swiss skulls, possessed by the Phrenological Society, in juxtaposition, we perceive a national form and combination of organs in each, obtruding itself upon our notice, and corresponding with the mental characters of the respective tribes; the cerebral development of one tribe is seen to differ as widely from that of another, as the European mind does from that of the Carib. Each Hindoo, Esquimaux, Peruvian, and Carib, obviously inherits from his parents a certain general type of head; and so does each European. And if the general forms and proportions be thus palpably transmitted, can we doubt that the individual varieties follow the same rule, modified slightly by causes peculiar to the parents of the individual? The differences of national *character* are as conspicuous as those of national *brains*, and it is surprising how permanently both endure. It is observed by an author cited in the *Edinburgh Review*, that "the Vincentine district is, as every one knows, and has been for ages, an integral part of the Venetian dominions, professing the same religion, and governed by the same laws, as the other continental provinces of Venice: yet the English character is not more different from the French, than that of the Vincentine from the Paduan; while the contrast between the Vincentine and his other neighbour, the Veronese, is hardly less remarkable."—No. lxxxiv. p. 459. See Appendix, No. V.

A striking and undeniable proof of the effect on the character and dispositions of children, produced by the form of brain transmitted to them by hereditary descent, is to be found in the progeny of marriages between Europeans, whose brains possess a favourable development of the moral and intellectual organs, and Hindoos and native Americans, whose brains are inferior. All authors agree (and report the circumstance as singularly striking) that the children of such unions are decidedly superior in mental qualities to the native, while they are still inferior to the European parent. Captain Franklin says, that the half-breed American Indians "are upon the whole a good-looking people, and, where the experiments have been made, have shewn much expertness in learning, and willingness to be taught; they have, however, been sadly neglected."—*First Journey*, p. 86. He adds, "It has been remarked, I do not know with what truth, that half-breeds shew more personal courage than the pure breeds." The writers on South America mention, that the offspring of aboriginal and Spanish parents constitute the most active, vigorous, and powerful portion of the inhabitants of these countries; and that many of them rose to high commands during the revolutionary war. So much is this the case in Hindustan, that several authors have already mentioned the mixed race as destined to become the future sovereigns of India. They inherit from the native parent a certain adaptation to the climate, and from the European a higher development of brain; the two combined constituting their superiority.

Another example occurs in Persia. The Circassian and Georgian brain stands comparatively high in the development of the moral and intellectual organs,* and for ages the custom has existed among the nobles of Persia of purchasing beautiful female Circassian captives, and forming alliances with them as wives. It is mentioned by some travellers, that the race of nobles in Persia is the most gifted in natural qualities, bodily and mental, of any class in that country; a fact diametrically opposite to that which occurs in Spain, and other European countries, where the nobles intermarry closely with each other, and set the organic laws at defiance. Consanguinity in the parents exerts a deteriorating influence on the children. The degeneracy and even idiocy of some of the noble and royal families of Spain and Portugal, from marrying nieces and other near relations, is well known; and in these cases defective brains may be observed.

If, then, form, size, and constitution of brain, be transmitted from parents to children, and if these determine natural mental talents and dispositions, which in their turn exercise the greatest influence over the happiness of individuals throughout the whole of life, it becomes extremely important to discover the laws according to which this transmission takes place. At the first aspect of the question, three views present themselves for our consideration. Either, in the *first* place, the constitution, size, and configuration of brain, which the parents themselves inherited at birth, are transmitted absolutely, so that the children, sex following sex, are exact copies, without variation or modification, of the one parent or the other; or, *secondly*, the natural and inherent qualities of the father and mother combine, and are transmitted in a modified form to the offspring; or, *thirdly*, the qualities of the children are determined jointly by the constitution of the stock, and by the faculties which predominate in power and activity in the parents at the particular time when the organic existence of each child commences.

We learn by observation that the *first* cannot be the law; for, as often mentioned, a real law of nature admits of no exceptions; and it is well established, that the minds of children are *not exact copies*, without variation or modification, of those of the parents, sex following sex. Neither can the *second* be the law; because it is equally certain that the minds of children although *sometimes, are not always*, in talents and dispositions, exactly blended reproductions of the father and mother. If this law prevailed, no child would be a copy of the father, none a copy of the mother or of any collateral relation; but each would be invariably a compound of the two parents, and all the children would be exactly alike, sex alone excepted. Observation enables us to say that this is not the law. What, then, does experience say to the *third* idea, that the mental character of each child is determined by the particular qualities of the stock, combined with those which predominate in the parents when its existence commenced?

I have already adverted to the influence of the stock, and shall now illustrate that of the condition of the parents, when existence is communicated. For this purpose we may consider, 1*st*, The transmission of *factitious or temporary conditions of the body*; 2*dly*, The transmission of *acquired habits*; 3*dly*, The appearance of *peculiarities in children, in consequence of impressions made on the mind of the mother*; and, 4*thly*, The transmission of *temporary mental and bodily qualities*.

1. With respect to the first of these topics, Dr Prichard, in his Researches into the Physical History of Mankind, states the result of his investigations to be, *first*, That the organization of the offspring is always modelled according to the type of the *original structure*

* In Mr W. Allan's picture of the Circassian captives, the form of the head is said to be a copy from nature, taken by that artist when he visited the country. It is engraved by Mr James Stewart with great beauty and fidelity, and may be consulted as an example of the superiority of the Circassian development of brain.

of the parent; and, *secondly*, "That changes produced by external causes in the appearance or constitution of the individual are temporary; and, in general, acquired characters are transient; they terminate with the individual, and have no influence on the progeny."—Vol. ii. p. 536. He supports the first of these propositions by a variety of facts occurring "in the porcupine family," "in the hereditary nature of complexion," and "in the growth of supernumerary fingers or toes, and corresponding deficiencies." "Maupertuis has mentioned this phenomenon; he assures us, that there were two families in Germany, who have been distinguished for several generations by six fingers on each hand, and the same number of toes on each foot," &c. Dr Prichard admits, at the same time, that the *second* proposition is of more difficult proof, and that "an opinion contrary to it has been maintained by some writers, and a variety of singular facts have been related in support of it." But many of these relations, as he justly observes, are obviously fables. The following facts, however, certainly militate against it.

A man's first child was of sound mind; afterwards he had a fall from his horse, by which his head was much injured. His next two children proved to be idiots. After this he was trepanned, and had other children, and they were of sound mind. This case was communicated to me by a medical practitioner of Douglas, in the Isle of Man.

"In Europe," says a late writer, "the constant practice of milking cows has enlarged the udder greatly beyond its natural size, and so changed the secretions, that the supply does not cease when the calf is removed. In Colombia, where circumstances are entirely different, nature shews a strong tendency to assume its original type: a cow gives milk there only while the calf is with her."*

2. There are some curious facts which seem to prove that *acquired habits* are hereditary, at least in the inferior animals. A strong illustration is quoted in the Edinburgh Review, No. lxxxiv. p. 457.

"Every one conversant with beasts," says the writer, "knows, that not only their natural, but many of their acquired qualities, are transmitted by the parents to their offspring. Perhaps the most curious example of the latter fact may be found in the pointer.

"This animal is endowed with the natural instinct of winding game, and stealing upon his prey, which he surprises, having first made a short pause, in order to launch himself upon it with more security of success. This sort of *semicolon* in his proceedings, man converts into a *full stop*, and teaches him to be as much pleased at seeing the bird or beast drop by the shooter's gun, as at taking it himself. The staunchest dog of this kind, and the original pointer, is of Spanish origin, and our own is derived from this race, crossed with that of the foxhound, or other breed of dog, for the sake of improving his speed. This mixed and factitious race, of course, naturally partakes less of the true pointer character; that is to say, is less disposed to stop, or at least he makes a shorter stop at game. *The factitious pointer is, however, disciplined, in this country, into staunchness; and, what is most singular, this quality is, in a great degree, inherited by his puppy*, who may be seen earnestly standing at swallows or pigeons in a farm-yard. For intuition, though it leads the offspring to exercise his parent's faculties, does not instruct him how to direct them. The preference of his master afterwards guides him in his selection, and teaches him what game is better worth pursuit. On the other hand, the pointer of pure Spanish race, unless he happen to be well broke himself, which in the south of Europe seldom happens, produces a race which are all but unteachable, according to our notions of a pointer's business. They will make a stop at their game, as natural instinct prompts them, but seem incapable of being drilled into the habits of the animal which education has formed in this country, and has rendered, as I have said, in some degree capable of transmitting his acquirements to his descendants."

"Acquired habits are hereditary in other animals besides dogs. English sheep, probably from the greater richness of our pastures, feed very much together; while Scotch sheep are obliged to extend and scatter themselves over their hills, for the better discovery of food. Yet the English sheep, on being transferred to Scotland, *keep their old habit of feeding in a mass*, though so little adapted to their new country: so do their descendants; and the English sheep is not thoroughly naturalized into the necessities of his place *till the third generation*. The same thing may be observed as to the nature of his food that is observed in his mode of seeking it. When turnips were introduced from England into Scotland, *it was only the third generation* which heartily adopted this diet, the first having been starved into an acquiescence in it."

The author of the article America, in the Encyclopædia Britannica (7th edit. vol. ii. p. 653) says, "It is worthy of notice, that the amble, the pace to which the domestic horse in Spanish America is exclusively trained, becomes in the course of some generations hereditary, and is assumed by the young ones without teaching."

3. *Impressions on the mind of the mother*, especially those received through the senses, often produce a palpable effect on the offspring. On this subject Dr Prichard observes, "The opinion which formerly prevailed, and which has been entertained by some modern writers, among whom is Dr Darwin, that at the period when organization commences in the ovum, that is, at or soon after the time of conception, the structure of the fœtus is capable of undergoing modification from impressions on the mind or senses of the parent, does not appear altogether so improbable. It is contradicted, at least, by no fact in physiology. It is an opinion of very ancient prevalence, and may be traced to so remote a period, that its rise cannot be attributed to the speculations of philosophers, and it is difficult to account for the origin of such a persuasion, unless we ascribe it to facts which happened to be observed."—P. 556.

The following case fell under my own observation:—W. B. shoemaker in Portsburgh, called and shewed me his son, aged 18, who is in a state of idiocy. He is simple and harmless, but never could do any thing for himself. The father said that his wife was sound in mind; that he has other three children all sound; and that the only account he could ever give of the origin of the condition of this son was the following: He kept a public house; and some months before the birth of this boy, an idiot lad accompanied a brewer's drayman and helped him to lift casks off the cart into his cellar; that that idiot made a strong impression on his wife; that she complained that she could not get his appearance removed from her mind, on which account she afterwards kept out of the way when he came to the house; and that his son was weak in body and silly in mind from birth, and had the slouched and slovenly appearance of the idiot.

"It is peculiarly lamentable to observe," says Dr Mason Good, in reference to deafness and dumbness, "That when the defect has once made an entrance into a family, whether from the influence it produces on the nervous system of the mother, or from any other less obvious cause, it is peculiarly apt to become common to those children which are born afterwards; insomuch that we often meet with a third, or a half, and in a few instances, where the first-born has been thus affected, with every individual of the progeny, suffering from the same distressing evil. 'The late investigation in Ireland discovered families in which there were two, three, four, or more, thus circumstanced. In one family there were five children all deaf and dumb, in another

* Encyclop. Brit., 7th edit. vol. ii. p. 653, article *America*.

seven, in another ten; and in that of a poor militia officer on half-pay, there were nine born deaf and dumb in succession.'—(*Quart. Jour. of Foreign Med.*, vol. i. p. 321.) Yet it is consoling to reflect, that the instances are very rare indeed, in which the same defect has been propagated to a succeeding generation, when the deaf-dumb have married, and even when both the husband and wife have been thus afflicted."*

The following additional facts are mentioned in the Athenæum:—"Many persons who have never known any, or perhaps not more than one, deaf and dumb individual in the immediate circle in which they lived, would be astonished to read the lists of applications circulated by the committee for the asylum in the Kent Road, so ably conducted by Mr Watson, which usually contain nearly a hundred names. The most remarkable fact, however, which these lists present, is the number of deaf and dumb children frequently found in the same families, evidently in consequence of the continued operation of some unknown cause connected with the parents. Three, four, and five, deaf and dumb children are not uncommonly met with in one family, and in some instances there have been as many as seven. In the family of Martin, a labourer, out of ten children seven were deaf and dumb; in the family of Kelly, a porter, seven out of eight were deaf and dumb; and in the family of Aldum, a weaver, six out of twelve were deaf and dumb. The result of a Table of twenty families, given in the 'Historical Sketch of the Asylum,' published by Powell, Dowgate-hill, is ninety deaf and dumb out of one hundred and fifty-nine children."†

A medical friend says, "Several of the children of a clergyman in the west of Scotland have been born blind. I know a family of six individuals—four girls and two boys. All the girls were born blind, while the boys see perfectly. Both parents had good eyesight, so far as I can learn. These are curious facts, and not easily explained." Portal states, that "Morgagni has seen three sisters dumb '*d'origine.*' Other authors also cite examples, and I have seen like cases myself." In a note, he adds, "I have seen three children out of four of the same family blind from birth by amaurosis, or *gutta serena.*"—*Portal, Mémoires sur Plusieurs Maladies*, tom. iii. p. 193. Paris, 1808.

Dr Prichard, in his "Researches," already quoted, observes, "Children resemble, in feature and constitution, both parents, but I think more generally the father. In the breeding of horses and oxen, great importance is attached, by experienced propagators, to the male. In sheep, it is commonly observed that black rams beget black lambs. In the human species also the complexion chiefly follows that of the father; and I believe it to be a general fact, that the offspring of a *black father* and white mother is *much darker* than the progeny of a *white father* and a dark mother."—Vol. ii. p. 551.‡ These facts appear to me to be referrible to both causes. The stock must have had some influence, but the mother, in all these cases, is not impressed by her own colour, because she does not look on herself; while the *father's* complexion must strikingly attract her attention, and may, in this way, give the darker tinge to the offspring.§

4. The idea of the transmission of *temporary mental and bodily qualities*, is supported by numerous facts tending to shew that the state of the parents, particularly of the mother, at the time when the existence of the child commences, has a strong influence on its talents, dispositions, and health.

The father of Napoleon Buonaparte, says Sir Walter Scott, "is stated to have possessed a very handsome person, a talent for eloquence, and a vivacity of intellect, which he transmitted to his son." "It was in the middle of civil discord, fights, and skirmishes, that Charles Buonaparte married Lætitia Ramolini, one of the most beautiful young women of the island, and possessed of a great deal of firmness of character. She partook of the dangers of her husband during the years of civil war, and is said to have accompanied him on horseback on some military expeditions, or perhaps hasty flights, shortly before her being delivered of the future Emperor."—*Life of Napoleon Buonaparte*, vol. iii. p. 6.

The murder of David Rizzio was perpetrated by armed nobles, with many circumstances of violence and terror, in the presence of Mary, Queen of Scotland, shortly before the birth of her son, afterwards James the First of England. The constitutional liability of this monarch to emotions of fear, is recorded as a characteristic of his mind; and it has been mentioned that he even started involuntarily at the sight of a drawn sword. Queen Mary was not deficient in courage, and the Stuarts, both before and after James the First, were distinguished for this quality; so that his dispositions were an exception to the family character. Napoleon and James form striking contrasts; and it may be remarked that the mind of Napoleon's mother appears to have risen to the danger to which she was exposed, and braved it; while the circumstances in which Queen Mary was placed, were such as must have inspired her with violent fear.

Esquirol, a celebrated French medical writer, in adverting to the causes of madness, mentions that many children, whose existence dated from periods when the horrors of the French Revolution were at their height, turned out subsequently to be weak, nervous, and irritable in mind, extremely susceptible of impressions, and liable to be thrown, by the least extraordinary excitement, into absolute insanity.

A lady of considerable talent wrote as follows to a phrenological friend:—"From the age of two I foresaw that my eldest son's restlessness would ruin him; and it has been even so. Yet he was kind, brave, and affectionate. I read the Iliad for six months before he saw the light, and have often wondered if that could have any influence on him. He was actually an Achilles."*

The following particulars have been communicated to me by the medical friend already alluded to. "I know an old gentleman," says he, "who has been twice married. The children of his first marriage are strong, active, healthy people, and their children are the same. The produce of the second marriage are very inferior, especially in an intellectual point of view; and the younger the children are, the more is this obvious. The girls are superior to the boys, both physically and intellectually: indeed, their mother told me that she had great difficulty in rearing her sons, but none with her daughters. The gentleman himself, at the time of his second marriage, was upwards of sixty, and his wife about twenty-five. This shews very clearly that the boys have taken chiefly of the father, and the daughters of the mother."

In a case which fell under my own observation, the father of a family became sick, had a partial recovery, but relapsed, declined in health, and in two months died. Seven months after his death, a son was born, of the full age, and the origin of whose existence was referrible to the period of the partial recovery. At that time, and during the subsequent two months, the faculties of the mother were highly excited, in ministering to her husband, to whom she was greatly attached; and, after his death, the same excitement continued, as she was then loaded with the charge of a numerous family, but not depressed; for her circumstances were comfortable. The son is now a young

* Good's Study of Medicine, 2d edit. i. 506.
† Athenæum, 28th May 1825, p. 498.
‡ See Appendix, No. VI.
§ Black hens, however, lay dark-coloured eggs.

* This lady's head is large; in particular, the organs of Combativeness, Self-Esteem, and Firmness, are very large; those of Destructiveness and Adhesiveness are large; and the temperament is very active.

man; and, while his constitution is the most delicate, the development and activity of the mental organs are decidedly greater in him than in any other member of the family.

A lady possessing a large brain and active temperament, was employed professionally as a teacher of music. Her husband also had a fine temperament, and a well-constituted brain, but his talents for music were only moderate. They had several children, all of whom were produced while the mother was in the full practice of her profession, and the whole now indicate superior musical abilities. They have learned to play on several instruments as if by instinct, and highly excel. In this case the original endowments of the mother, and her actual exercise of them, conspired to transmit them to her children.

A friend told me that in his youth he lived in a county in which the gentlemen were much addicted to hard drinking: and that he, too frequently, took a part in their revels. Several of his sons, born at that time, although subsequently educated in a very different moral atmosphere, turned out strongly addicted to inebriety; whereas the children born after he had removed to a large town and formed more correct habits, were not the victims of this propensity. Another individual, of superior talents, described to me the wild and mischievous revelry in which he indulged at the time of his marriage, and congratulated himself on his subsequent domestication and moral improvement. His eldest son, born in his riotous days, notwithstanding a strictly moral education, turned out a personification of the father's actual condition at that time; and his younger children were more moral in proportion as they were removed from the period of vicious frolics. The mother, in this case, possessed a favourable development of brain.

The Margravine of Anspach observes, that "when a female is likely to become a mother, she ought to be doubly careful of her temper; and, in particular, to indulge no ideas that are not cheerful, and no sentiments that are not kind. Such is the connexion between the mind and body, that the features of the face are moulded commonly into an expression of the internal disposition; and is it not natural to think that an infant, before it is born, may be affected by the temper of its mother?"—*Memoirs*, vol. ii. chap. viii.*

When two parties marry very young, the eldest of their children generally inherits a less favourable development of the moral and intellectual organs than those produced in more mature age. The animal organs in the human race are, in general, most vigorous in early life, and this energy appears to cause them to be then most readily transmitted to offspring. Indeed, it is difficult to account for the wide varieties in the form of the brain in children of the same family, except on the principle, that the organs which predominate in vigour and activity in the parents, at the time when existence is communicated, determine the tendency of corresponding organs to develope themselves largely in the children. The facts illustrative of the truth of this principle, which have been communicated to me and observed by myself, are so numerous, that I now regard it as highly probable.

If this be the law of nature—parents, in whom Combativeness and Destructiveness are habitually active, will transmit these organs to their children, with a constitutional tendency to high development and excitement; while parents, in whom the moral and intellectual organs reign supreme, will transmit the predisposition to develope them in predominant size and activity.

This view is in harmony with the fact, that children generally, although not universally, resemble their parents in their mental qualities. The largest organs being naturally the most active, the habitual mental condition of the parents will be determined by those which predominate in size in their own brains; and, on the principle that predominance in activity and energy causes the transmission of similar qualities to the offspring, the children will generally resemble the parents. But they will not always do so; because even inferior characters, in whom the moral and intellectual organs are deficient, may be occasionally exposed to external influences which, for the time, may excite these organs to unwonted vivacity; and, according to the rule now explained, a child dating its existence from that period may inherit a brain superior to that of the parent. On the other hand, a person with an excellent moral development, may, by some particular occurrence, have his animal propensities roused to unwonted vigour, and his moral sentiments thrown for a time into the shade; and any offspring connected with this condition, would prove inferior to himself in the development of the moral organs, and greatly surpass him in the size of those of the propensities.

I repeat, that I do not present these views as ascertained phrenological science, but as inferences strongly supported by facts, and consistent with known phenomena. If we suppose them to be true, they will greatly strengthen the motives for preserving the *habitual* supremacy of the moral sentiments and intellect; since, by our doing so, improved moral and intellectual capacities may be conferred on offspring. If it be true that this lower world is arranged in harmony with all the faculties, the moral and intellectual powers, in cases of conflict, holding the supremacy, what a noble prospect would this law open up, of the possibility of man ultimately becoming capable of placing himself more fully in accordance with the Divine institutions than he has hitherto been able to do, and, in consequence, of reaping numberless enjoyments that appear destined for him by his Creator, and avoiding thousands of miseries that now render life too often only a series of calamities! The views here expounded also harmonize with the principle maintained in a former part of this work:—that, as activity in the faculties is the fountain of enjoyment, the whole constitution of nature is designedly framed to support them in ceaseless action. What scope for observation, reflection, exercise of the moral sentiments, and the regulation of animal impulse, does not this picture of nature present!

I cordially agree, however, with Dr Prichard, that this subject is still involved in great obscurity. "We know not," says he, "by what means any of the facts we remark are effected; and the utmost we can hope to attain is, by tracing the connection of circumstances, to learn from what combinations of them we may expect to witness particular results."—Vol. ii. p. 542. But much of this darkness may be traced to ignorance of the functions of the brain. If we consider that, in relation to mind, the brain has always been the most important organ of our system; but that, nevertheless, all past observations have been conducted without the knowledge of its functions; it will not appear marvellous, that hitherto much confusion and contradiction have existed in the cases recorded, and in the inferences drawn from them. At present, almost all that phrenologists can pretend to accomplish is, to point out the mighty void; to offer an exposition of its causes; and to state such conclusions as their own very limited observations have hitherto enabled them to deduce. Far from pretending to be in possession of certain and complete knowledge on this topic, I am inclined to think, that, although every conjecture now hazarded were founded in nature, centuries of observation might probably be necessary to render the principles fully practical. We have still almost no information concerning the effects, on the children, of different temperaments, different combinations in the cerebral organs, and differences of age, in the parents.

It is remarkable, however, to what extent mere pecuniary interests excite men to investigate and observe the Natural Laws, while moral and rational considera-

* See Appendix, No. VII.

tions exert so small an influence in leading them to do so. Before a common insurance company will undertake the risk of paying L.100 on the death of an individual, the following questions must be answered by credible and intelligent witnesses:—

"1. How long have you known Mr A. B.?

"2. Has he had the gout?

"3. Has he had a spitting of blood, asthma, consumption, or other pulmonary complaint?

"4. Do you consider him at all predisposed to any of these complaints?

"5. Has he been afflicted with fits, or mental derangement?

"6. Do you think his constitution perfectly good, in the common acceptation of the term?

"7. Are his habits in every respect strictly regular and temperate?

"8. Is he at present in good health?

"9. Is there any thing in his form, habits of living, or business, which you are of opinion may shorten his life?

"10. What complaints are his family most subject to?

"11. Are you aware of any reason why an insurance might not with safety be effected on his life?"

A man and woman about to marry, have, in the generality of cases, the health and happiness of five or more human beings depending on their attention to considerations essentially the same as the foregoing, and yet how much less scrupulous are they than the mere dealers in money! "Before the parties," says Dr Caldwell, "form a compact fraught with consequences so infinitely weighty, let the constitution and education of both be matured. They will then not only transmit to their offspring a better organization, but be themselves, from the knowledge and experience they have attained, better prepared to improve it by cultivation. For I shall endeavour to make it appear that cultivation can improve it. When a skilful agriculturist wishes to amend his breed of cattle, he does not employ, for that purpose, immature animals. On the contrary, he carefully prevents their intercourse. Experience moreover teaches him not to expect fruit of the best quality from immature fruit-trees or vines. The product of such crudeness is always defective. In like manner, marriages between boarding-school girls and striplings in or just out of college, ought to be prohibited. In such cases, prohibition is a duty, no less to the parties themselves, than to their offspring and society. Marriages of the kind are rarely productive of any thing desirable. Mischief and unhappiness of some sort are their natural fruit. Patriotism therefore, philanthropy, and every feeling of kindness to human nature, call for their prevention. Objections resting on ground not altogether dissimilar may be justly urged against young women marrying men far advanced in years. Old men should in no case contract marriages likely to prove fruitful. Age has impaired their constitutional qualities, which descending to their offspring, the practice tends to deteriorate our race. It is rare for the descendants of men far advanced in years to be distinguished for high qualities of either body or mind.

"As respects persons seriously deformed, or in any way constitutionally enfeebled—the rickety and club-footed, for instance, and those with distorted spines, or who are predisposed to insanity, scrofula, pulmonary consumption, gout, or epilepsy—all persons of this description should conscientiously abstain from matrimony. In a special manner, where both the male and female labour under a hereditary taint, they should make it a part of their duty to God and their posterity never to be thus united. Marriage in such individuals cannot be defended on moral ground, much less on that of public usefulness. It is selfish to an extent but little short of crime. Its abandonment or prevention would tend, in a high degree, to the improvement of mankind." *

I am indebted for the following particulars to the medical gentleman already repeatedly quoted, who was induced to communicate them by a perusal of the second edition of the present treatise:—"If your work has no other effect than that of turning attention to the laws which regulate marriage and propagation, it will have done a vast service, for on no point are such grievous errors committed. I often see in my own practice the most lamentable consequences resulting from neglect of these laws. There are certain families which I attend, where the constitutions of both parents are bad, and where, when any thing happens to the children, it is almost impossible to cure them. An inflamed gland, a common cold, hangs about them for months, and almost defies removal. In other families, where the parents are strong and healthy, the children are easily cured of almost any complaint. I know a gentleman aged about 50, the only survivor of a family of six sons and three daughters, all of whom, with the exception of himself, died young of pulmonary consumption. He is a little man with a narrow chest, and married a lady of a delicate constitution and bad lungs. She is a tall spare woman, with a chest still more deficient than his own. They have had a large family, all of whom die off regularly as they reach manhood and womanhood, in consequence of affections of the lungs. In the year 1833, two sons and a daughter died within a period of ten months. Two still survive, but they are both delicate, and there can be no doubt that when they arrive at maturity they will follow the rest. This is a most striking instance of punishment under the organic laws."

It is pleasing to observe, that, in Wurtemberg, there are two excellent laws calculated to improve the moral and physical condition of the people, which other states would do well to adopt. First, "It is illegal for any young man to marry before he is twenty-five, or any young woman before she is eighteen; and a young man, at whatever age he wishes to marry, must shew to the police and the priest of the commune where he resides, that he is able, and has the prospect, to provide for a wife and family." The second law compels parents to send their children to school, from the age of six to fourteen.†

There is no moral difficulty in admitting and admiring the wisdom and benevolence of the institution by which *good* qualities are transmitted from parents to children: but it is frequently held as unjust to the latter, that they should inherit parental *deficiencies*, and be made to suffer for sins which they did not commit. With a view to answering this objection, let us, in the *first* place, suppose the law of hereditary descent to be abrogated altogether,—that is to say, the natural qualities of each individual of the race to be conferred at birth, without the slightest reference to what his parents had been or done:—it is clear that this form of constitution would have excluded the means of improvement of *the race*. The brains of the New Hollanders, Caribs, and other savage tribes, are distinguished by great deficiencies in the moral and intellectual organs.‡ If it be true that a considerable development of these is indispensable to the comprehension of science and the practice of virtue, it would, on the present supposition, be impossible to raise the New Hollanders, as a people, one step higher in capacity for intelligence and virtue than they now are. We might cultivate each generation up to the limits of its powers, but there the im-

* Thoughts on the True Mode of Improving the Condition of Man. By Charles Caldwell, M. D. Lexington, Kentucky, 1833, p. 20. The greater part of this eloquent and powerful Essay is reprinted in the Phrenological Journal, Vol. viii. No. 40.

† See Appendix, No. VIII.

‡ This fact is demonstrated by specimens in most Phrenological Museums.

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provement (and a low one it would be) would stop; for, the next generation being produced with brains equally deficient in the moral and intellectual regions, no principle of increasing amelioration would exist. The same remarks are applicable to every tribe of mankind. If we assume modern Europeans as a standard,—then, if the law of hereditary descent were abrogated, every deficiency which at this moment is attributable to imperfect or disproportionate development of brain, would be irremediable by human means, and continue as long as the race existed. Each generation might be cultivated till the summit-level of its capacities was attained, but higher than this no succeeding generation could rise. When we contrast with such a prospect, the very opposite effects flowing from the law of hereditary transmission of qualities in an increasing ratio, the whole advantages are at once perceived to be on the side of the latter arrangement. According to this rule, the children of the individuals who have obeyed the organic, the moral, and the intellectual laws, will, when well educated, not only start from the highest level of their parents in acquired knowledge, but will inherit an enlarged development of the moral and intellectual organs, and thereby enjoy an increasing capability of discovering and obeying the institutions of the Creator.*

* It appears to me that the native American savages, and native New Hollanders, cannot, with their present brains, adopt Christianity or civilization. Mr Timothy Flint, a Presbyterian clergyman, who passed ten years, commencing in 1815, in wanderings and preaching in the valley of the Mississippi, says of the Indians among whom he lived, that "they have not the same acute and tender sensibilities with the other races of men. They seem callous to every passion but rage." ... "Their impassable fortitude and endurance of suffering, which have been so much vaunted, are, after all, in my mind, the result of a greater degree of physical insensibility." "No ordinary stimulus excites them to action. None of the common excitements, endearments, or motives, operate upon them at all. They seem to hold most of the things that move us in proud disdain. The horrors of their warfare,—the infernal rage of their battles,—the demoniac fury of gratified revenge,—the alternations of hope and despair in their gambling, to which they are addicted far beyond the whites,—the brutal exhilaration of drunkenness,—these are their excitements." He concludes, "It strikes me that Christianity is the religion of civilized man; that the savages must first be civilized; and that, as there is little hope that the present generation of Indians can be civilized, there is but little more that they will be Christianized."

The reader will find, in the phrenological collections, specimens of the skulls of these savages; and on comparing them with those of Europeans, he will observe that, in the American Indians, the organs of reflecting intellect, and of all the moral feelings, are greatly inferior in size to the same organs in the Europeans. The moral and intellectual organs are decidedly larger in the Sandwich Islanders than in these Indians, and they have received European civilization with greater cordiality and success. If, by conforming to the organic laws, the moral and intellectual organs of the American savages could be considerably enlarged, they would *desire* civilization, and would adopt it when offered. If this view be well founded, every method used for their cultivation, which is not calculated at the same time to improve their cerebral organization, will be limited in its effects by the narrow capacities attending their present development. In youth, all the organs of the body are more susceptible of modification than in advanced age; and hence the effects of education on the young may arise from the greater susceptibility of the brain to changes at that period than in later life. This

2*dly*, We may suppose the law of hereditary descent to be limited to the transmission of good, and abrogated as to the transmission of bad, qualities; and it may be thought that such an arrangement would be more benevolent and just. There are objections to this view, however, which do not occur without reflection to the mind. We see as matter of fact, that a vicious and debased parent is actually defective in the moral and intellectual organs. Now, if his children should take up exactly the same development as himself, this would be the transmission of imperfections, which is the very thing objected to; while, if they were to take up a development fixed by nature, and not at all referrible to that of the parent, this would render the whole race stationary in their first condition, without the possibility of improvement in their capacities—which also, we have seen, would be an evil greatly to be deprecated. But the bad development may be supposed to transmit, by hereditary descent, a good development. This, however, would set at nought the supremacy of justice and benevolence; it would render the consequences of contempt for and violation of the divine laws, and of obedience to them by the parents, in this particular, precisely alike. The debauchee, the cheat, the murderer, and the robber, would, according to this view, be able to look upon the prospects of their posterity, with the same confidence in their welfare and happiness, as the pious intelligent Christian, who had sought to know God and to obey his institutions during his whole life. Certainly no individual in whom the higher sentiments prevail, will for a moment regard this imagined change as any improvement on the Creator's arrangements. What a host of motives to moral and religious conduct would at once be withdrawn, were such a spectacle of divine government to be exhibited to the world!

3*dly*, It may be supposed that human happiness would have been more completely secured, by endowing all individuals at birth with that degree of development of the moral and intellectual organs which would have best fitted them for discovering and obeying the Creator's laws, and by preventing all aberrations from this standard; just as the lower animals appear to have received instincts and capacities adjusted with the most perfect wisdom to their conditions. Two remarks occur on this supposition. *First*, We are not competent at present to judge correctly how far the development actually bestowed on the human race is, or is not, wisely adapted to their circumstances; for, possibly, there may be, in the great system of human society, departments exactly suited to all existing forms of brain not imperfect through disease, if we possessed knowledge sufficient to discover them. The want of a natural index to the mental dispositions and capacities of individuals, and of a true theory of the constitution of society, may have hitherto precluded philosophers from arriving at sound conclusions on this question. It appears to me probable, that, while there may be great room for improvement in the talents and dispositions of vast numbers of individuals, the imperfections of the race in general may not be so great as we, in our present state of ignorance of the aptitudes of particular persons for particular situations, are prone to believe. But, *secondly*, On the principle that activity of the faculties is the fountain of enjoyment, it may be questioned whether additional motives to the exercise of the whole faculties in harmony with the moral and intellectual powers, and consequently greater happiness, are not conferred by leaving men (within certain limits) to regulate the talents and tendencies of their descendants, than by endowing each individual with the best qualities, independently of the conduct of his parents.

improvement will, no doubt, have its limits; but it may probably extend to that point at which man will be capable of placing himself in harmony with the natural laws. The effort necessary to *maintain* himself there, will still provide for the activity of his faculties.

On the whole, there seems reason to conclude that the actual institution, by which both good and bad qualities* are transmitted, is fraught with higher advantages to the race, than the abrogation of the law of transmission altogether, or than the supposed change of it, by which bad men should transmit good qualities to their children. The actual law, when viewed by the moral sentiments and intellect, appears, both in its principles and in its consequences, beneficial and expedient. When an individual sufferer, therefore, complains of its operation, he regards it through the animal faculties alone; his self-love is annoyed, and he carries his thoughts no farther. He never stretches his mind forward to the consequences which would ensue to mankind at large, if the law which grieves him were reversed. The animal faculties, when acting by themselves, regard nothing beyond their own immediate and apparent interest, and they do not discern even *it* correctly; for no arrangement that is beneficial for the race would be found injurious to individuals, if its operations in regard to them were distinctly traced. The abrogation of the rule, therefore, under which they complain, would, we may presume, bring greater evils, even upon themselves, than its continuance.

On the other hand, an individual sufferer under hereditary pain, in whom the moral and intellectual faculties predominated, and who should understand the principle and consequences of the institution of hereditary descent as now explained, would not murmur at them as unjust: he would bow with submission to a law which he perceived to be fraught with blessings to the race when it was known and obeyed; and the very practice of this reverential acquiescence would diminish, in a great degree, the severity of his misfortune. Besides, he would see the door of mercy standing widely open, and inviting his return:—Every step which he made in his own person towards exact obedience, would remove, by so much, the organic penalty transmitted on account of his parent's transgressions; and his posterity would reap the full benefits of his more dutiful observance.

It may be objected to the law of hereditary transmission of organic qualities, that the children of a blind and lame father have frequently sound eyes and limbs. But, in the *first* place, these defects are generally the result of accident or disease, occurring either during pregnancy or posterior to birth; and, consequently, the elements of the defective organs being present in the constitution, the imperfections are not transmitted to the progeny: *Secondly*, Where the defects are congenital or constitutional, it frequently happens that they are transmitted through successive generations. This is sometimes exemplified in blindness, and even in the possession of supernumerary fingers or toes. One reason why such peculiarities are not transmitted to all the progeny, may probably be, that, in general, only one parent is defective. If the father, for instance, be blind or deaf, the mother is generally free from that imperfection, and her influence may extend to, and modify the result in those of her progeny, who take their constitution chiefly from her.

If the mental qualities transmitted to offspring be, to some extent, dependent on the organs most highly excited in the parents, this will account for the varieties, along with the general resemblance, that occur in children of the same marriage. It will throw some light also on the circumstance of genius being sometimes transmitted and sometimes not. Unless *both* parents should possess the cerebral development and temperament of genius, the organic law would not certainly transmit these qualities to the children; and even although both did possess these endowments, they would be transmitted only on condition of the parents obeying these laws—one of which forbids that excessive exertion of the mental and corporeal functions which exhausts and debilitates the system; an error almost universally committed by persons endowed with high original talent, under the present condition of ignorance of the natural laws, and erroneous fashions and institutions of society. The supposed law would be disproved by cases of weak, imbecile, and vicious children, being born of parents whose own constitutions and habits had been in the highest accordance with the organic, moral, and intellectual laws; but no such cases have hitherto come under my observation.

As rules are best taught by examples, I shall now mention some facts that have fallen under my own notice, or been communicated to me from authentic sources, illustrative of the practical consequences of infringing the law of hereditary descent.

A man, aged about 50, possessed a brain in which the animal, moral, and knowing intellectual organs, were all large, but the reflecting small. He was pious, but destitute of education; he married an unhealthy young woman, deficient in moral development, but of considerable force of character; and several children were born. The father and mother were far from being happy; and when the children attained to eighteen or twenty years of age, they were adepts in every species of immorality and profligacy; they picked their father's pocket, stole his goods, and had them sold back to him by accomplices, for money, which was spent in betting, cock-fighting, drinking, and low debauchery. The father was greatly grieved: but knowing only two resources, he beat the children severely as long as he was able, and prayed for them: his own words were, that "if *after that*, it pleased the Lord to make vessels of wrath of them, the Lord's will must just be done." I mention this last observation, not in jest, but in great seriousness. It was impossible not to pity the unhappy father: yet, who that sees the institutions of the Creator to be in themselves wise, but in this instance to have been directly violated, will not acknowledge that the bitter pangs of the poor old man were the consequences of his own ignorance; and that it was an erroneous view of the divine administration which led him to overlook his own mistakes, and to attribute to the Almighty the purpose of making vessels of wrath of his children, as the only explanation which he could give of their wicked dispositions? Who that sees the cause of his misery can fail to lament that his piety was not enlightened by philosophy, and directed to obedience, in the first instance, to the organic laws of the Creator, as one of the prescribed conditions without observance of which he had no title to expect a blessing upon his offspring?

In another instance, a man in whom the animal organs, particularly those of Combativeness and Destructiveness, were very large, but who had a pretty fair moral and intellectual development, married, against her inclination, a young woman, fashionably and showily educated, but with a very decided deficiency of Conscientiousness. They soon became unhappy, and even blows were said to have passed between them, although they belonged to the middle rank of life. The mother employed the children to deceive and plunder the father, and latterly spent the pilfered sums in purchasing ardent spirits. The sons inherited the deficient morality of the mother, combined with the ill temper of the father; and before they attained majority, they had retaliated the blows with which he had visited them in their earlier years so recklessly that his death might at any moment have ensued. The family fireside became

* In using the popular expressions "good qualities" and "bad qualities," I do not mean to insinuate, that any of the tendencies bestowed on man are essentially bad in themselves. Destructiveness and Acquisitiveness, for example, are in themselves essential to human welfare in this world, and, when properly directed, produce effects unquestionably good; but they become the sources of evil when they are ill directed, which may happen either from moral deficiency, from intellectual ignorance, or from their organs being too large in proportion to those of the superior sentiments and intellect.

a theatre of war, and the father was glad to have them removed from his house, as the only means by which he could feel even his life in safety from their violence.

In another family, the mother possesses an excellent development of the moral and intellectual organs, while in the father the animal organs predominate in great excess. She has been the unhappy victim of ceaseless misfortune, originating from the misconduct of her husband. Some of the children have inherited the father's brain, and some the mother's; and of the sons whose heads resemble that of the father, several have died through sheer debauchery and profligacy under thirty years of age, whereas those who resemble the mother are alive, and little contaminated even amidst all the disadvantages of evil example.

On the other hand, I am not acquainted with a single instance in which the moral and intellectual organs predominated in the stocks from which both the father and mother were descended, and also in themselves, and whose external circumstances permitted the general activity of these powers, in which the whole children did not partake of a moral and intellectual character, differing slightly in degrees of excellence one from another, but all presenting the predominance of the human over the animal faculties.

There are well-known examples of the children of ostensibly religious and moral fathers exhibiting dispositions of a very inferior description; but in all the instances of this sort that I have been able to observe, there has been in one or both parents a large development of the animal organs, which were with difficulty controlled by the moral and intellectual powers. The unfortunate child inherited the large animal development, with defective moral organs; and thus was inferior to both. The way to satisfy one's self on this point, is to examine the heads of the parents. In such cases, a large base of the brain, which is the region of the animal propensities, will be found in one or both.

Another law of the animal kingdom deserves attention, viz. that by which marriages between blood relations tend to the deterioration of the physical and mental qualities of the offspring. In Spain, kings marry their nieces, and in this country first and second cousins marry without scruple; although every philosophical physiologist will declare that this is in opposition to the institutions of nature. The 42d Number of the Phrenological Journal contains an account of an idiot in Manchester, whose parents are cousins, and one of whose sisters is likewise idiotic. His head is extremely small, particularly in the upper part of the forehead. A representation of it is here given.

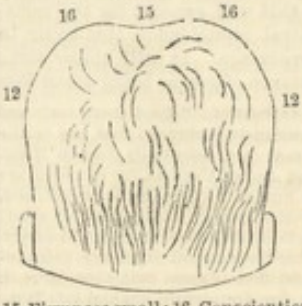
This law holds also in the vegetable kingdom. "A provision of a very simple kind, is, in some cases, made to prevent the male and female blossoms of the same plant from breeding together, this being found to hurt the breed of vegetables, just as breeding in and in does the breed of animals. It is contrived that the dust shall be shed by the male blossom before the female is ready to be affected by it, so that the impregnation must be performed by the dust of some other plant, and in this way the breed be crossed." *Objects, &c. of Science*, p. 33.

On a similar principle, it is highly advantageous in agriculture to avoid sowing grain of the same stock in constant succession on the same soil. If both the soil and plants possess great vigour, the same kind of grain may be sown twice or thrice in succession, with less perceptible deterioration than when the elements of reproduction are feeble and imperfect; and a similar rule holds good in the animal kingdom. If two near relations, uncommonly robust, and possessing very favourably developed brains, unite in marriage, their offspring may not be deteriorated *so much* below the common standard of the country as to attract particular attention, and in such cases the law of nature is supposed not to act; but it does operate; for to a law of nature there is no exception. The offspring are uniformly inferior to what they *would have been*, if the same parents had united with strangers in blood of *equal vigour and cerebral development*. Whenever there is any remarkable deficiency in parents who are related in blood, these appear in the most marked and aggravated forms in the offspring. This fact is so well known, and so easily ascertained, that I forbear to enlarge upon it.—So much for miseries arising from neglect of the organic laws in forming the *domestic compact*.

I proceed to advert to those evils which arise from overlooking the operation of the same laws in the ordinary relations of society.

How many little annoyances arise from the misconduct of servants and dependants in various departments of life; how many losses, and sometimes ruin, arise from dishonesty and knavery in confidential clerks, partners, and agents! A mercantile house of great reputation, in London, was ruined and became bankrupt, by a clerk having embezzled a large amount of funds, and absconded to America; another company in Edinburgh sustained a great loss by a similar instance of dishonesty; a company in Paisley was ruined by one of the partners having collected their assets, and eloped with them to the United States; and several bankers, and other persons in Edinburgh, suffered severely, by the conduct of an individual some time connected with the public press. It is said that depredations are constantly committed in the post-offices of the United Kingdom, although every effort is made to select persons of the best character, and the strictest vigilance is exercised over their conduct. If it be true that the talents and dispositions of individuals are influenced and indicated by the development of their brains, and that their conduct is the result of this development and of their external circumstances, including in the latter every moral and intellectual influence coming from without, it is obvious that the evils here enumerated may, to some extent, be obviated by the application of Phrenology. These misfortunes can be traced to the error of having placed human beings, decidedly deficient in moral or intellectual qualities, in situations which demanded these in a higher degree than they possessed them; and any means by which the presence or absence of these qualities could be certainly predicated, before their appointment, would go far to prevent the occurrence of the evils alluded to. The two following figures represent several of the organs most important in practical conduct in opposite states of development, and the dispositions of the individuals exactly correspond with them.

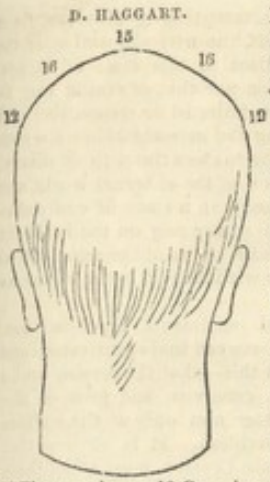
MRS H.



15. Firmness small; 16. Conscientiousness large; 12. Cautiousness full.

Mrs H. was a lady remarkable for Conscientiousness, but unsteady of purpose. It was necessary for her to have a friend, whose advice she constantly asked and followed, in order to preserve herself from yielding to every internal impulse or outward solicitation.

David Haggart was a dexterous and enter-



15 Firmness large; 16. Conscientiousness deficient; 12. Cautiousness rather large.

prising thief and pickpocket, who was executed at last for murdering the jailor of Dumfries, with a view to escape from justice.

If individuals having brains resembling that of Haggart, who was remarkable for dishonesty, should be placed in situations of trust, in which there should be presented to them temptations to deception and embezzlement which could be resisted only by strong sentiments of justice, their misconduct, sooner or later, would be almost certain, owing to the great size of their animal organs, and the deficiency of their organs of Conscientiousness. I have seen so many instances of dishonest practices in concomitance with similar combinations, that I cannot doubt of their connexion. Where external circumstances remove from persons thus constituted all temptation to pilfering, their deficient perceptions of justice will still be discernible in the laxness of their notions of morality, in their treatment of inferiors, and in their general conduct.

Again, if a person were wanted for any situation in which great decision of character, steadiness, and perseverance were necessary, and if one were chosen whose organ of Firmness resembled that of Mrs H., assuredly his employers would be disappointed. This lady, as already mentioned, was remarkable for vacillation of purpose; and I have never seen a single instance of decision of character combined with such a defect of brain as is here represented. These cases are introduced merely as examples and illustrations. The reader who wishes to pursue the subject farther, is referred to the common treatises on Phrenology and to the Phrenological Journal for additional information.

If any man were to go to sea in a boat of pasteboard, which the very fluidity of the element would dissolve, no one would be surprised at his being drowned; and, in like manner, if the Creator has so constituted the brain as to exert a great influence over the mental dispositions, and if, nevertheless, men are pleased to treat this fact with neglect and contempt, and to place individuals, naturally deficient in the moral organs, in situations where great morality is required, they have no cause to be surprised if they suffer the penalties of their own misconduct, in being plundered and defrauded.

Although I can state, from experience, that it is possible, by the aid of Phrenology, to select individuals whose moral qualities may be relied on, yet the extremely limited extent of our practical knowledge in regard to the intellectual talents that fit persons for particular duties, must be confessed. To be able to judge accurately what combination of natural talents and dispositions in an individual will best fit him for any given employment, we must have seen a variety of combinations tried in particular departments, and observed their effects. It is impossible, at least for me, to anticipate with certainty, in new cases, what these effects will be; but I have ever found nature constant; and after once discovering, by experience, an assortment of qualities suited to a particular duty, I have found no subsequent exception to the rule. Cases in which the predominance of particular regions of the brain, such as the moral and intellectual, is very decided, present fewest difficulties; although, even in them, the very deficiency of animal organs may sometimes incapacitate individuals for important stations. Where the three classes of organs, the animal, moral, and intellectual, are nearly *in equilibrio*, the most opposite results may ensue by external circumstances exciting the one or the other to decided predominance in activity, and little reliance ought to be placed on individuals thus constituted, except when temptations are removed, and strong motives to virtue presented.*

Having now adverted to calamities from external violence,—to bad health,—to unhappiness in the domestic circle, arising from ill-advised unions and viciously-disposed children,—and to the evils suffered from placing individuals, as servants, clerks, partners, or public instructors, in situations for which they are not suited by their natural qualities,—and traced all of them to infringements or neglect of the physical or organic laws, I proceed to advert to the last, and what is reckoned the greatest, of all calamities, DEATH, which itself is obviously a part of the organic law.

In the introduction, page 2, to which I refer, I have stated briefly the changes which occurred in the globe before man was introduced to inhabit it. The researches of geologists appear to shew that the world we inhabit was at first in a fluid condition; that crystalline rocks were deposited before animal or vegetable life began; that then came the lowest orders of zoophytes and of vegetables; next fishes and reptiles,—and trees in vast forests, giving origin to our present beds of coal; then quadrupeds and birds, and shells and plants, *resembling* those of the present era, but all of which, as species, have utterly perished from the earth: that next came alluvial rocks, containing bones of mammoths and other gigantic animals; and that last of all came man. Dr Buckland has shewn that certain long, rounded, stony bodies, like oblong pebbles or kidney potatoes, scattered on the shore at Lyme Regis, and frequently lying beside the bones of the saurian or lizard-like reptiles there discovered, are the dung of these animals in a fossil state. Many specimens of them contain scales, teeth, and bones of fishes, that seem to have passed undigested through the body of the animal; just as the enamel of the teeth and fragments of bone are found undigested in the dung of the ravenous hyena. Similar fossils (scientifically named coprolites) are found on the shore of the Firth of Forth, about a mile westward from Newhaven. These facts appear to shew that death, or destruction of vegetable and animal life, was an institution of nature before man became an inhabitant of the globe.†

Physiologists in general regard the organic frame of man also as containing within itself the seeds of dissolution. "The last character," says a popular author, "by which the living body is distinguished, is that of

* The prospectus of the "British Surety Company for guaranteeing the fidelity of persons employed by others," on payment of an annual premium by the persons employed, has recently appeared. Such a Company, conducted on phrenological principles, could scarcely fail of success; for by means of this science they could ascertain pretty correctly the extent of their risks. The best developed brains would be safe from dishonesty in all circumstances exclusive of disease; the worst would be secure in no circumstances in which temptation was possible; while those in whom all the three regions of the brain were *in equilibrio* would stand or fall according to their external inducements to virtue or vice. If they do not avail themselves of phrenology, they will be liable to be plundered by knaves. A combination of rogues may hire one of their own number as a confidential clerk, obtain a guarantee for a large sum, send him off to the Continent or America, pretend that he has robbed them, and compel the company to pay up the alleged loss. Phrenology would afford them pretty nearly a complete protection against such individuals. *See Testimonials presented by Sir George S. Mackenzie to Lord Glenely*, printed in the Appendix to "a System of Phrenology by George Combe."

† As, however, some of these views are disputed by geologists of eminence, I state them here merely as hypothetical illustrations of the general doctrine maintained in the text, the proper evidence of which is facts directly observed in nature in our own day.

terminating its existence by the process of death. The vital energies by which the circle of actions and reactions necessary to life is sustained, at length decline, and finally become exhausted. Inorganic bodies preserve their existence unalterably and for ever, unless some mechanical force, or some chemical agent, separate their particles or alter their composition. But, in every living body, its vital motions inevitably cease, sooner or later, from the operation of causes that are internal and inherent. Thus, to terminate its existence by death, is as distinctive of a living being as to derive its origin from a pre-existing germ."*

It is beyond the compass of philosophy to explain *why* the world was constituted in the manner here represented. I therefore make no inquiry why death was instituted, and refer, of course, only to the dissolution of organized bodies, and not at all to the state of the soul or mind after its separation from the body.

Let us first view the dissolution of the body abstractedly from personal considerations, as a mere natural arrangement. Death appears to be a result of the constitution of all organized beings; for the very definition of the genus is, that the individuals grow, attain maturity, decay, and die. The human imagination cannot conceive how the former part of this series of movements could exist without the latter, as long as space is necessary to corporeal existence. If all the vegetable and animal productions of nature, from creation downwards, had grown, attained maturity, and there remained, the world would not have been capable of containing the thousandth part of them. On this earth, therefore, decaying and dying appear indispensably necessary to admit of reproduction and growth. Viewed abstractedly, then, organized beings live as long as health and vigour continue; but they are subjected to a process of decay, which gradually impairs all their functions, and at last terminates in their dissolution. Now, in the vegetable world, the effect of this law is, to surround us with young trees, in place of everlasting stately full grown forests, standing forth in awful majesty, without variation in leaf or bough;—with the vernal bloom of spring, changing gracefully into the vigour of summer and the maturity of autumn;—with the rose, first simply and delicately budding, then luxuriant and lovely in its perfect evolution. In short, when we advert to the law of death, as instituted in the vegetable kingdom, and as related to our own faculties of Ideality and Wonder, which desire the beautiful and the new, and delight in the very changes which death introduces, we without hesitation exclaim, that all is wisely and wonderfully made. Turning again to the animal kingdom, we discover that the same fundamental principle prevails. Death removes the old and decayed, and the organic law introduces in their place the young, the gay, and the vigorous, to tread the stage of life with fresh agility and delight.

This succession in existence may readily be granted to be beneficial to the young; but, at first sight, it appears the opposite of benevolent to the old. To have lived at all, is felt as giving a right to continue to live; and the question arises, How can the institution of death, as the result of the organic law, be reconciled with benevolence and justice?

I am aware that, theologically, death is regarded as the punishment of sin, and that the attempt to reconcile our minds to it by reason is objected to, as at once futile and dangerous. But I beg leave to observe, that death prevails among the lower animals, not only by natural decay and the operation of physical forces, but by the express institution of carnivorous creatures destined to prey on living beings; that man himself is carnivorous, and obviously framed by the Creator for a scene of death; that the inherent qualities of his organic constitution, imply death as its termination; and that if these facts be admitted on the one hand, and we are prohibited, on the other, from attempting to discover, from the records of creation itself, the wise adaptation of the human feelings and intellect to this state of things, neither the cause of religion nor that of reason can be benefited. Facts cannot be disputed or concealed; and the only effect of excluding the investigation on which I propose to enter, would be to close the path of reason, and to leave the constitution of the external world and of the human mind apparently in a state of contradiction to each other. Let us rather rely on the inherent consistency of all truths; and on sound conclusions in reason being in accordance with correct interpretations of Scripture.

In treating of the moral sentiments, I pointed out, that the grand distinction between these sentiments and the propensities consists in this—that the former are in their nature disinterested, generous, and fond of the general good, while the latter aim only at the welfare or gratification of the individual. It is obvious that death, as an institution of the Creator, must affect these two classes of faculties in the most different manner. A being endowed only with propensities and intellect, and enabled, by the latter, to discover death and its consequences, would probably regard it as an appalling visitation. It would see in it only the utter extinction of enjoyment to itself; for, although it perceived existence conferred on other beings, who would enjoy life after its removal from the scene, this would afford it no consolation, in consequence of its wanting all the faculties which derive pleasure from disinterestedly contemplating the enjoyments of other creatures. The lower animals, then, whose whole being is composed of the inferior propensities and several *knowing* faculties, would probably see death, if they could at all anticipate it, in this light. It would appear to them as the extinguisher of every pleasure which they had ever felt; and apparently the bare prospect of it would render their lives so wretched, that nothing could alleviate the depressing gloom with which the habitual consciousness of it would inspire them. But, by depriving them of *reflective* faculties, the Creator has kindly and effectually withdrawn them from this evil. He has by this means rendered them completely blind to its existence. There is not the least reason to believe, that any one of the lower animals, while in health and vigour, has the slightest conception that it is a mortal creature, any more than a tree has that it will die. In consequence, it lives in as full enjoyment of the present, as if it were assured of every agreeable sensation being eternal. Death always takes the individual by surprise, whether it comes in the form of violence suppressing life in youth, or of slow decay by age; and really operates as the removal of one existence to make room for another, without consciousness of the loss in the one which dies. Let us, however, trace the operation of death, in regard to the lower animals, a little more in detail.

Philosophy, as already remarked, cannot explain why death was instituted at first; but, according to the views maintained in this work, we should expect to find it connected with, and regulated by, benevolence and justice,—that is to say, that it should not be inflicted for the sole purpose of extinguishing the life of individuals, to their damage, without any other result; but that the general system under which it takes place should be, on the whole, favourable to the enjoyment not only of the race, but of each individual animal while life is given. And this accordingly is the fact. Violent death, and the devouring of one animal by another, are not purely benevolent; because pure benevolence would never inflict pain: but they are instances of destruction leading to beneficial results; that is, wherever death is introduced under the institutions of nature, it has been preceded by enjoyment arising out of it, to the very animals which are to become the subjects of it. While the world is calculated to support only a limited number of living creatures, the lower animals

* Animal Physiology, p. 7; Library of Useful Knowledge.

have received from nature powers of reproduction far beyond what are necessary to supply the waste of natural decay, and they do not possess intellect sufficient to restrain their numbers within the limits of their means of subsistence. Herbivorous animals, in particular, are exceedingly prolific, and yet the supply of vegetable food is limited. Hence, after multiplication for a few years, extensive starvation, the most painful and lingering of all deaths, and the most detrimental to the race, would inevitably ensue: but carnivorous animals have been instituted who kill and eat them; and, by this means, not only do carnivorous animals reap the pleasures of life, but the numbers of the herbivorous are restrained within such limits that the individuals among them enjoy existence while they live.* The destroyers, again, are limited in their turn: the moment they become too numerous, and carry their devastations too far, their food fails them, and they die of starvation, or, in their conflicts for the supplies that remain, destroy one another. Nature seems averse from inflicting death extensively by starvation, probably because it impairs the constitution long before it extinguishes life, and has the tendency to produce degeneracy in the race. It may be remarked also, speculatively, that herbivorous animals must have existed in considerable numbers before the carnivorous began to exercise their functions; for many of the former must die, that one of the latter may live. If a single sheep and a single tiger had been placed together at first, the tiger would have eaten up the sheep at a few meals, and afterwards died itself of starvation.

There is reason to believe, that, in the state of nature, death is attended with little suffering to the lower creatures. In natural decay, the organs are worn out by mere age, and the animal sinks into gradual insensibility, unconscious that dissolution awaits it. Farther, the wolf, the tiger, the lion, and other beasts of prey instituted by the Creator as instruments of violent death, are provided, in addition to Destructiveness, with large organs of Cautiousness and Secretiveness, which prompt them to steal upon their victims with the unexpected suddenness of a mandate of annihilation; and they are also impelled to inflict death in the most instantaneous and least painful method. The tiger and lion spring from their covers with the rapidity of the thunderbolt, and one blow of their tremendous paws, inflicted at the junction of the head with the neck, produces instantaneous death. The eagle is taught to strike its sharp beak into the spine of the birds which it devours, and their agony endures scarcely for an instant. It has been objected that the cat plays with the unhappy mouse, and prolongs its tortures; but the cat that does so is the pampered and well-fed inhabitant of a kitchen; the cat of nature is too eager to devour, to indulge in such luxurious gratifications of Destructiveness and Secretiveness. It kills in a moment, and eats. Here, then, is a regularly organized process for withdrawing individuals among the lower animals from existence, almost by a fiat of destruction, which permits the comfortable subsistence of the creatures while they live, and makes way for a succession of new occupants.† "Nature," says St Pierre, "does nothing in vain: she intends few animals to die of old age; and I believe that she has permitted to none except man to run the entire course of life, because in his case alone can old age be useful to the race. What would be the advantage of old animals, incapable of reflection, to a posterity born with instincts holding the place of experience; and how, on the other hand, would decrepit parents find support among offspring which instinctively leave them whenever they are able to swim, to fly, or to run? Old age would prove to such creatures a burden; of which beasts of prey mercifully deliver them."

Man, in his mode of putting the lower creatures to death, is not so tender as beasts of prey: but he might be so. If the sheep were guillotined, and not maltreated before its execution, it would never know that it had ceased to live. And, by the law which I have explained, man does not with impunity add one unnecessary pang to the death of the inferior animals. In the butcher who inflicts torments on calves, sheep, and cattle, while driving them to slaughter,—and who bleeds them to death by successive stages, prolonged for days to whiten their flesh,—the animal faculties of Destructiveness, Acquisitiveness, and Self-Esteem, predominate so decidedly in activity over the moral powers, that he is necessarily excluded from the enjoyments attendant on the supremacy of the human faculties: He, besides, goes into society under the influence of the same low combination, and suffers at every hand animal retaliation; so that he does not escape with impunity for his outrages against the moral law.

Here, then, we perceive nothing malevolent in the institution of death, in so far as regards the lower animals. A pang certainly does attend it; but while Destructiveness must be recognised in the pain, Benevolence is equally perceptible in its effects.

No remedial process is instituted by nature to repair injuries sustained by purely physical objects. If a mirror fall and be smashed, it remains ever after in fragments; if a ship sink, it lies at the bottom of the ocean, chained down by the law of gravitation. Under the organic law, on the other hand, a distinct remedial process is established. If a tree be blown down, every root that remains in the ground will increase its exertions to preserve its life; if a branch be lopped off, new branches will shoot out in its place; if a leg in an animal be broken, the bone will reunite; if a muscle be severed, it will grow together; if an artery be obliterated, the neighbouring arteries will enlarge their dimensions, and perform its duty. The Creator, however, not to encourage animals to abuse this benevolent institution, has established pain as an attendant on infringement of the organic law, and made them suffer for the violation of it, even while he restores them to health. It is under this law that death has received its pangs. Instant death is not attended with pain of any perceptible duration; and it is only when a lingering death occurs in youth and middle age, that the suffering is severe. Dissolution, however, does not occur at these periods *as a direct and intentional result of the organic laws*, but as the consequence of infringement of them. Under the fair and legitimate operation of these laws, the individual whose constitution was at first sound, and whose life has been in accordance with their dictates, will live till old age fairly wears out his organized frame, and then the pang of expiration is little perceptible.*

* St Pierre states this argument forcibly.—"By their production without restraint," says he, "creatures would be multiplied beyond all limits, till even the globe itself could not contain them. The preservation of every individual produced, would lead to ultimate destruction of the species. Some will answer, that the animals might live always, if they observed a proportion suitable to the territory which they inhabited. But, according to this supposition, they must at last cease to multiply; and then adieu to the loves and alliances, the building of nests, and all the harmonies which reign in their nature."—*Etude de la Nature*, Paris, 1791, p. 17.

† Mr H. C. Watson disputes the views stated in the text, and maintains that "innumerable creatures, after being crushed, lacerated, or otherwise injured by stronger animals, are left to a lingering death by starvation, or other slowly completed consequences of the injuries which they have received." "The butcher-bird impales living insects upon thorns, and leaves them to die."—Phren. Jour. vol. xiii. p. 363. The reader must decide which of these views best accords with the general system of nature.

* The following table is copied from an interesting article by Mr William Fraser, on the History and Constitution of Benefit or Friendly Societies, published in the Edinburgh New Philosophical Journal for October 1827, and is deduced from Returns by Friendly Societies in Scotland for various years, from 1750 to 1821. It shews how much sickness in-

This view of our constitution is objected to by some persons, because disease appears to them to invade our bodies, and after a time either to end in death or to disappear, without any organic cause being discoverable. On this subject I would observe, that there is a vast difference between the uncertain and the unascertained. It is now generally admitted that all the movements of matter are regulated by laws, and that the motions are never uncertain, although the laws in virtue of which they occur, may, in some instances, be unascertained. The revolutions of the planets, for example, are fully understood, while those of some of the comets are as yet unknown; but no philosopher imagines that the latter are uncertain. The minutest drop of water that descends the mighty Fall of Niagara, is regulated in all its movements by definite laws—whether it rise in mist, and float in the atmosphere to distant regions, there to descend as rain; or be absorbed by a neighbouring shrub, and reappear as an atom in a blossom adorning the Canadian shore; or be drunk up by a living creature, and sent into the wonderful circuit of its blood; or become a portion of an oak, which, at a future time, shall career over the ocean as a ship. Nothing can be less ascertained, or probably less ascertainable by mortal study, than the motions of such an atom; but every philosopher will, without a moment's hesitation, concede that not one of them is uncertain.* A philosophic understanding will extend the same conviction to the events evolved in every department of nature. In many instances our knowledge may be so imperfect, that we are incapable of unfolding the chain of connection between a disease and its organic cause; but he is no philosopher who doubts the *reality* of the connection.

One reason of the obscurity that prevails on this subject, in the minds of persons not medically educated, is ignorance of the structure and functions of the body; and another is, that diseases appear under two very distinct forms—structural and functional—only the first of which is understood, by common observers, to constitute a proper organic malady. If an arrow be shot into the eye, derangement of the structure will follow; and the most determined opponent of the natural laws will at once admit the connection between the blindness which ensues, and the lesion of the organ. But if a watchmaker or an optical-instrument-maker, by long continued and excessive exertion of the eye, become blind, the disease is called functional; the function, from its organ being overwrought, cannot be successfully executed, but frequently no alteration of structure can be perceived. No philosophic physiologist, however, doubts that there *is* a change in the structure, corresponding to the functional derangement, although human observation cannot detect it. He never says that it is nonsense to assert that the patient has become blind in consequence of infringement of the organic laws. It is one of these laws that the eyes shall be exercised moderately, and it is a breach of that law to strain them to excess. The same principle applies to a large number of diseases occurring under the organic laws. Imperfections in the tone, structure, or proportions of certain organs, may exist at birth, so hidden by their situation, or so slight, as not to be readily perceptible, but which are not on that account the less real and important; or deviations may be made gradually and imperceptibly from the proper and healthy exercise of the functions; and from one or other cause disease may invade the constitution. Religious persons term diseases arising from such hidden causes, dispensations of God's providence; the careless name them unaccountable events; but the enlightened physician views them as the results of imperfect or excessive action of the organs; and never doubts that they have been caused by deviations from the laws which the Creator has prescribed for the regulation of the animal economy. The objection that the doctrine of the organic laws is unsound, because diseases come and go without uneducated persons being able to trace their causes, has not a shadow of philosophy to support it. I may err in my exposition of these laws; but I hope that I do not err in stating that neither disease nor death, in early and middle life, can take place under the ordinary administration of Providence, except when the organic laws have been infringed.

The pains of premature death, then, are the punishments of infringement of these laws; and the object of subjecting us to them probably is to impress upon us the necessity of obeying the laws that we may live, and to prevent our abusing that capacity of remedial action which is inherent to a certain extent in our constitution.

Let us now view death as an institution appointed to man. If it be true, that the constitution of man, when sound in its elements, and preserved in accordance with the organic laws, is fairly calculated to endure in health from infancy to old age; and that death, when it occurs during the early or middle periods of life, is the consequence of departure from these laws; it follows, that, even in premature death, a benevolent principle is discernible. Although the capacity of remedial action allows animals to recover from moderate injuries, yet the very nature of the organic laws must place a limit to it. If life could be preserved, and health be restored, after the brain had been blown to atoms by a bomb-shell, as effectually as a broken leg and a cut finger can be healed, this would be an abrogation of the organic laws, and of all the curbs which they impose on the lower propensities; and all the incitements which they afford to the activity of the higher sentiments and intellect would have been lost. The limit, then, is this,—that any disobedience, from the effects of which restoration is permitted, must be moderate in extent, and must not involve, to a great degree, any organ essential to life, such as the brain, lungs, stomach, or intestines. The maintenance of the law, with all its advantages, requires that restoration from grievous derangements of these organs should not be permitted. When we reflect on the transmission of hereditary qualities to children, we perceive benevolence to the race, in the institution which cuts short the life of an individual in whose person disease of essential organs has exceeded the limits of the remedial process: it prevents the extension of the punishment of his errors over an innumerable posterity. In premature death, then, we see two objects accomplished; *first*, the individual sufferer is withdrawn from agonies which could serve no beneficial end to himself—he has transgressed the limits of recovery, and continued life would be protracted misery: and, *secondly*, the race is guaranteed against the future transmission of his disease by hereditary descent.

The disciple of Mr Owen formerly alluded to, who had grievously transgressed the organic law and suffered a punishment of equal intensity, observed, when in the midst of his agony,—"Philosophers have urged

* I owe this forcible illustration to Dr Chalmers, having heard it in one of his Lectures.

creases with age, and how little there is of it in youth, even in the present disordered state of human conduct. We may expect the quantity to decrease, at all ages, in proportion to the increase of obedience to the organic laws. It is chiefly in advanced life, when the constitution has lost a portion of its vigour, that the accumulated effects of disobedience become apparent.

Average Annual Sickness of each Individual.

Age.	Weeks and Decimals.	Weeks.	Days.	Hours.	Proportion of Sick Members.
Under 20	0.3797	0	2	16	1 in 136.95
20–30	0.5916	0	4	3	1 „ 87.89
30–40	0.6865	0	4	19	1 „ 75.74
40–50	1.0273	1	0	4	1 „ 50.61
50–60	1.8806	1	6	3	1 „ 27,65
60–70	5.6337	5	4	10	1 „ 9.23
Above 70	16.5417	16	3	19	1 „ 3.14

the institution of death as an argument against divine goodness; but not one of them could have experienced, for five minutes, the pain which I now endure, without looking on it as a merciful dispensation. I have departed from the natural laws, and suffered the punishment; and I see in death only the Creator's benevolent hand, stretched out to terminate my agonies when they cease to serve any beneficial end." On this principle, the death of a feeble and sickly child is an event of mercy to it. It withdraws a being, in whose person the organic laws have been violated, from useless suffering; cutting short, thereby, also the transmissions of its imperfections to posterity. If, then, pain and disease, as punishments for transgressing the organic laws, be founded in benevolence and wisdom; and if death, in the early and middle periods of life, be an arrangement for withdrawing the transgressor from farther suffering, after return to obedience is impossible, and for protecting the race from the consequences of his errors, it also is in itself wise and benevolent.

This, then, leaves only *death in old age* as a natural and unavoidable institution of the Creator. It will not be denied, that, if old persons, when their powers of enjoyment are fairly exhausted, and their cup of pleasure is full, could be removed from this world, as we have supposed the lower animals to be, in an instant, and without pain or consciousness, to make way for a fresh and vigorous offspring, about to run the career which the old have terminated, there would be no lack of benevolence and justice in the arrangement. At present, while we live in ignorance and habitual neglect of the organic laws, death probably comes upon us with more pain and agony, even in advanced life, than would be its legitimate accompaniment if we placed ourselves in accordance with them; so that we are not now in a condition to ascertain the *natural* quantity of pain necessarily attendant on death. Judging from such facts as have been observed, we may infer, that the close of a long life, founded at first, and afterwards spent, in accordance with the Creator's laws, would not be accompanied with great organic suffering, but that an insensible decay would steal upon the frame.

Be this, however, as it may, I observe, in the next place, that, as the Creator has bestowed on man, animal faculties that fear death, and reason that carries home to him the conviction that he must die, it is an interesting inquiry, whether He has provided any *natural* means of relief from the consequences of this combination of terrors. "And what thinkest thou," said Socrates to Aristodemus, "of this continual love of life, this dread of dissolution, which takes possession of us from the moment that we are conscious of existence?" "I think of it," answered he, "as the means employed by the same great and wise artist, deliberately determined to preserve what he has made." Lord Byron strongly expressed the same opinion, and was struck with the energetic efforts which he instinctively made, in a moment of danger, to preserve his life, although in his hours of calm reflection he felt so unhappy that he wished to die. There are reasons for believing not only that the love of life is a special instinct, but that it is connected with a particular organ, which is supposed to be situate at the base of the brain; and that, *cæteris paribus*, the feeling varies in intensity in different individuals, according to the size of the organ. I have ascertained, from numerous confidential communications, as well as by observation, that even when external circumstances are equally prosperous, there are great differences in the desire of life in different minds. Some persons have assured me, that death, viewed even as the extinction of being, and without reference to a future state, did not appear to them in the least appalling, or calculated, when contemplated as their certain fate, to impair the enjoyment of life; and these were not profligate men, whose vices might make them desire annihilation as preferable to future punishment, but persons of pure lives and pious dispositions. This is so different from the feelings experienced by ordinary persons, that I have been led to ascribe it to a very small development of the organ of the Love of Life in these individuals. A medical gentleman who was attached to the native army in India, informed me, that in many of the Hindoos the love of life was by no means strong. On the contrary, it was frequently necessary to compel them to make even moderate exertions, quite within the compass of their strength, to avoid death. That part of the base of the brain which lies between the ear and the anterior lobe, is generally narrow, measuring across the head, in such individuals. Farther, if there be an organ for the love of life, the vivacity of the instinct will diminish in proportion as the organ decays; so that age, which induces the certain approach of death, will, by impairing the organ, strip him, in a corresponding degree, of his terrors. The apparent exceptions to this rule will be found in cases in which this organ predominates in size and activity, and preserves an ascendency over the others even in decay.

These ideas, however, are thrown out only as speculations, suggested by the facts before described. Whatever may be thought of them, it is certain that the Creator has bestowed moral sentiments on man, and arranged the theatre of his existence on the principles of their supremacy; and these, when duly cultivated and enlightened, are calculated to save him from the moral terrors of death.

1*st*, It is obvious that, in consequence of the institution of death, Amativeness and Philoprogenitiveness are provided with opportunities of gratification. If the same individuals had lived here for ever, there could have been no field for the enjoyment that flows from the sexual union and the rearing of offspring. The very existence of these propensities shews, that the production and rearing of young form part of the design of creation; and the successive production of young appears necessarily to imply the removal of the old.

2*d*, Had things been otherwise arranged, the other faculties would have been limited in their gratifications. Conceive, for a moment, how much exercise is afforded to our intellectual and moral powers, in acquiring and communicating knowledge to the young, and in providing for their enjoyments—also, what a delightful exercise of the higher sentiments is implied in the intercourse between the aged and the young; all which pleasures would have been unknown had there been no young in existence.

3*d*, Constituted as man is, the law of a succession of individuals withdraws beings whose physical and mental constitutions have run their course and become impaired in sensibility, and substitutes in their place fresh and vigorous minds and bodies, far better adapted for the enjoyment of creation.

4*th*, If I am right in the position that the organic laws transmit to offspring, in an increasing ratio, the qualities most active in the parents, the law of succession provides for a higher degree of improvement in the race than could have been reached, supposing the permanency of a single generation, possessing the present human constitution, to have been the rule.

Let us inquire, then, how the moral sentiments are affected by death in old age, as a natural institution.

Benevolence, glowing with a disinterested desire for the increase and diffusion of enjoyment, utters no complaint against death in old age, as a surrender of morta life by a being impaired in its capacity for usefulness and pleasure, to make way for one fresh and vigorous in all its powers, and fitted to carry forward, to a higher point of improvement, every beneficial measure previously begun. Conscientiousness, if thoroughly enlightened, perceives no infringement of justice in the calling on a guest, satiated with enjoyment, to retire from the banquet, so as to permit a stranger with a keener and more youthful appetite to partake; an

Veneration, when instructed by intellect that this is the institution of the Creator, and made acquainted with its objects, bows in humble acquiescence to the law. Now, if these powers have acquired, in any individual, that complete supremacy which they are clearly intended to hold, he will be placed by them as much above the terror of death as a natural institution, as the lower animals are by being ignorant of its existence. And unless the case were so, man would, by the very knowledge of death, be rendered, during his whole life, more miserable than they.

In these observations, I have said nothing of the prospect of a future existence as a palliative of the evils of dissolution, because I was bound to regard death, in the first instance, as the result of the organic law, and to treat of it as such. But no one who considers that the prospect of a happy life to come, is directly addressed to Veneration, Hope, Wonder, Benevolence, and Intellect, can fail to perceive that this consolation also is clearly founded on the principle, that the moral sentiments are intended by the Creator to protect man from the terrors of death.

The true view of death, therefore, as a natural institution, is, that it is an essential part of the system of organization; that birth, growth, and arrival at maturity, as completely imply decay and death in old age, as morning and noon imply evening and night, as spring and summer imply harvest, or as the source of a river implies its termination. Besides, organized beings are constituted by the Creator to be the food of other organized beings, so that some must die that others may live. Man, for instance, cannot live on stones, on earth, or water, which are not organized, but must feed on vegetable and animal substances; so that death is as much, and as essentially, an inherent attribute of organization as life itself. If the same animals and men had been destined for a permanent occupation of the earth, we may presume, from analogy, that God,—instead of creating a primitive pair of each, and endowing them with extensive powers of reproduction, with a view to their ushering young beings into existence,—would have furnished the world with a definite complement of living creatures, perfect at first in all their parts and functions, and that these would have remained without diminution and without increase.

To prevent, however, all chance of being misapprehended, I repeat, that I do not at all allude to the state of the soul or mind after death, but merely to the dissolution of organized bodies; that, according to the soundest view which I am able to obtain of the natural law, pain and death during youth and middle age, in the human species, are consequences of departure from the Creator's laws,—while death in old age, by insensible decay, is an essential and apparently indispensable part of the system of organic existence; that this arrangement admits of the succession of individuals, substituting the young and vigorous for the feeble and decayed; that it is directly the means by which organized beings live, and indirectly the means by which Amativeness, Philoprogenitiveness, and a variety of our other faculties obtain gratification; that it admits of the race ascending in the scale of improvement, both in their organic and in their mental qualities; and finally, that the moral sentiments, when supreme in activity, and enlightened by intellect, which perceives its design and consequences, are calculated to place man in harmony with it; while religion addresses its consolations to the same faculties, and completes what reason leaves undone.

If the views now unfolded be correct, death in old age will never be abolished as long as man continues an organized being; but pain and the frequency of premature death will decrease in the exact ratio of his obedience to the physical and organic laws. It is interesting to observe that there is already some evidence of this process being begun. About seventy years ago, tables of the average duration of life in England were compiled for the use of the Life Insurance Companies; and from them it appears to have been then 28 years—that is, 1000 persons being born, and the years of their respective lives being added together, and divided by 1000, the result was 28 to each. By recent tables, it appears that the average is now 32 years to each; that is to say, in consequence of superior morality, cleanliness, knowledge, and general obedience to the Creator's laws, fewer individuals now perish in infancy, youth, and middle age, than perished in these conditions seventy years ago. Some persons have said, that the difference arises from errors in compiling the old tables, and that the superior habits of the people are not the cause. It is probable that there may be errors in the old tables, but it is also natural that increasing knowledge and stricter obedience to the organic laws should diminish the number of premature deaths. If this idea be correct, the average duration of life should go on increasing; and our successors, two centuries hence, may probably attain to an average of 40 years, and then ascribe to errors in our tables the present low average of 32.*

SECT. III.—CALAMITIES ARISING FROM INFRINGEMENT OF THE MORAL LAW.

We now proceed to consider the Moral Law, which is proclaimed by the whole faculties acting harmoniously; or, in cases of conflict, by the higher sentiments and intellect acting harmoniously, and holding the animal faculties in subjection. In surveying the moral and religious codes of different nations, and the moral and religious opinions of different philosophers, every reflecting mind must have been struck with their diversity. Phrenology, by demonstrating the different combinations in power and activity of which the faculties are susceptible, enables us to account for these varieties of sentiment. A code of morality framed by a legislator in whom the animal propensities were strong and the moral sentiments weak, would be very different from one instituted by another lawgiver, in whom this combination was reversed. In like manner, a system of religion, founded by an individual in whom Destructiveness, Wonder, and Cautiousness were very large, and Veneration, Benevolence, and Conscientiousness deficient, would present views of the Supreme Being widely different from those which would be promulgated by a person in whom the last three faculties and intellect decidedly predominated. The particular code of morality and religion *which is most in harmony with the whole faculties of the individual*, will necessarily appear to him to be the best, *while he refers only to the dictates of his individual mind as the standard of right and wrong*. But if we shew, that when several faculties conflict, the *scheme of external creation is arranged in harmony with certain principles, in preference to others*, so that enjoyment flows upon the individual from without when his conduct is in conformity with some, and that evil overtakes him when he resigns himself to others, we shall prove that the former is the morality and religion established by the Creator, and that individual men, who support codes differing from His, must necessarily be deluded by imperfections in their own minds. That constitution of mind, also, may be pronounced to be the best, which harmonizes most completely with the morality and religion established by the Creator. In this view, *morality becomes a science*, and departures from its dictates may be demonstrated to be practical follies, injurious to the interest and happiness of the individual.

Dugald Stewart has most justly remarked, that "the importance of agriculture and of religious toleration to the prosperity of states, the criminal impolicy of thwarting the kind arrangements of Providence by restraints upon commerce, and the duty of legislators *to study the laws of the moral world as the groundwork and standard*

* See Appendix, No. IX.

of their own, appear, to minds unsophisticated by inveterate prejudices, as approaching nearly to the class of axioms;—yet, how much ingenious and refined discussion has been employed, even in our own times, to combat the prejudices which everywhere continue to struggle against them; and how remote does the period yet seem, when there is any probability that these prejudices will be completely abandoned!"* The great cause of the long continuance of these prejudices, is the want of an intelligible and practical philosophy of morals. Before ordinary minds can perceive that the world is really governed by divine laws, they must become acquainted with, *first*, the nature of man, physical, animal, moral, and intellectual; *secondly*, the relations of the different parts of that nature to each other; and, *thirdly*, the relationship of the whole to God and external objects. The present treatise is an attempt (a very feeble and imperfect one indeed) to arrive, by the aid of phrenology, at a demonstration of morality as a science. The interests dealt with in the investigation are so elevating, and the effort itself is so delightful, that the attempt carries its own reward, however unsuccessful in its results. I am not without hope, that if phrenology, as the science of mind, and the doctrine of the natural laws, were taught to the people as part of their ordinary education, the removal of these prejudices would be considerably accelerated. This instruction may be postponed; but if the views maintained in this work be sound, it will in time be communicated to the young.

Assuming, then, that, in cases of conflict among the faculties of the mind, the higher sentiments and intellect hold the natural supremacy, I shall endeavour to shew, that obedience to the dictates of these powers is rewarded with pleasing emotions in the mental faculties themselves, and with the most beneficial external consequences; whereas disobedience is followed by deprivation of these emotions, by painful feelings within the mind, and by much external evil.

First, Obedience is accompanied by pleasing emotions in the faculties. It is scarcely necessary to dwell on the circumstance, that every propensity, sentiment, and intellectual faculty, when gratified in harmony with all the rest, is a fountain of pleasure. How many exquisite thrills of joy arise from Philoprogenitiveness, Adhesiveness, Acquisitiveness, Constructiveness, Love of Approbation, and Self-Esteem, when gratified in accordance with the moral sentiments! Who that has ever poured forth the aspirations of Hope, Ideality, Wonder, and Veneration, directed to an object in whom Intellect and Conscientiousness also rejoiced, has not experienced the deep delight of such an exercise? And who is a stranger to the grateful pleasures attending an active Benevolence? Turning to the intellect, what pleasures are afforded by the scenery of nature, by painting, poetry, and music, to those who possess the combination of faculties suited to these objects! And how rich a feast does philosophy yield to those who possess large reflective organs, combined with Concentrativeness and Conscientiousness! The reader is requested, therefore, to keep steadily in view, that these exquisite rewards are attached by the Creator to the active exercise of our faculties in accordance with the moral law; and that one punishment, clear, obvious, and undeniable, inflicted on those who neglect or infringe that law, is *deprivation* of these pleasures. This is a consideration very little attended to; because men, in general, live in such habitual neglect of the moral law, that they have only a very partial experience of its rewards, and do not know the enjoyments they are deprived of by its infringement. Before its full measure can be judged of, the mind must be instructed in its own constitution, in that of external objects, and in the relationship established between it and them, and between it and the Creator. Until a tolerably distinct perception of these truths be obtained, the faculties cannot enjoy repose, nor act in full vigour and harmony: while, for example, our forefathers regarded the marsh fevers to which they were subjected in consequence of deficient drainage in their fields,—and the outrages on person and property, attendant on the wars waged by the English against the Scots, or by one feudal lord against another, on their own soil,—not as punishments for particular infringements of the organic and moral laws, to be removed by obedience to these laws, but as inscrutable dispensations of God's providence, which it behoved them meekly to endure, but which it was impossible for them to avert, —the full enjoyment which the moral and intellectual faculties were fairly calculated to afford, could not be experienced. Benevolence would pine in dissatisfaction; Veneration would flag in its devotions; and Conscientiousness would suggest endless surmises of disorder and injustice, in a scheme of creation under which such evils occurred and were left without a remedy:—in short, the full tide of moral, religious, and intellectual enjoyment could not possibly flow, until views more in accordance with the constitution and desires of the moral faculties were obtained. The same evil still afflicts mankind to a prodigious extent. How is it possible for the Hindoo, Mussulman, Chinese, and savage American, while they continue to worship deities whose qualities outrage Benevolence, Veneration, and Conscientiousness, and while they remain in profound ignorance of almost all the Creator's natural institutions, in consequence of infringing which they suffer punishment without ceasing—how is it possible for such men to form even a conception of the gratifications which the moral and intellectual nature of man is calculated to enjoy, when exercised in harmony with the Creator's true character and institutions? This operation of the moral law is not the less real because many persons do not recognise it. Sight is not a less excellent gift to those who see, because some men born blind have no conception of the extent of pleasure and advantage from which the want of it cuts them off.

The attributes of the Creator may be inferred from His works; but it is obvious that, to arrive at the soundest views, we must know his institutions thoroughly. To a grossly ignorant people, who suffer hourly from transgression of his laws, the character of the Deity will appear more mysterious and severe than to enlightened men, who trace the principles of his government, and who, by observing his laws, avoid the penalties of infringing them. His attributes will appear to human apprehension, more and more perfect and exalted, in proportion as his works shall be understood. The low and miserable conceptions of God formed by the vulgar among the Greeks and Romans, were the reflections of their own ignorance of natural, moral, and political science. The discovery and improvement of phrenology must necessarily have a great effect on natural religion. Before phrenology was known, the moral and intellectual constitution of man was unascertained: in consequence, the relations of external nature towards it could not be competently judged of; and, while these were involved in obscurity, many of the ways of Providence must have appeared mysterious and severe, which in themselves were lucid and benevolent. Again, as bodily suffering and mental perplexity would bear a proportion to this ignorance, the character of God would appear to the natural eye in that condition, much more unfavourable than it will seem after these clouds of darkness shall have passed away.

Some persons, in their great concernment about a future life, are prone to overlook the practical direction of the mind in the present. When we consider the nature and objects of the mental faculties, we perceive that a great number of them have the most obvious and undeniable reference to this life: for example, Amativeness, Philoprogenitiveness, Combativeness, Destructiveness, Acquisitiveness, Secretiveness, Cautiousness, Self-Esteem, and Love of Approbation, with Size

* Prelim. Dissert. to Supp. Encyc. Brit. p. 127.

Form, Colouring, Weight, Tune, Wit, and probably other faculties, stand in such evident relationship to this particular world, with its moral and physical arrangements, that if they were not capable of legitimate application here, it would be difficult to assign a reason for their being bestowed on us. We possess also Benevolence, Veneration, Hope, Ideality, Wonder, Conscientiousness, and Reflecting Intellect, all of which appear to be particularly adapted to a higher sphere. But the important consideration is, that here on earth these two sets of faculties are combined; and, on the same principle that led Sir Isaac Newton to infer the combustibility of the diamond, I am disposed to expect that the external world, when its constitution and relations shall be sufficiently understood, will be found to be in harmony with all our faculties,—and that of course the character of the Deity, as unfolded by the works of creation, will more and more gratify our moral and intellectual powers, in proportion as knowledge advances. The structure of the eye is admirably adapted to the laws of light, that of the ear to the laws of sound, and that of the muscles to the laws of gravitation; and it would be strange if our mental constitution were not as wisely adapted to the general order of the external world.

The principle is universal, and admits of no exception, that want of power and activity in every faculty is attended with deprivation of the pleasures attendant on its vivacious exercise. He who is so deficient in Tune that he cannot distinguish melody, is cut off from a vast source of gratification enjoyed by those who possess that organ in a state of vigour and high cultivation; and the same principle holds good in the case of every other organ and faculty. Criminals and profligates of every description, therefore, from the very constitution of their nature, are excluded from great enjoyments attendant on virtue; and this is the *first* natural punishment to which they are inevitably liable. Persons, also, who are ignorant of the constitution of their own minds, and the relations among external objects, not only suffer many direct evils on this account, but, through the consequent inactivity of their faculties, are, besides, deprived of many exalted enjoyments. The works of creation, and the character of the Deity, are the legitimate objects of contemplation to our highest powers; and he who is blind to their qualities, loses nearly the whole benefit of his moral and intellectual nature. If there be any one to whom these gratifications are unknown, or appear trivial, either he must, to a very considerable degree, be still under the dominion of the animal propensities, or his views of the Creator's character and institutions must not harmonize with the natural dictates of the moral sentiments and intellect. The custom of teaching children to regard with the highest admiration, the literature and history of the Greeks and Romans, stained with outrages condemned by all the superior faculties of man, and of thereby diverting their minds from the study of the Creator and his works, has had a most pernicious effect on the views entertained of this world by many excellent and intellectual individuals. The achievements of barbarous men engage that attention which might be more profitably bestowed on the glorious designs of God: We need not be surprised that no satisfaction to the moral sentiments is experienced while such a course of education is pursued.

But, in the *second* place, as the world is arranged on the principle of the supremacy of the moral sentiments and intellect, in cases of conflict among the faculties, observance of the moral law is attended with external advantages, and infringement of it with evil consequences; and from this constitution arises the second natural punishment of immoral conduct.

Let us trace the advantages of obedience.—In the domestic circle, if we preserve habitually Benevolence, Conscientiousness, Veneration, and Intellect supreme, it is quite undeniable, that we shall rouse the moral and intellectual faculties of children, servants, and assistants, to love us, and to yield us willing service, obedience, and aid. Our commands will then be reasonable, mild, and easily executed, and the commerce will be that of love. With regard to our equals in society, what would we not give for a friend in whom we were perfectly convinced of the supremacy of the moral sentiments; what love, confidence, and delight, would we not repose in him! To a merchant, physician, lawyer, magistrate, or an individual in any public employment, how invaluable would be the habitual supremacy of these sentiments! The Creator has bestowed intellectual talents in different degrees on different individuals, and also limited our powers;—consequently, by confining our attention to one department of labour we execute it best,—an arrangement which amounts to a direct institution of separate trades and professions. Under the natural laws, then, the manufacturer may pursue his calling with the entire approbation of all the moral sentiments, for he is dedicating his talents to supplying the wants of his fellow-men; and how much more successful will he be, if his every proceeding be accompanied by the desire to act benevolently and honestly towards those who are to consume and pay for the products of his labour! He cannot gratify his Acquisitiveness half so successfully by any other method. The same remark applies to the merchant, the lawyer, and the physician. The lawyer and physician who consult, as a paramount object, the interests of their clients and patients, obtain not only the direct reward of gratifying their own moral faculties, which is no slight enjoyment, but also high respect and a well-founded reputation, combined with increasing emolument, not grudgingly paid, but willingly offered by persons who feel the worth of the services bestowed.

Three conditions are required by the moral and intellectual law, which must all be observed to ensure its rewards. 1*st*, The department of industry selected must be really useful to human beings: Benevolence demands this; 2*d*, The quantum of labour bestowed must bear a just proportion to the natural demand for the commodity produced: Intellect requires this; and, 3*d*, In our social connexions, we must scrupulously attend to the fact that different individuals possess different developments of brain, and in consequence different natural talents and dispositions,—and we must rely on each, only to the extent warranted by his natural endowments.

If, then, an individual have received, at birth, a sound organic constitution and favourably developed brain, and if he live in accordance with the physical, the organic, the moral, and the intellectual laws, it appears to me that, in the constitution of the world, he has received from the Creator an assurance of provision for his animal wants, and of high enjoyment in the legitimate exercise of his various mental powers.

I have already observed, that before we can obey the Creator's institutions we must know them; that the sciences which teach the physical laws are natural philosophy and chemistry; while the organic laws belong to the department of anatomy and physiology: and I now add, that it is the business of the Political Economist to unfold the kinds of industry that are really necessary to the welfare of mankind, and the extent of labour that will meet with a just reward. The leading object of political economy, as a science, is to increase enjoyment, by directing the application of industry. To attain this end, however, it is obviously necessary that the nature of man, the constitution of the physical world, and the relations between these, should be known. Hitherto, the knowledge of the former of these elementary parts has been deficient; and, in consequence, the whole superstructure has been weak and unproductive, in comparison with what it may become when founded on a more perfect basis.

Political Economists have not taught that the world is arranged in accordance with the harmonious activity of all our faculties,—the moral sentiments and intellect, in cases of conflict, holding the supremacy;—that, consequently, to render man happy, *his leading pursuits must be such as will exercise and gratify all his powers*,—and that his life will necessarily be miserable, if devoted exclusively to the production of wealth. They have proceeded on the notion, that the accumulation of wealth is the *summum bonum*: but all history testifies, that national happiness does not invariably increase in proportion to national riches; and until they shall teach that intelligence and morality are the foundation of all lasting prosperity, they will not interest the great body of mankind, nor give a practical direction to their efforts.

If the views contained in the present treatise be sound, it will become a leading object with future masters in economic science, to teach that civilized man should limit his bodily, and extend his moral and intellectual occupations, as the only means of saving himself from ceaseless punishment under the natural laws.

The idea of men in general being taught natural philosophy, anatomy, physiology, political economy, and the other sciences that expound the natural laws, has been sneered at as ridiculous. But I would ask, In what occupations are human beings so urgently engaged, that they *have no leisure* to bestow on the study of the Creator's laws? The delivery of a course of lectures on natural philosophy would occupy sixty or seventy hours; a course on anatomy and physiology the same; and a pretty full course on phrenology could be delivered in forty hours! These, twice or thrice repeated, would serve to initiate the student, so that he could afterwards advance in the same paths, by the aid of observation and books. Is life, then, so brief, and are our hours so urgently occupied by higher and more important duties, that we cannot afford these pittances of time to learn the laws that regulate our existence? No! The only difficulty lies in exciting the *desire* for knowledge; for when that is attained, *time* will not be wanting. No idea can be more preposterous, than that human beings have no time to study and obey the natural laws. These laws, when neglected, punish so severely, that the offender loses more time in undergoing his chastisement, than would be requisite to obey them. A gentleman extensively engaged in business, whose nervous and digestive systems were impaired by neglect of the organic laws, was desired to walk in the open air at least one hour a-day; to repose from all exertion, bodily and mental, for an hour after breakfast, and another hour after dinner (because the brain cannot expend its energy to good purpose in thinking and in aiding digestion at the same time); and to practise moderation in diet: this last injunction he regularly observed, but he laughed at the idea of his having three hours a-day to spare for attention to his health. The reply was, that the organic laws admit of no exception, and that he must either obey them or suffer the consequences; but that the time lost in enduring the punishment would be double or treble that requisite for obedience: and, accordingly, the fact was so. Instead of fulfilling an appointment, it was usual for him to send a note, perhaps at two in the afternoon, in these terms:—"I was so distressed with headach last night, that I never closed my eyes; and to-day I am still incapable of being out of bed." On other occasions, he is out of bed, but apologises for incapacity to attend to business, on account of an intolerable pain in the region of the stomach. In short, if the hours lost in these painful sufferings were added together, and distributed over the days when he is able for duty, they would far outnumber those which would suffice for obedience to the organic laws—and with this difference in the results: by neglecting them he loses both his hours and his enjoyment; whereas, by obedience, he would be rewarded by aptitude for business, and a pleasing consciousness of existence.

We shall understand the operation of the moral and intellectual laws more completely, by attending to the evils which arise from neglect of them.

1. Let us consider INDIVIDUALS. At present, the almost universal persuasion of civilized men is, that happiness consists in the possession of wealth, power, and external splendour; objects related to the animal faculties and intellect much more than to the moral sentiments. In consequence, each individual starts in pursuit of these as the chief business of his life; and, in the ardour of the chase, he recognises no limitations to the means which he may employ, except those imposed by the municipal law. He does not perceive or acknowledge the existence of natural laws, determining not only the sources of his happiness, but the steps by which it may be attained. From this moral and intellectual blindness, merchants and manufacturers, in numberless instances, hasten to be rich beyond the course of nature: that is to say, they engage in enterprises far exceeding the extent of their capital and capacity; they place their property in the hands of debtors, whose natural talents and morality are so low, that they ought never to have been entrusted with a shilling; they send their goods to sea without insuring them, or leave them uninsured in their warehouses; they ask pecuniary accommodation from other merchants, to enable them to carry on undue speculations, and become security for them in return, and both fall into misfortunes; or they live in splendour and extravagance, far beyond the limit of the natural return of their capital and talents, and speedily reach ruin as their goal. In every one of these instances, the calamity is obviously the consequence of infringement of the moral and intellectual laws. The lawyer, medical practitioner, or probationer in the church, who is disappointed of his reward, will, in most cases, be found to have placed himself in a profession for which his natural talents and dispositions did not fit him, or to have pursued his vocation under the guidance chiefly of the lower propensities; preferring selfishness to honourable regard for the interests of his employers. Want of success in these professions, appears to me to be owing, chiefly, to three causes. *First*, If the brain be too small, or constitutionally lymphatic, the mind will not act with sufficient energy to make an impression. *Secondly*, Some particular organs indispensably requisite to success, may be very small—as Language, or Causality, in a lawyer; deficiency in the first rendering him incapable of ready utterance, and in the second, destitute of that intuitive sagacity, which sees at a glance the bearing of the facts and principles founded on by his adversary, and estimates the just inferences that follow. A lawyer, who is weak in this power, appears to his client like a pilot who does not know the shoals and the rocks. His deficiency is perceived whenever difficulty presents itself, and he is pronounced unfit to take charge of great interests; he is then passed by, and suffers the penalties of having made an erroneous choice of a profession. The *third* cause is predominance of the animal and selfish faculties. The client and the patient discriminate instinctively between the cold, pitiless, but pretending manner of Acquisitiveness and Love of Approbation, and the unpretending genuine warmth of Benevolence, Veneration, and Conscientiousness; and they discover very speedily that the intellect inspired by the latter sees more clearly, and promotes more successfully, their interests, than when animated only by the former. The victim of selfishness either never rises, or quickly sinks, wondering why his merits are not appreciated.

In all these instances, the failure of the merchant, and the bad success of the lawyer and physician, are the consequences of infringement of the natural laws, either by himself or by those with whom he is connected; and the evil they suffer is the punishment for having failed in a great duty, not only to society, but to themselves.

II. Some of the CALAMITIES ARISING FROM INFRINGEMENT OF THE SOCIAL LAW may next be considered.

The greatest difficulties present themselves in tracing the operation of the moral and intellectual laws, in the wide field of social life. An individual may be enabled to comprehend how, if he commit an error, he should suffer a particular punishment; but when calamity overtakes whole classes of the community, each person absolves himself from all share of the blame, and regards himself simply as the victim of a general but inscrutable visitation. Let us then examine briefly the Social Law.

In regarding the human faculties, we perceive that numberless gratifications spring from the social state. The muscles of a single individual could not rear the habitations, build the ships, forge the anchors, construct the machinery, or, in short, produce the countless enjoyments that everywhere surround us, and which are attained in consequence of combinations of human power and skill, to accomplish a common end. In the next place, social intercourse is the means of affording direct gratification to a variety of our mental faculties. If we had lived in solitude, the propensities, sentiments, and reflecting faculties, would have been deprived—some of them absolutely, and others of them nearly—of all opportunities of gratification. The social law, then, is the source of the highest delights of our nature, and its institution indicates the greatest benevolence towards us in the Creator.

Still, however, this law does not suspend or subvert the laws instituted for the regulation of the conduct of man as an individual. If a man desire to sail safely in a ship, the natural laws require that his intellectual faculties should have been previously instructed in navigation, and in the features of the coasts and seas to be visited; that he should know and avoid the shoals, currents, and eddies; that he should trim his canvass in proportion to the gale; and that his animal faculties should be kept so much under subjection to his moral sentiments, that he should not abandon himself to drunkenness, sloth, or any animal indulgence, when he ought to be watchful at his duty. If he obey the natural laws, he will be safe; but if he disobey them he may be drowned.* Only a small vessel, however, bound on a short voyage, could be managed by one man; for he must sleep, and he could not do so and manage his sails at the same time. It is the interest, therefore, of individuals who wish to go to sea, to avail themselves of the social law; that is, to combine their powers under one leader. By doing so, they may sail in a larger ship, have more ample stores of provisions, obtain intervals for rest, and enjoy each other's society. If, at the same time, they choose a captain qualified for his office, they will sail in safety; whereas, if they place in charge of the ship an individual whose intellectual faculties are weak, whose animal propensities are strong, whose moral sentiments are in abeyance, and who, in consequence, is ignorant of navigation and habitually neglects the natural laws, they may suffer the penalty in being wrecked.

It may be objected that the crew and passengers do not appoint the captain; but in every case (except impressment in the British navy), they may embark on board, or stay out of a particular ship, according as they discover the captain to possess the qualities necessary for command, or not. This, at present, ninety-nine individuals out of a hundred never inquire into; but an equal number of persons neglect other natural laws, and suffer the penalty, because they have not been instructed in the existence and effects of these, or trained to obey them. But they have from nature the power of observing them, if properly trained; and, besides, I offer this merely as an illustration of the mode of operation of the social law.

* I wave at present the question of storms, which he could not foresee, as these fall under the head of ignorance of natural laws which may be subsequently discovered.

Another example may be given. By employing servants, the labours of life are rendered less burdensome to the master: but he must employ individuals who know the moral law, and who possess the desire to act under it; otherwise, as a punishment for neglecting this requisite, he may be robbed, cheated, or murdered. Phrenology presents the means of observing this law, in a degree unattainable without it, by the facility which it affords in discovering the natural talents and dispositions of individuals.

By entering into copartnership, merchants and other persons in business may extend the field of their exertions, and gain advantages beyond those they could reap if labouring as individuals. But, by the natural law, each must take care that his partner knows, and is inclined to obey, the moral and intellectual laws, as the only condition on which the Creator will permit him *securely* to reap the *advantages* of the social compact. If a partner in China be deficient in intellect and moral sentiment, another in London may be utterly ruined. It is said that this is an example of the innocent suffering for, or at least along with, the guilty; but it is not so. It is an example of a person seeking to obtain the *advantages* of the social law without conceiving himself bound to obey the conditions required by it; the first of which is, that those individuals of whose services he avails himself shall be capable and willing to observe the moral and intellectual laws.

Let us now advert to the calamities which overtake whole classes of men, or COMMUNITIES, under the social law,—trace their origin, and see how far they are attributable to infringement of the Creator's laws.

If the whole faculties of man be intended by the Creator to be harmoniously gratified, and if all natural institutions be in accordance with them; it follows, that if large communities of men, in their systematic conduct, habitually seek the gratification of the inferior propensities, and devote either no part, or too small and inadequate a part, of their time, to objects related to their higher powers, they will act in opposition to nature, and suffer punishment in sorrow and disappointment. To confine our attention to our own country,—I may remark, that, until within these few years, the labouring population of Britain were not taught to refrain from multiplying their numbers beyond the demand for their labour; and that, even now, this is not admitted by one in a thousand to be a duty, nor acted on as a principle by one in ten thousand of those whose happiness or misery depends on observance of it. The doctrine of Malthus, that "population cannot go on perpetually increasing, without pressing on the limits of the means of subsistence, and that a check of some kind or other must, sooner or later, be opposed to it," amounts to this,—that the means of subsistence are not susceptible of such rapid and unlimited increase as the numbers of the people, and that, in consequence, the amative propensity must be restrained by reason, otherwise population will be checked by misery. This principle is in accordance with the views of human nature maintained in the present treatise, and applies to all the faculties. Thus Philoprogenitiveness, when indulged in opposition to reason, leads to spoiling children, which is followed directly by misery both to them and to their parents. Acquisitiveness, when uncontrolled by wisdom and morality, leads to avarice or theft, and these again carry suffering in their train. I can discover no reason why Amativeness should enjoy an exemption from the laws which circumscribe all the other faculties within the limits of prudence and virtue.

But so little are such views appreciated, that the lives of the inhabitants of Britain generally are devoted to the acquisition of wealth, of power and distinction, or of animal pleasure: in other words, the great object of the labouring classes, is to live and gratify the inferior propensities; of the mercantile and manufacturing population, to gratify Acquisitiveness and Self-Esteem; of

the more intelligent class of gentlemen, to gratify Self-Esteem and Love of Approbation, by attaining political, literary, or philosophical eminence, and of another portion, to gratify Love of Approbation by supremacy in fashion—and these gratifications are sought by means not in accordance with the dictates of the higher sentiments, but by the joint aid of the intellect and animal powers. If the harmonious action of the whole faculties, and in cases of conflict the supremacy of the moral sentiments and intellect, be the natural law,—we should expect that, after rational restraint on population, and the proper use of machinery, such moderate labour as will leave ample time for the exercise of the higher powers, will suffice to provide for human wants; and, *secondly*, that if this exercise be neglected, and the time which should be dedicated to it be employed in labour to gratify the propensities, direct evil will ensue—and this accordingly appears to me to be really the result.

By means of machinery, and the aids derived from science, the ground may be cultivated, and every necessary and luxury of life may be produced in abundance, by a moderate expenditure of labour. If men were to stop when they had reached this point, and to dedicate the residue of each day to moral and intellectual pursuits, the consequence would be the existence of ready and steady, because not overstocked, markets. Labour, pursued till it provided abundance, but not superfluity, would meet with a certain and just reward, and would also yield a vast increase of happiness; for no joy equals that which springs from the harmonious gratification of our whole faculties in accordance with the Creator's laws. Farther, morality would be improved; for men, being happy, would become less vicious: and, lastly, there would be improvement in the organic, moral, and intellectual capabilities of the race; for the active moral and intellectual organs of the parents would tend to cause an increase in the volume of these in their offspring—and each successive generation would start not only with greater stores of acquired knowledge than those which its predecessors possessed, but with higher natural capabilities of applying them to advantage.

Before merchants and manufacturers can be expected to act in this manner, a great change must be effected in their sentiments and perceptions; but so was a striking revolution effected in the ideas and practices of the tenantry west of Edinburgh, when they removed the stagnant pools between each ridge of land, and banished ague from their district. If any reader will compare the state of Scotland during the thirteenth, fourteenth, and fifteenth centuries (correctly and spiritedly represented in Sir Walter Scott's *Tales of a Grandfather*), with its present condition, in regard to knowledge, morality, religion, and the relative ascendency of the rational over the animal part of our nature, he will perceive so great an improvement in later times, that the commencement of the millenium itself, five or six hundred years hence, would scarcely be a greater advance beyond the present, than the present is beyond the past. If the laws of the Creator be here rightly interpreted, it is obvious that, were they taught as elementary truths to every class of the community, and were the sentiment of Veneration called in to enforce obedience to them, a set of new motives and principles would be brought into play, calculated to accelerate the change; especially if it were seen—what, in the next place, I proceed to shew—that the consequences of neglecting these laws are very serious visitations of suffering. According to the views advocated in this work, the system on which the manufactures of Britain are at present conducted, is as great an aberration from the laws of nature as were any of the previous pursuits of mankind recorded in the history of the world. It implies not only that the vast body of the people shall for ever remain in a condition little superior to that of mere working animals, in order that, by means of cheap labour, our traders may undersell the merchants of all other nations; but also that our manufactures and commerce shall enjoy an indefinite extension—this being essential to their prosperity as they are now conducted, although in the nature of things impossible. On the 13th of May 1830, Mr Slaney, M. P., called the attention of the House of Commons to "the increase which had taken place in the number of those employed in manufacturing and mechanical occupations, as compared with the agricultural class." He stated, that "in England, the former, as compared with the latter, were 6 to 5 in 1801; they were as 8 to 5 in 1821; and, taking the increase of population to have proceeded in the same ratio, they were now as 2 to 1. In Scotland the increase had been still more extraordinary. In that country they were as 5 to 6 in 1801; as 9 to 6 in 1821; and now they were as 2 to 1. The increase in the general population during the last twenty years had been 30 per cent.; in the manufacturing population it had been 40 per cent.; in Manchester, Coventry, Liverpool, and Birmingham, the increase had been 50 per cent.; in Leeds it had been 54 per cent.; in Glasgow, it had been 100 per cent." Here we perceive that a vast population has been called into existence, and trained to manufacturing industry. I do not doubt that the skill and labour of this portion of the people have greatly contributed to the wealth of the nation; but I fear that the happiness of the laborious individuals who have conferred this boon, has not kept pace with the riches which they have created. The causes of their present condition appear to be the following:—

Several millions of human beings have been trained to manufactures, and are unfit for any other occupation. In consequence of the rapid increase of their numbers, and of improvements in machinery, the supply of labour has for many years outstripped the demand for it, and wages have fallen ruinously low. By a coincidence, which at first sight appears unfortunate, much of the machinery of modern invention may be managed by children. The parent who, by his own labour for twelve hours a-day, is able to earn only seven shillings a-week, adds to his income one shilling and sixpence or two shillings a-week, for each child whom he can bring to the manufactory; and by the united wages of the family a moderate subsistence may be eked out. Both parents and children, however, are reduced to a hopeless condition of toil; for their periods of labour are so long, and their remuneration is so small, that starvation stares each of them in the face when they either relax from exertion or cease to live in combination. Mental culture and moral and intellectual enjoyment are excluded, and their place is supplied by penury and labour. Dr Chalmers reports, that, in our great towns, whole masses of this class of the people are living in profound ignorance and practical heathenism. The system tends constantly to increase the evils of which it is the source. Young persons, when they arrive at manhood, find themselves scarcely able to subsist by their individual exertions, whereas, if they can add the scanty income of three or four children to their own, their condition is in some degree improved. House-rent, and the expenses of furniture and fuel, are not increased by the wants, in proportion to the contributions, of the young. Adults are thus tempted—nay, almost driven by necessity—to contract early marriages, to rear a numerous offspring, devoted to the same employments with themselves, and in this way to add to the supply of labour, already in excess. The children grow up, and in their turn follow the same course; and thus, however widely the manufactures of Britain may have extended, a still farther and indeed an indefinite extension of them seems to be demanded; for the system produces a constantly increasing, yet an ignorant, starving, and miserable population, more than adequate to supply all the labour that can be profitably expended. The consequence is, that markets are overstocked with produce, prices first fall ruinously low; the

operatives are thrown out of work, and left in destitution, till the surplus produce of their formerly excessive labour, and perhaps something more, are consumed: after this, prices rise too high in consequence of the supply falling rather below the demand; the labourers then resume their toil, on their former system of excessive exertion; they again overstock the market, again want employment and suffer misery.

In 1825–6–7, this operation of the natural laws was strikingly exhibited; large bodies of starving and unemployed labourers were supported on charity. How many hours did they not stand idle, and how much of excessive toil would not these hours have relieved, if distributed over the periods when they were overworked! The results of that excessive exertion were seen in the form of untenanted houses and of shapeless piles of goods decaying in warehouses—in short, in every form in which the products of misapplied industry could go to ruin. These observations are strikingly illustrated by the following official report.

> "*State of the Unemployed Operatives resident in Edinburgh, who are supplied with work by a Committee constituted for that purpose, according to a list made up on Wednesday the 14th March* 1827.
>
> "The number of unemployed operatives who have been remitted by the Committee for work, up to the 14th of March, are 1481
>
> "And the number of cases they have rejected, after having been particularly investigated, for being bad characters, giving in false statements, or being only a short time out of work, &c. &c. are 446
>
> Making together, 1927
>
> "Besides these, several hundreds have been rejected by the Committee, as, from the applicants' *own* statements, they were not considered as cases entitled to receive relief, and were not, therefore, remitted for investigation.
>
> "The wages allowed is 5s. per week, with a peck of meal to those who have families. Some youths are only allowed 3s. of wages.
>
> "The particular occupations of those sent to work are as follows:—242 masons, 643 labourers, 66 joiners, 19 plasterers, 76 sawyers, 19 slaters, 45 smiths, 40 painters, 36 tailors, 55 shoemakers, 20 gardeners, 229 various trades. Total 1481."

Edinburgh is not a manufacturing city; and if so much misery existed in it in proportion to its population, what must have been the condition of Glasgow, Manchester, and other manufacturing towns?

Here, then, the Creator's laws shew themselves paramount, even when men set themselves systematically to infringe them. He intended the human race, under the moral law, not to pursue wealth excessively, but to labour only during a certain moderate portion of their time; and although they do their utmost to defeat this intention, they cannot succeed: they are constrained to remain idle as many days and hours, while their surplus produce is consuming, as would have served for the due exercise of their moral and intellectual faculties, and the preservation of their health, if they had dedicated them regularly to these ends from day to day, as time passed over their heads. But their punishment proceeds: the extreme exhaustion of nervous and muscular energy, with the absence of all moral and intellectual excitement, create an irresistible craving for ardent spirits; these call the organs of the animal propensities into predominant activity; this condition of mind and body descends to their children; increased crime and a deteriorating population are the results; while the moral and intellectual incapacity for arresting the evils increases with the lapse of every generation.

According to the principles of the present treatise, what are called by commercial men "times of prosperity," are seasons of the greatest infringement of the natural laws, and precursors of great calamities. Times are not reckoned prosperous, unless *all* the industrious population is employed during *the whole day* (hours of eating and sleeping only excepted), in the production of *wealth*. This is a dedication of their whole lives to the service of the propensities, and must necessarily terminate in punishment, if the world be constituted on the principle of the harmonious gratification of all our powers.

This truth has already been illustrated more than once in the history of commerce. The following is a recent example:

By the combination laws, workmen were punishable for uniting to obtain a rise of wages, when an extraordinary demand occurred for their labour. These laws, being obviously unjust, were at length repealed. In the summer and autumn of 1825, however, commercial men conceived themselves to have reached the highest point of prosperity, and the demand for labour was unlimited. The operatives availed themselves of the opportunity to improve their condition; formed extensive combinations; and, because their demands were not complied with, struck work, and continued idle for months in succession. The master-manufacturers clamoured against the new law, and complained that the country would be ruined if combinations were not again declared illegal, and suppressed by force. According to the principles expounded in this work, the just law must from the first have been *the most beneficial for all parties* affected by it; and the result amply confirmed this idea. Subsequent events shewed that the extraordinary demand for labourers in 1825 was entirely factitious, fostered by an overwhelming issue of bank paper, much of which ultimately proved to be worthless; in short, that the master-manufacturers had been engaged in an extensive system of speculative over-production, to which the combinations of the workmen presented a *natural check*. The ruin that overtook the masters in 1826 arose from their having accumulated, under the influence of unbridled Acquisitiveness, vast stores of commodities which were not required by society. To have compelled the labourers to manufacture more at their bidding would have aggravated the evil. It is a well-known fact, that those masters whose operatives most resolutely refused to work, and who, on this account, clamoured most loudly against the law, were the greatest gainers in the end. Their stocks of goods were sold off at high prices during the speculative period: and when the revulsion came, instead of being ruined by the fall of property, they were prepared, with their capitals at command, to avail themselves of the depreciation, to make new and highly profitable investments. Here again, therefore, we perceive the law of justice vindicating itself, and benefiting by its operation even those individuals who blindly denounced it as injurious to their interests. A practical faith in the doctrine that the world is arranged by the Creator in harmony with all the faculties, the moral sentiments and intellect governing, would be of unspeakable advantage to both rulers and subjects; for they would then be able to pursue, with greater confidence, the course dictated by moral rectitude, convinced that the result would prove beneficial, even although, when they took the first step, they could not distinctly perceive the issue. Dugald Stewart remarks that Fenelon, in his *Adventures of Telemachus*, makes Mentor anticipate some of the profoundest and most valuable doctrines of modern political economy, respecting the principles and advantages of free trade, merely by causing him to utter the simple dictates of benevolence and justice in regard to commerce. In Fenelon's day, such ideas were regarded as fitted only for adorning sentimental novels or romances; but they have since been discovered to be not only philosophical truths, but beneficial practical maxims. This is the case apparently, because the world

is really arranged on the principle of the supremacy of the moral and intellectual faculties, so that, when men act agreeably to their dictates, the consequences, although they cannot all be anticipated, naturally tend towards good.

In the whole system of the education and treatment of the labouring population, the laws of the Creator, such as I have now endeavoured to expound them, are neglected or infringed. Life with them is spent to so great an extent in labour, that their moral and intellectual powers are stinted of exercise and gratification; and their mental enjoyments are chiefly those afforded by the animal propensities:—in other words, their existence is too little *rational*; they are rather organized machines than moral and intellectual beings. The chief duty performed by their higher faculties, is merely to communicate so much intelligence and honesty as to enable them to execute their labours with fidelity and skill. I speak, of course, of the great body of the labouring population: there are many individual exceptions, who possess higher attainments; and I mean no disrespect to any portion of this most useful and deserving class of society: on the contrary, I represent their condition in what appears to me to be a true light, only with a view to excite them to amend it.

Does human nature, then, admit of such a modification of the employments and habits of this class, as to raise them to the condition of beings whose pleasures should embrace their rational natures?—that is, creatures whose bodily powers and animal propensities should be subservient to their moral and intellectual faculties, and who should derive their enjoyment from the harmonious action of all their powers. To attain this end, it would not be necessary that they should *cease to labour*; on the contrary, the necessity of labour to the enjoyment of life is imprinted in strong characters on the structure of man. The osseous, muscular, and nervous systems of the body, all require exercise as a condition of health; while the digestive and sanguiferous apparatus rapidly fall into disorder, if due exertion be neglected. Exercise of the body is labour; and labour directed to a useful purpose is more beneficial to the corporeal organs, and also more pleasing to the mind, than when undertaken for no end but the preservation of health.* Commerce is rendered advantageous by the Creator, because different climates yield different productions. Agriculture, manufactures, and commerce, therefore, are adapted to man's nature, and I am not their enemy. But they are not the *ends* of human existence, even on earth. Labour is beneficial to the whole human economy, and it is a mere delusion to regard it as in itself an evil; but in order that it may be enjoyed, it must be moderate in intensity and duration. I say *enjoy* it; because moderate exertion is pleasure,—and it is only labour carried to *excess*, which has given rise to the common opinion that *retirement* from active industry is the goal of happiness.

It may be objected that a healthy and vigorous man is not oppressed by ten or twelve hours' labour a-day; and I grant that, if he be well fed, his physical strength may not be so much exhausted by this exertion as to cause him pain. But this is regarding him merely as a working animal. My proposition is, that after ten or twelve hours of muscular exertion a-day, continued for six days in the week, the labourer is not in a fit condition for that active exercise of his moral and intellectual faculties which alone constitutes him a rational being. The exercise of these powers depends on the condition of the brain and nervous system; and these are exhausted and deadened by too much muscular exertion. The fox-hunter and ploughman fall asleep when they sit within doors and attempt to read or think. The truth of this proposition is demonstrable on physiological principles, and is supported by general experience; nevertheless, the teachers of mankind have too often neglected it. The first change, therefore, must be to limit the hours of labour, and to dedicate a portion of time daily to the exercise of the mental faculties.

So far from this limitation being unattainable, it appears to me that the progress of arts, sciences, and society, is rapidly tending towards its adoption. Ordinary observers appear to conceive man's chief end, in Britain at least, to be to manufacture hardware, broadcloth, and cotton goods, for the use of the whole world, and to store up wealth. They forget that the same impulse which inspires the British with so much ardour in manufacturing, will sooner or later inspire other nations also; and that if all Europe shall follow our example, and employ efficient machinery and a large proportion of their population in our branches of industry, which they are fast doing, the four quarters of the globe will at length be deluged with manufactured goods, only part of which will be required. When this state of things shall arrive,—and in proportion as knowledge and civilization are diffused it will approach,—labourers will be compelled by dire necessity to abridge their toil; because excessive labour will not be remunerated. The admirable inventions which are the boast and glory of civilized men, are believed by many persons to be at this moment adding to the misery and degradation of the people. Power-looms, steam-carriages, and steamships, it is asserted, have hitherto all operated directly in increasing the hours of exertion, and abridging the reward of the labourer! Can we believe that God has bestowed on us the gift of an almost creative power, solely to increase the wretchedness of the many, and minister to the luxury of the few? Impossible! The ultimate effect of mechanical inventions on human society appears to be not yet divined. I hail them as the grand instruments of civilization, by giving leisure to the great mass of the people to cultivate and enjoy their moral, intellectual, and religious powers.

To enable man to follow pursuits connected with his higher endowments, provision for the wants of his animal nature is necessary, viz. food, raiment, and comfortable lodging; and muscular power, intellect, and mechanical ability, have been conferred on him, apparently with the design that he should build houses, plough fields, and fabricate commodities. But we have no warrant from reason or Scripture for believing that any portion of the people are doomed to dedicate their whole lives and energies, aided by all mechanical inventions, to these ends, as their proper business, to the neglect of the study of the works and will of the Creator. Has man been permitted to discover the steam-engine, and apply it in propelling ships on the ocean and carriages on railways, in spinning, weaving, and forging iron,—and has he been gifted with intellect to discover the astonishing powers of physical agents, such as are revealed by chemistry and mechanics,—only that he may be enabled to build more houses, weave more cloth, and forge more iron, without any direct reference to his moral and intellectual improvement? If an individual, unaided by animal or mechanical power, had wished to travel from Manchester to Liverpool, a distance of thirty miles, he would have been under the necessity of devoting ten or twelve hours of time, and considerable muscular energy, to the task. When roads and carriages were constructed, and horses trained, he could, by their assistance, have accomplished the same journey in four hours, with little fatigue; and now, when railways and steam-engines have been successfully completed, he may travel that distance without any bodily fatigue whatever, in an hour and a half; and I ask, For what purpose has Providence bestowed on the individual the nine or ten hours of spare time which are thus set free? I humbly answer—that he may be enabled to cultivate his moral, intellectual, and religious faculties. Again, before steam-engines were applied to spinning

* See Dr Combe's Principles of Physiology, 9th edition.

and weaving, a human being would have needed to labour, perhaps for a month, in order to produce linen, woollen, and cotton cloth, necessary to cover his own person for a year; or, in case of a division of labour, a twelfth part of the population would necessarily have been constantly engaged in this employment: by the application of steam, the same ends may be accomplished in a day. I repeat the inquiry—For what purpose has Providence bestowed the twenty-nine days out of the month, set free by the invention of the steam-engine and machinery? These proportions are not named as statistically correct, but as mere illustrations of my proposition, that every discovery in natural science, and every invention in mechanics, has a direct tendency to increase the leisure of man, and to enable him to provide for his physical wants with less laborious exertion.

The question recurs, Is it the object of Providence, in thus favouring the human race, to enable only a portion of them to enjoy the highest luxuries, while the mass shall continue labouring animals; or is it his intention to enable *all* to cultivate and enjoy their rational nature?

In proportion as mechanical inventions shall be generally diffused over the world, they will increase the powers of production to such an extent, as to supply, by moderate labour, every want of man; and then the great body of the people will find themselves in possession of reasonable leisure, in spite of every exertion to avoid it. Great misery will probably be suffered in persevering in the present course of action, before their eyes shall be opened to this result. The first effect of these stupendous inventions threatens to be to accumulate wealth in the hands of a few, without proportionally abridging the toil, or adding to the comforts, of the many. This process of elevating a part of the community to affluence and power, and degrading the rest, threatens to proceed till the disparity of condition shall become intolerable to both, the labourer being utterly oppressed, and the higher classes harassed by insecurity. Then, probably, it may be recognised, that the real benefit of physical discovery is to give leisure to the mass of the people, which is the first requisite of true civilization, knowledge being the second. The science of human nature will enable men at length to profit by exemption from excessive toil; and it may be hoped that, in course of time, sincere attempts will be made to render all ranks prosperous and happy, by institutions formed in harmony with all the faculties.

The same means will lead to the realization of practical Christianity. An individual whose active existence is engrossed by mere bodily labour, or by the pursuits of gain or ambition, lives under the predominance of faculties that do not produce the perfect Christian character. The true practical Christian possesses a vigorous and enlightened intellect, and moral affections glowing with gratitude to God and love to man; but how can the people at large be enabled to realize this condition of mind, if stimulus for the intellect and the nobler sentiments be excluded by the daily routine of their occupations?

In some districts of England, the operatives lately demanded an abridgment of labour without abatement of wages. This project was unjust, and proved unsuccessful. They should have given up first one hour's labour, and the price of it, and waited till the increase of capital and of demand brought up wages to their former rate; which, if they had restrained population, would certainly have happened. They should have then abated a second hour, submitting again to a reduction, and again waited for a reaction; and so on, till they had limited their labour to eight or nine hours a-day. The change must be gradual, and the end must be obtained by *moral* means, else it will never be accomplished at all.

The objection has been stated, that, even in the most improved condition of the great body of the people, there will still be a considerable proportion of them so deficient in talent, so incapable of improvement, and so ignorant, that their labour will be worth little; that, as they must obtain subsistence, no alternative will be left to them but to compensate by protracted exertion for their deficiency in skill; and that their long-continued labour, furnished at a cheap rate, will affect all the classes above them, and indeed prevent the views now advocated from ever being realized. This objection resolves itself into the proposition, That the people have been destined by the Creator to be labouring animals, and that, from their inherent mental defects, they are incapable, generally, of being raised to any more honourable station; which is just the great point at issue between the old and the new philosophy. If mankind at large (for the industrious classes constitute so very great a majority of the race, that I may be allowed to speak of them as the whole) had been intended for mere hewers of wood and drawers of water, I do not believe that the moral and intellectual faculties, which they unquestionably possess, would have been bestowed on them; and as they do enjoy the rudiments of all the feelings and capacities which adorn the highest of men, and as these faculties are improvable, I cannot subscribe to the doctrine of the permanent incapacity of the race. I consider the operatives to be capable of learning, in the course of successive generations, to act as rational beings; and that whenever the great majority of them shall have acquired a sense of the true dignity of their nature, and a relish for the enjoyments afforded by their higher powers, they will so regulate the supply of labour in reference to the demand, as to obtain the means of subsistence in return for moderate exertion. In fine, I hope that few of the imbeciles, before alluded to, will exist, and that these few will be directed and provided for, by the multitude of generous and enlightened minds which will exist around them.

At the same time, there is much force in the objection, considered in reference to the present and several succeeding generations. In throwing out these views, I embrace centuries of time. I see the slow progress of the human race in the past, and do not anticipate miracles in the future. If a sound principle, however, be developed—one having its roots in nature—there is a certainty that it will wax strong and bear fruit in due season; but that season, from the character of the plant, may be a distant one. All who aim at benefiting mankind should keep this truth constantly in view. Almost every scheme is judged of by its effects on the living generation; whereas no great fountain of happiness ever flowed clear at first, or yielded its full sweets to the generation which discovered it.

It is now an established principle in political economy, that Government ought not to interfere with industry. This maxim was highly necessary when rulers were grossly ignorant of all the natural laws which regulate production and the private interests of men; because their enactments, in general, were then absurd—they often did much harm, and rarely good. "Men," says Lord Kames, in reference to the English poor law, "will always be mending: What a confused jumble do they make, when they attempt to mend the laws of Nature! Leave Nature to her own operations; she understands them the best."* But if the science of human nature were once fully and clearly developed, it is probable that this rule might, with great advantage, be relaxed, and that the legislature might considerably accelerate improvements, by adding the constraining authority of human laws to enactments already proclaimed by the Creator. Natural laws do exist, and the Creator punishes if they are not obeyed. The evils of life are these punishments. Now, if the great body of intelligent men in any state saw clearly, that a course of action pursued by the ill-informed of their fellow-subjects was

* Sketches, B. ii. Sk. 10

the source of continual suffering, not only to the evil-doers themselves, but to the whole community, it appears to me allowable that they should avert it by legislative enactment. If the majority of the middle classes resident in towns were to request Parliament to ordain shops in general to be shut at eight o'clock, or even at an earlier hour, to allow time for the cultivation of the rational faculties of the individuals engaged in them, it would be no stretch of power to give effect to the petition: no evil would ensue, although the avaricious were prevented by law from continuing ignorant, and from forcing all their competitors in trade to resemble them in their defects. If the Creator have so constituted the world that men may execute all necessary business, and still have time to spare for the cultivation of their rational faculties, any enactments of the legislature calculated to facilitate arrangements for accomplishing both ends, would be beneficial and successful, because accordant with nature; although the prejudiced and ignorant of the present generation might complain, and probably resist them. The right of interference would go much farther; for its only limits seem to me to be those of the real knowledge of nature: as long as the legislature enacts in conformity with nature, the result will be successful. At present, ignorance is too extensive and prevalent to authorize Parliament to venture far. From indications which already appear, however, I think it probable that the labouring classes will ere long recognise Phrenology and the natural laws, as deeply interesting to themselves; and whenever their minds shall be opened to rational views of their own constitution as men, and their position as members of society, I venture to predict that they will devote themselves to improvement, with a zeal and earnestness that in a few generations will change the condition of their order.

The consequences to the middle ranks of the community, of departing from the moral law, are in accordance with the effects on the lower. Uncertain gains,—continual fluctuations in fortune,—the absence of all reliance, in their pursuits, on moral and intellectual principles,—a gambling spirit,—an insatiable appetite for wealth,—alternately the extravagant joys of excessive prosperity and the bitter miseries of disappointed ambition,—render the lives of manufacturers and merchants, too often scenes of vanity and vexation of spirit. As the *chief occupations* of the British nation, manufactures and commerce, are disowned by reason; for, as now conducted, they imply the permanent degradation of the great mass of the people. They already constitute England's weakness; and, unless they shall be regulated by sounder views than those which at present prevail, they will involve the population in unspeakable misery. The oscillations of fortune, which almost the whole of the middle ranks of Britain experience, in consequence of the alternate depression and elevation of commerce and manufactures, are attended with extensive and severe individual suffering. Deep, though often silent, agonies pierce the heart, when ruin is seen stealing, by slow but certain steps, on a young and helpless family; the mental struggle often undermines the parent's health, and conducts him prematurely to the grave. No death can be imagined more painful than that which arises from a broken spirit, robbed of its treasures, disappointed in its ambition, and conscious of failure in the whole scheme of life. The best affections of the soul are lacerated and agonized at the prospect of leaving their dearest objects to struggle, without provision, with a cold and selfish world. Thousands of the middle ranks in Britain, unhappily, experience these misfortunes in every passing year. Nothing is more essential to human happiness than fixed principles of action, on which we can rely for our present safety and future welfare; and the Creator's laws, when seen and followed, afford this support and delight to our faculties in a high degree. It is one, not the least, of the punishments that overtake the middle classes for neglecting these laws, that they do not, as a permanent condition of mind, feel secure and internally at peace with themselves. In days of prosperity, they continue to fear adversity. They live in a constant struggle with fortune; and when the excitement of business has subsided, vacuity and craving are experienced. These proceed from the moral and intellectual faculties calling aloud for gratification; but, owing to an imperfect education, either idleness, gossiping conversation, fashionable amusements, or intoxicating liquors, are resorted to, and with these a vain attempt is made to fill up the void of life. I know that this class ardently desires a change that would remove the evils here described, and will zealously co-operate in diffusing knowledge, by means of which alone it can be introduced.

The punishment which overtakes the higher classes is equally obvious. If they do not engage in some active pursuit, so as to give scope to their energies, they suffer the evils of ennui, morbid irritability, and excessive relaxation of the functions of mind and body; which carry in their train more suffering than even that which is entailed on the operatives by excessive labour. If they pursue ambition in the senate or the field, in literature or philosophy, their real success is in exact proportion to the approach which they make to observance of the supremacy of the moral sentiments and intellect. Sully, Franklin, and Washington, may be contrasted with Sheridan and Buonaparte, as illustrations. Sheridan and Napoleon did not, systematically, pursue objects sanctioned by the higher sentiments and intellect, as the end of their exertions; and no person who is a judge of human emotions can read the history of their lives, and consider what must have passed within their minds, without coming to the conclusion, that even in their most brilliant moments of external prosperity the canker was gnawing within, and that there was no moral relish of the present, or reliance on the future, but a mingled tumult of inferior propensities and intellect, carrying with it an habitual feeling of unsatisfied desires.

Let us now consider the effect of the moral law on NATIONAL prosperity.

If the Creator has constituted the world in harmony with the dictates of the moral sentiments, the highest prosperity of each particular nation should be thoroughly compatible with that of every other: Hence England, by sedulously cultivating her own soil, pursuing her own courses of industry, and regulating her internal institutions and her external relations by the principles of Benevolence, Veneration, and Justice, which imply abstinence from wars of aggression, from conquest, and from all selfish designs of commercial monopoly,—should be in the highest condition of prosperity and enjoyment that nature admits of; and every step that she deviates from these principles, should carry an inevitable punishment along with it. The same statement may be made with respect to France and every other nation. According to this principle, also, the Creator should have conferred on each nation such peculiar advantages of soil, climate, situation, or genius, as should enable it to carry on amicable intercourse with its fellow states, in a beneficial exchange of the products peculiar to each; so that the higher one nation rose in morality, intelligence, and riches, the more estimable and valuable it should become as a neighbour to all the surrounding states. This is so obviously the real constitution of nature, that proof of it would be superfluous.

England, however, as a nation, has set this law at defiance. She has led the way in taking the propensities as her guides, in founding her laws and institutions on them, and in following them in her practical conduct. England placed restrictions on trade, and carried them to the greatest height; she conquered colonies, and ruled them in the full spirit of selfishness

she encouraged lotteries, fostered the slave-trade, and carried paper money and the most avaricious spirit of manufacturing and speculating in commerce to their highest pitch; she defended corruption in Parliament, and distributed churches and seats on the bench of justice, on principles purely selfish; all in direct opposition to the supremacy of the moral law. If the world had been created in harmony with the predominance of the animal faculties, England would have been a most felicitous nation; but as the reverse is the case, it was natural that a severe national retribution should follow these departures from the Divine institutions,—and grievous accordingly has been, and, I fear, will be, the punishment.

The principle which appears to regulate national chastisements is, that the precise combination of faculties which leads to the transgression, carries in its train the punishment. Nations as well as individuals are under the moral and intellectual law. A carter who half starves his horse, and unmercifully beats it, to supply, by the stimulus of pain, the vigour that nature intended to flow from abundance of food, may be supposed to practise this barbarity with impunity in this world, if he evade the eye of the police; but this is not the case. The hand of Providence reaches him by a direct punishment: he fails in his object; for blows cannot supply the vigour which, by the constitution of the horse, will flow only from sufficiency of wholesome provender. In his conduct, he manifests excessive Destructiveness, with deficient Benevolence, Veneration, Justice, and Intellect; and he cannot reverse this character by merely averting his eyes and his hand from the horse. He carries these dispositions into the bosom of his family and into the company of his associates, and a variety of evil consequences ensue. The delights that spring from active moral sentiments and intellectual powers are necessarily unknown to him; and the difference between these pleasures and the sensations attendant on *his* moral and intellectual condition, are as great as between the external splendour of a king and the naked poverty of a beggar. It is true that he has never felt the enjoyment, and does not know the extent of his loss; but still the difference exists; *we* see it, and know that, as a direct consequence of his state of mind, he is excluded from a great and exalted pleasure. Farther, his active animal faculties rouse the Combativeness, Destructiveness, Self-Esteem, Secretiveness, and Cautiousness, of his wife, children, and associates, against him, and they inflict on him animal punishment. He, no doubt, goes on to eat, drink, blaspheme, and abuse his horse, day after day, apparently as if Providence took no note of his conduct; but he neither feels, nor can any one who attends to his condition believe him to feel, *happy:* he is uneasy, discontented, and conscious of being disliked—all which sensations are his punishment; and it is owing solely to his own grossness and ignorance that he does not connect it with his offence. Let us apply these remarks to nations.

England, under the impulses of excessively strong Acquisitiveness, Self-Esteem, and Destructiveness, for a long time protected the slave-trade. During the periods of her greatest sin in this respect, the same combination of faculties should, according to the law which I am explaining, be found working most vigorously in her other institutions, and producing punishment for that offence. In these periods, a general spirit of domineering and rapacity should appear in her public men, rendering them little mindful of the welfare of the people; injustice and harshness in her taxations and public laws; and a spirit of aggression and hostility towards other nations, provoking retaliation of her insults. And accordingly I have been informed, as a matter of fact, that while these measures of injustice were publicly patronised by the government, its servants vied with each other in injustice towards it, and its subjects dedicated their talents and enterprise towards corrupting its officers, and cheating it of its due. Every trader who was liable to excise or custom duties evaded the one-half of them, and did not feel that there was any disgrace in doing so. A gentleman, who was subject to the excise-laws fifty years ago, described to me the condition of his trade at that time. The excise-officers, he said, regarded it as an understood matter, that at least one-half of the goods manufactured were to be smuggled without being charged with duty; but then, said he, "they made us pay a moral and pecuniary penalty that was at once galling and debasing. We were constrained to ask them to our table at all meals, and place them at the head of it in our holiday parties: when they fell into debt, we were obliged to help them out of it; when they moved from one house to another, our servants and carts were in requisition to transport their effects. By way of keeping up discipline upon us, and also to make a show of duty, they chose every now and then to step in and detect us in a fraud, and get us fined: if we submitted quietly, they told us that they would make us amends by winking at another fraud, and they generally did so; but if our indignation rendered passive obedience impossible, and we gave utterance to our opinion of their character and conduct, they enforced the law on *us*, while they relaxed it on our neighbours; and these, being rivals in trade, undersold us in the market, carried away our customers, and ruined our business. Nor did the bondage end here. We could not smuggle without the aid of our servants; and as they could, on occasion of any offence given to themselves, carry information to the head-quarters of excise, we were slaves to them also, and were obliged tamely to submit to a degree of drunkenness and insolence that appears to me now perfectly intolerable. Farther, this evasion and oppression did us no good; for all the trade were alike, and we just sold our goods so much the cheaper the more duty we evaded: so that our individual success did not depend upon superior skill and superior morality, in making an excellent article at a moderate price, but upon superior capacity for fraud, meanness, sycophancy, and every possible baseness. Our lives were any thing but enviable. Conscience, although greatly blunted by practices that were universal and viewed as inevitable, still whispered that they were wrong; our self-respect very frequently revolted at the insults to which we were exposed; and there was a constant feeling of insecurity arising from our dependence upon wretches whom we internally despised. When the government took a higher tone, and infused more principle and greater strictness into the collection of the duties, we thought ourselves ruined. The reverse, however, has been the case. The duties, no doubt, are now excessively burdensome from their amount; but that is their least evil. Were it possible to collect them from every trader with perfect equality, our independence would be complete, and our competition would be confined to superiority in morality and skill. Matters are much nearer this point now than they were fifty years ago; but still they would admit of considerable improvement." The same individual mentioned, that, in his youth, now seventy years ago, the civil liberty of the people of Scotland was held by a weak tenure. About 1760, he knew instances of soldiers being sent, in time of war, to the farm-houses, to carry off, by force, young men for the army: as this was against the law, they were accused of some imaginary offence, such as a trespass or an assault, which was proved by false witnesses; and the magistrate, perfectly aware of the farce and its object, threatened the victim with transportation to the colonies, as a felon, if he would not enlist—which, unprotected and overwhelmed by power and injustice,—he was, of course, compelled to do.

If the same minute representation were given of other

departments of private life, during the time of the greatest immoralities on the part of the government, we should find that this paltering with conscience and character in the national proceedings, tended to keep down the morality of the people, and fostered in them a rapacious and gambling spirit, to which many of the evils that have since overtaken us have owed their origin.

But we may take a more extensive view of the subject of national responsibility.

In the American war Britain desired to gratify her Acquisitiveness and Self-Esteem, in opposition to Benevolence and Justice, at the expense of her transatlantic colonies. This roused the animal resentment of the latter, and the propensities of the two nations came into collision; that is to say, they made war on each other—Britain, to support a dominion in direct hostility to the principles which regulate the moral government of the world, in the expectation of becoming rich and powerful by success in that enterprise; the Americans to assert the supremacy of the higher sentiments, and to become free and independent. According to the principles which I am now unfolding, the greatest misfortune that could have befallen Britain would have been success, and the greatest advantage, failure in her attempt; and the result is now acknowledged to be in exact accordance with this view. If Britain had subdued the colonies in the American war, every one must see to what an extent her Self-Esteem, Acquisitiveness, and Destructiveness, would have been let loose upon them. This, in the first place, would have roused the animal faculties of the conquered party, and led them to give her all the annoyance in their power; and the expense of the fleets and armies requisite to repress this spirit, would have far counterbalanced the profits she could have wrung out of the colonists by extortion and oppression. In the second place, the very exercise of these animal faculties by herself, in opposition to the moral sentiments, would have rendered her government at home an exact parallel of that of the carter in his own family. The same malevolent principles would have overflowed on her own subjects: the government would have felt uneasy, and the people rebellious, discontented, and unhappy; and the moral law would have been amply vindicated by the suffering which would have everywhere abounded. The consequences of her failure have been the reverse. America has sprung up into a great and moral nation, and actually contributes ten times more to the wealth of Britain, standing as she now does in her natural relation to this country, than she ever could have done as a discontented and oppressed colony. This advantage is reaped without any loss, anxiety, or expense; it flows from the divine institutions, and both nations profit by and rejoice under it. The moral and intellectual rivalry of America, instead of prolonging the ascendency of the propensities in Britain, tends strongly to excite the moral sentiments in her people and government; and every day that we live, we are reaping the benefits of this improvement in wiser institutions, deliverance from abuses, and a higher and purer spirit pervading every department of the executive administration of the country. Britain, however, did not escape the penalty of her attempt at the infringement of the moral laws. The pages of her history, during the American war, are dark with suffering and gloom, and at this day we groan under the debt and difficulties then partly incurred.

If the world be constituted on the principle of the supremacy of the moral sentiments and intellect, the practice of one nation seeking riches and power, by conquering, devastating, or obstructing the prosperity of another, must be *essentially futile:* Being in opposition to the moral constitution of creation, it must occasion misery while in progress, and can lead to no result except the impoverishment and mortification of the people who pursue it. It is narrated that Themistocles told the Athenians that he had conceived a project which would be of the greatest advantage to Athens, but that the profoundest secrecy was necessary to ensure its success. They desired him to communicate it to Aristides, and promised, if he approved, to execute it. Themistocles took Aristides aside, and told him that he proposed, unawares, to burn the ships of the Spartans, then in profound peace with the Athenian state and not expecting an attack; which would very much weaken the Spartan power. Aristides reported, that nothing could be more *advantageous*, but nothing more *unjust*, than the project in view. The people refused to hear or to execute it.* Here the *intellect* of Aristides appears to have viewed the execution of the scheme as *beneficial*, while his sentiment of Conscientiousness distinctly denounced it as *morally wrong;* and the question is, Whether external nature is so constituted, that the intellect can, *in any case*, possess *sufficient data* for inferring *actual benefit* from conduct which is *disowned and denounced by the moral sentiments?* It appears to me that it cannot. Let us trace the project of Themistocles to its results.

The inhabitants of Sparta possessed the faculties of Self-Esteem, Combativeness, Destructiveness, Intellect, Benevolence, and Conscientiousness. The proposed destruction of their ships, in time of profound peace, would have outraged the higher sentiments and intellect, and these would have kindled Combativeness and Destructiveness into the most intense activity. The greater the injustice of the act, the fiercer would the flame of opposition, retaliation, and revenge, have glowed; and not only so, but the more grossly and wantonly the moral sentiments were outraged by the act, the higher would have been the class of minds which would have instinctively burned with the desire of revenge. The Athenians, then, by the very constitution of nature, would have been assailed by this fearful storm of moral indignation and animal resentment, rendered doubly terrible by the most virtuous and intelligent being converted into the most determined of their opponents. Turning to their own state again,—only those individuals among themselves in whom intellect and moral sentiment were inferior to Acquisitiveness and Self-Esteem, which give rise to selfishness and the lust of power, could have cordially approved of the deed. The virtuous would have turned from the contemplation of it with shame and sorrow; and thus both the character and number of the defenders would have been diminished in the very ratio of the atrocity of the crime, while the power of the assailants, as we have seen, would, by that very circumstance, have been proportionally increased. It was impossible, therefore, that advantage to Athens could ultimately have resulted from such a flagrant act of iniquity; and the apparent opposition, in the judgment of Aristides, between the justice of the deed and the benefits to be expected from it, arose from his intellect not being sufficiently profound and comprehensive to grasp the whole springs which the enterprise would call into action, and to trace out the ultimate results. In point of fact, there would have been no opposition between the dictates of Conscientiousness, and those of an intellect that could have accurately surveyed the whole causes and effects which the unjust enterprise would have set in motion—but the reverse; and the Athenians, in following the suggestions of the moral sentiment, actually adopted the most advantageous course which it was possible for them to pursue. The trite observation, that honesty is the best policy, thus becomes a profound philosophical maxim, when traced to its foundation in the constitution of human nature.

The national debt of Britain has been contracted chiefly in wars, originating in commercial jealousy and thirst for conquest; in short, under the suggestions of Combativeness, Destructiveness, Acquisitiveness, and Self-Esteem.† Did not our ancestors, therefore, im-

* Cicero de Officiis, lib. iii.

† Of 127 years, terminating in 1815, England spent 65 in

pede their own prosperity and happiness, by engaging in these contests? and have any consequences of them reached us, except the burden of paying nearly thirty millions of taxes annually, as the price of the gratification of the propensities of our ignorant forefathers? Would a statesman, who believed in the doctrines maintained in this work, have recommended these wars *as essential to national prosperity?* If the twentieth part of the sums had been spent in effecting objects recognised by the moral sentiments—in instituting, for example, seminaries of education and penitentiaries, and in making roads, canals, and public granaries—how different would have been the present condition of the country!

After the American followed the French revolutionary war. Opinions are at present more divided upon this subject; but my view of it, offered with the greatest deference, is the following: When the French Revolution broke out, the domestic institutions of Britain were, to a considerable extent, founded and administered on principles in opposition to the supremacy of the moral sentiments. A clamour was raised by the nation for reform of abuses. If my leading principle be sound, every departure from the moral law, in nations as well as individuals, carries its punishment with it, from the hour of its commencement till its final cessation; and if Britain's institutions were then, to any extent, corrupt and defective, she could not have too speedily abandoned them, and adopted purer and loftier arrangements. Her government, however, clung to the suggestions of the propensities, and resisted every innovation. To divert the national mind from causing a revolution at home, they embarked in a war abroad; and, for a period of twenty-three years, let loose the propensities on France with headstrong fury and a fearful perseverance. France, no doubt, threatened the different nations of Europe with the most violent interference with their governments; a menace wholly unjustifiable, and one which called for resistance. But the rulers of that country were preparing their own destruction, in exact proportion to their departure from the moral law; and a statesman, who knew and had confidence in the constitution of the world as now explained, could have listened to the storm with perfect composure, prepared to repel actual aggression; and could have left the exploding of French infatuation to the Ruler of the Universe, in unhesitating reliance on the efficacy of His laws. Britain preferred a war of aggression. If this conduct was in accordance with the dictates of the higher sentiments, we should now, like America, be reaping the reward of our obedience to the moral law, and plenty and rejoicing should flow down our streets like a stream. But mark the contrast. This island exhibits the spectacle of millions of men toiling to the extremity of human endurance, for a pittance scarcely sufficient to sustain life; weavers labouring for fourteen or sixteen hours a-day for eightpence, and frequently unable to procure work even on these terms; other artisans, exhausted almost to death by laborious drudgery, and who, if better recompensed, seek compensation and enjoyment in the grossest sensual debauchery, drunkenness, and gluttony; master-traders and manufacturers anxiously labouring for wealth, now gay in the fond hope that all their expectations will be realized, then sunk in despair by the ploughshare of ruin having passed over them; landholders and tenants now reaping unmeasured returns from their properties, then pining in penury amidst an overflow of every species of produce; the government cramped by an overwhelming debt and the prevalence of ignorance and selfishness on every side, so that it is impossible for it to follow with a bold step the most obvious dictates of expediency and justice, by reason of the countless prejudices and imaginary interests which everywhere obstruct the path of improvement. This much more resembles punishment for transgression than reward for obedience to the Divine laws.

If every man in Britain will turn his attention inwards, and reckon the pangs of disappointment which he has felt at the subversion of his own most darling schemes by unexpected turns of public events, or the deep inroads on his happiness which such misfortunes, overtaking his dearest relations and friends, have occasioned to him; the numberless little enjoyments in domestic life, which he is forced to deny himself, in consequence of the taxation with which they are loaded; the obstructions to the fair exercise of his industry and talents, presented by stamps, licenses, excise-laws, custom-house duties, *et hoc genus omne*; he will discover the extent of responsibility attached by the Creator to national transgressions. From my own observation, I would say, that the miseries inflicted upon individuals and families, by fiscal prosecutions, founded on excise-laws, stamp-laws, post-office laws, &c., all originating in the necessity of providing for the national debt, are equal to those arising from some of the most extensive natural calamities. It is true, that few persons are prosecuted without having offended; but the evil consists in presenting men with enormous temptations to infringe mere financial regulations, not always in accordance with natural morality, and then inflicting ruinous penalties for transgression. Men have hitherto expected the punishment of their offences in the thunderbolt or the yawning earthquake, and have believed that because the sea did not swallow them up, or the mountains fall upon them and crush them to atoms, heaven was taking no cognizance of their sins; while, in point of fact, an omnipotent, an all-just, and an all-wise GOD, had arranged, before they erred, an ample retribution in the very consequences of their transgressions. It is by looking to the *principles* in the mind, from which transgressions flow, and attending to their whole operations and results, that we discover the real theory of the Divine government. When men shall be instructed in the laws of creation, they will discriminate more accurately than heretofore between natural and factitious evils, and become less tolerant of the latter.

Since the foregoing observations were written, the great measure of Parliamentary Reform has been carried into effect in Britain and Ireland, and already considerable progress has been made in rectifying our national institutions. For the first time in the annals of the world, a nation has voluntarily contributed a large sum of money for the advancement of pure benevolence and justice. We have agreed to pay twenty millions sterling for the freedom of 800,000 human beings, whom our unprincipled forefathers had led into hopeless slavery. Sinecures have been abolished, monopolies destroyed, unmerited pensions checked, and taxation lightened; and there is a spirit abroad which demands the reform of all other abuses in church and state. The high gratification which I experience in contemplating these

war and 62 in peace. The war of 1688, after lasting nine years, and raising our expenditure in that period 36 millions, was ended by the treaty of Ryswick in 1697. Then came the war of the Spanish succession, which began in 1702, concluded in 1713, and absorbed 62½ millions of our money. Next was the Spanish war of 1739, settled finally at Aix-la-Chapelle in 1748, after costing us nearly 54 millions. Then came the seven years' war of 1756, which terminated with the treaty of Paris in 1763, and in course of which we spent 112 millions. The next was the American war of 1775, which lasted eight years. Our national expenditure in this war was 136 millions. The French Revolutionary war began in 1793, lasted nine years, and exhibited an expenditure of 464 millions. The war against Buonaparte began in 1803, and ended in 1815: during these twelve years, we spent 1159 millions, 771 of which were raised by taxes, and 388 by loans. In the revolutionary war we borrowed 201 millions; in the American, 104 millions; in the seven years' war, 60 millions; in the Spanish war of 1739, 29 millions; in the war of the Spanish succession, 32½ millions; in the war of 1688, 20 millions. Total borrowed in the seven wars during 65 years, about 834 millions. In the same time, we raised by taxes 1189 millions; thus forming a total expenditure on war of TWO THOUSAND AND TWENTY-THREE MILLIONS OF POUNDS STERLING.—*Weekly Review.*

changes, arises from the perception that they have all the tendency to place the institutions of the country, and the administration of them, in harmony with the dictates of reason and the moral sentiments; the effect of which will infallibly be, not only to increase the physical enjoyments, but greatly to advance the moral, intellectual, and religious condition, of the people. Example is the most powerful means of instruction, and it was in vain for a priesthood allied to the state to preach truth, justice, and benevolence to the people, while force, oppression, and many other species of abuse, were practised by our rulers and the church itself. No more effectual means of purifying the hearts of the people can be devised, than that of purifying all public institutions, and exhibiting justice and kindly affection as the animating motives of public men and national measures.

Of all national enormities, that of legalising the purchase of human beings, and conducting them into slavery, is probably the most atrocious and disgraceful; and Britain was long chargeable with this iniquity. The callous inhumanity, the intense selfishness, and the utter disregard of justice, implied in the practice, must have overflowed in numerous evils on the people of Britain themselves. Indeed, the state of wretched destitution in which the Irish peasantry are allowed to remain, and the unheeded increase of ignorance, poverty, and toil, in the manufacturing districts, appear to be legitimate fruits of the same spirit which patronized slavery; and these probably are preparing punishment for the nation, if repentance shall not speedily appear. Slavery, however, has now been abolished by Britain, and I hail this as the first step in a glorious career of moral legislation. The North Americans have been left behind by England, for once, in the march of Christian practice. In the United States, Negro slavery continues to deface the moral brightness of her legislative page; and on no subject does prejudice appear to be so inveterately powerful in that country as on slavery. Greatly as I respect the character of the Americans, it is impossible to approve of their treatment of the Negro population. The ancestors of the present American people stole, or acquired by an unprincipled purchase, the ancestors of the existing Negroes, and doomed them to a degrading bondage. This act was utterly at variance with the dictates of the moral sentiments, and of Christianity. Their posterity have retained the blacks in thraldom, treated them with contumely, and at this day regard them as scarcely human beings. This also is a grievous transgression of the natural and revealed law of moral duty. Evil and suffering must flow from these transgressions to the American people themselves, if a just God really governs the world.

The argument that the negroes are incapable of civilization and freedom, is prematurely urged, and not relevant although it were based upon fact. The Negro head presents great varieties of moral and intellectual development, and I have seen several which appeared fully equal to the discharge of the ordinary duties of civilized men. But the race has never received justice from its European and American masters; and until its treatment shall have become moral, its capabilities cannot be fairly estimated, and the judgment against it is therefore premature.* But, whatever be the capabilities of the Negroes, it was a heinous moral transgression to transport them, by violent means, from the region where they had been placed by a wise and benevolent God, and to plant them in a new soil, and amidst institutions, for which they were never intended; and the punishment of this offence will rather be aggravated than averted, by losing sight of the source of the transgression, and charging the consequences of it on the Negroes, as if they were to blame for their alleged incapacity to glide gracefully into the ranks of American civilization. The Negroes must either be improved by culture and intermarriage with the white race, or retransferred to their native climate, before America can escape from the hands of divine justice. I am not sufficiently acquainted with the details of American social life, to be able to point out the practical form in which the punishment is inflicted; but if there be truth in the principles now expounded, no doubt can be entertained of its existence.

The alternative of incorporating the negroes, by intermarriage, with the European race, appears revolting to the feelings of the latter; while they also declare it to be impossible to retransport the blacks to Africa, on account of their overwhelming numbers. There is much force in both of these objections, but the following considerations have still greater weight:—the white race is exclusively to blame for the origin of the evil, and for all its consequences; the natural laws never relax in their operation; and hence the existing evils will go on augmenting until a remedy be adopted, and this will become more painful the longer it is delayed. If the present state of things shall be continued for a century, it is probable that it will end in a war of extermination between the black and the white population, or in an attempt by the blacks to conquer and exclusively possess one or more of the southern states of the Union as an independent kingdom for themselves.

At the time when I write these pages, the planters of Jamaica and of the other West India Islands are complaining of the ruinous consequences to them of Negro emancipation, and blaming the British Government for having abrogated slavery. These men apparently do not believe in the moral government of the world, or they do not know the manner in which it is administered. If they did, they would acknowledge that those who sow the wind have no right to complain when they reap the whirlwind. The permanence of Negro slavery in the West Indies was impossible; because it was a system of gross injustice, cruelty, and oppression, and no such social fabric can permanently endure. Its fruits have long been poisonous and bitter, and the planters are suffering the penalty of having reared them. They ought, however, to thank the justice and repentant generosity of the mother country, which, by purchasing the freedom of the slaves, has so greatly mitigated their punishment; for they may rest assured, that the annoyances now suffered are light and transient compared with the calamities which would have befallen them had slavery been prolonged until it had wrought out its own termination. Another generation will probably see and acknowledge this truth.

* The reader will find, in the 46th number of Chambers's Edinburgh Journal (15th Dec. 1832), a very interesting account of a Negro of high moral and intellectual qualities, who lived for a considerable time near Hawick. Another Negro, named Eustache, of whose head there is a cast in the Phrenological Society's collection, displayed a degree of shrewdness and disinterested benevolence very rare even in Europe; and his head, while it presents an excellent anterior development, is more prominent at the organ of Benevolence than any other head which has fallen under my observation. An account of Eustache will be found in the Phrenological Journal, vol. ix. p. 134, and *Journal de la Société Phrenologique de Paris*, April 1835. Mr Lawrence has collected, in the eighth chapter of his admirable Lectures on Physiology, Zoology, and the Natural History of Man, a great variety of facts tending to prove that the Negroes, though morally and intellectually inferior to the white race, are by no means near the bottom of the scale of humanity; and he expresses the well-grounded opinion, "that of the dark-coloured people none have distinguished themselves by stronger proofs of capacity for literary and scientific investigation, and, consequently, that none approach more nearly than the Negro to the polished nations of the globe."

May 1. 1841.—Since the text was written, I have visited the United States of North America, and examined numerous skulls and heads of Negroes, and can now confirm, from observation, the opinion of Mr Lawrence.—See my Notes on the United States of North America, vol. ii. pp. 77, 112, 292, vol. iii. pp. 76, 168, for a fuller exposition of this point.

But, in the mean time, I remark, that, be the sufferings of the West India planters at present what they may, they, as the representatives of the original transgressors, are justly sustaining the penalty; and, in their instance, as in that of a patient undergoing a severe operation to escape from a dangerous disease, delay would only have protracted their affliction, and augmented the ultimate pain and the danger of the remedy.

The Spaniards, under the influence of selfish rapacity and ambition, conquered South America, inflicted upon its wretched inhabitants the most atrocious cruelties, and continued, for 300 years, to weigh like a moral incubus upon that quarter of the globe. The punishment is now endured. By the laws of the Creator, nations must obey the moral law to be happy; that is, to cultivate the arts of peace, and to be industrious, upright, intelligent, pious, and humane. The reward of such conduct is individual happiness, and national greatness and glory: there shall then be none to make them afraid. The Spaniards disobeyed all these laws in the conquest of America; they looked to rapine and foreign gold, and not to industry, for wealth; and this fostered avarice and pride in the government, baseness in the nobles, and indolence, ignorance, and mental depravity in the people,—it led them to imagine happiness to consist, not in the exercise of the moral and intellectual powers, but in the gratification of all the inferior, to the outrage of the higher feelings. Intellectual cultivation was neglected, the sentiments ran astray into bigotry and superstition, and the propensities acquired a fearful ascendency. These causes made them the prey of internal discord and foreign invaders, and Spain at this moment suffers an awful retribution.

Cowper recognises these principles of divine government as to nations, and has embodied them in the following powerful verses:—

> The hand that slew till it could slay no more,
> Was glued to the sword-hilt with Indian gore.
> Their prince, as justly seated on his throne
> As vain imperial Philip on his own,
> Tricked out of all his royalty by art,
> That stripped him bare, and broke his honest heart,
> Died by the sentence of a shaven priest,
> For scorning what they taught him to detest.
> How dark the veil, that intercepts the blaze
> Of Heaven's mysterious purposes and ways!
> God stood not, though he seemed to stand, aloof;
> And at this hour the conqueror feels the proof:
> The wreath he won drew down an instant curse,—
> The fretting plague is in the public purse,
> The cankered spoil corrodes the pining state,
> Starved by that indolence their minds create.
> Oh! could their ancient Incas rise again,
> How would they take up Israel's taunting strain!
> Art *thou* too fallen, Iberia? Do we see
> The robber and the murd'rer weak as we?
> Thou that hast wasted earth, and dared despise
> Alike the wrath and mercy of the skies,
> Thy pomp is in the grave, thy glory laid
> Low in the pits thine avarice has made.
> We come with joy from our eternal rest,
> To see th' oppressor in his turn oppressed.
> Art *thou* the god, the thunder of whose hand
> Rolled over all our desolated land,
> Shook principalities and kingdoms down,
> And made the mountains tremble at his frown?
> The sword shall light upon thy boasted powers,
> And waste them, as the sword has wasted ours.
> 'Tis thus Omnipotence his law fulfils,
> And Vengeance executes what Justice wills.
>
> *Cowper's Poems.—Charity.*

The question has frequently been discussed, whether the civilization of savages may be more easily effected by forcible or by pacific measures? By one class of reasoners, including the late excellent Sir Stamford Raffles, it is contended that civilized nations may, in their endeavours to improve and enlighten savage tribes, employ with advantage the superior power with which they are armed: but, on the principle of the supremacy of the moral sentiments, we are entitled to conclude, *a priori*, that such a method of proceeding would be found ineffectual. The employment of compulsion is calculated to rouse chiefly the propensities, while the very essence of civilization is the predominance of the moral and intellectual powers.* This subject is ably handled by a very acute anonymous writer in the Library of Entertaining Knowledge.† History, he remarks, does not warrant the opinion that any nation has ever been civilized by the sword; and the improvement which followed the Roman conquests appears to have been brought about, not by compulsion, but by the exhibition of "a standard and pattern of comfort and elegance which the barbarians could hardly fail first to admire, and afterwards to imitate." The Romans do not seem to have violently interfered with the established customs and institutions of conquered nations. "The inferior animals," says the excellent writer alluded to, "can only be reduced to obedience by constraint; but men are formed to be tamed by other methods. Example, persuasion, instruction, are the only means we may lawfully make use of to wean savages from their barbarism; and they are also the best fitted to accomplish that object. It is not even pretended that an exercise of what are falsely called the rights of conquest for such a purpose would have any chance of being successful till after the lapse of at least two or three generations—till the conquered people, in fact, have become mixed and amalgamated with their conquerors, or, from not having been permitted to follow the customs of their ancestors, have actually forgotten them. In some cases the natives have been absolutely extirpated before this has happened, as was the case almost universally on the South American continent, and of which we have a more remarkable instance in the attempts of the Spanish Jesuits to christianize by main force the inhabitants of the Marianas, which were terminated in a few years by the almost entire depopulation of that beautiful archipelago."‡

In surveying the present aspect of Europe, we perceive astonishing improvements achieved in physical science. How much is implied in the mere names of the steam-engine, power-looms, rail-roads, steam-boats, canals, and gas-lights; and yet of how much misery are several of these inventions at present the direct sources, in consequence of being almost exclusively dedicated to the gratification of the propensities! The leading purpose to which the steam-engine in almost all its forms of application is devoted, is the accumulation of wealth, or the gratification of Acquisitiveness and Self-Esteem; and few have proposed to lessen, by its means, the hours of toil of the lower orders of society, so as to afford them opportunity and leisure for the cultivation of their moral and intellectual faculties, and thereby to enable them to render a more perfect obedience to the Creator's institutions. Physical has far outstripped moral science; and it appears to me, that, unless mankind shall have their eyes opened to the real constitution of the world, and be at length induced to regulate their conduct in harmony with the laws of the Creator, their future physical discoveries will tend only to deepen their wretchedness. Intellect, acting as the ministering servant of the propensities, will lead them only farther astray. The science of man's whole nature, animal, moral, and intellectual, was never more required to guide him than at present, when he seems to wield a giant's power, but in the application of it to display the ignorant selfishness, wilfulness, and absurdity of an overgrown child. History has not yielded half her fruits, and cannot yield them until mankind shall possess a true theory of their own nature.

* See Observations on the Phrenological Standard of Civilization, Phren. Jour. ix. 360.

† The New Zealanders, p. 402–410.

‡ See the narrative of these extraordinary proceedings, though related by a pen in the interest of their authors, in Father Legobien's *Histoire des Iles Marianes*."

Many persons believe that they discover evidence against the moral government of the world, in the success of individuals not greatly gifted with moral and intellectual qualities, in attaining to great wealth, rank, and social consideration, while men of far superior merit remain in obscurity and poverty. But the solution of this difficulty is to be found in the consideration, that success in society depends on the possession, in an ample degree, of the qualities which society needs and appreciates, and that these bear reference to the state in which society finds itself at the time when the observation is made. In the savage and barbarous conditions, bodily strength, courage, fortitude, and skill in war, lead a man to the highest honours; in a society like that of modern England, commercial or manufacturing industry may crown an individual with riches, and great talents of debate may carry him to the summit of political ambition. In proportion as society advances in moral and intellectual acquirements, it will make larger demands for high qualities in its favourites. The reality of the moral government of the world is discernible in the different degrees of happiness which individuals and society enjoy in these different states. If unprincipled commercial and political adventurers were happy in proportion to their apparent success; or if nations were as prosperous under the dominion of reckless warriors as under that of benevolent and enlightened rulers; or if the individuals who compose a nation enjoyed as much serenity and joy of mind when they advanced bold, selfish, and unprincipled men to places of trust and power, as when they chose the upright, benevolent, and pious,—the dominion of a just Creator might well be doubted. But the facts are the reverse of these.

CHAPTER VI.

ON PUNISHMENT.

1. *On punishment as inflicted under the natural laws*—Laws may be instituted either for the selfish gratification of the legislator, or for the benefit of the governed—Gessler's order to the Swiss, an instance of the former; the natural laws of God, of the latter—The object of punishment for disobedience to the divine laws is to arrest the offender, and save him from greater miseries—Beneficial effects of this arrangement—Laws of combustion; advantages attending them, and mode in which man is enabled to enjoy these and escape from the danger to which he is subjected by fire—Utility of pain—God's punishments in this world have for their object to bring the sufferers back to obedience for their own welfare, and to terminate their misery by death when the error is irreparable—Punishments mutually inflicted by the lower animals—Punishments mutually inflicted by men—Criminal laws hitherto framed on the principle of animal resentment—Inefficacy of these, from overlooking the causes of crime, and leaving them to operate with unabated energy after the infliction—Moral in preference to animal retribution, suggested as a mode of treatment—Every crime proceeds from an abuse of some faculty or other—The question, Whence originates the tendency to abuse? answered by the aid of Phrenology—Crime extinguishable only by removing its causes—The effects of animal and moral punishment compared—Remarks on the natural distinction between right and wrong—The objections considered, That, according to the proposed moral system of treating offenders, punishment would be abrogated and crime encouraged; and That the author's views on this subject are Utopian, and, in the present state of society, impracticable.——II. *Moral advantages of punishment*—The mental improvement of man not the primary object for which suffering is sent—Errors of some religious sects adverted to—Bishop Butler teaches, more rationally, that a large proportion of our sufferings is the result of our own misconduct—The objection, that punishments are often disproportionately severe, considered—Recapitulation of the advantages flowing from obedience, and misfortunes from disobedience, to the moral laws.

SECT. I.—ON PUNISHMENT AS INFLICTED UNDER THE NATURAL LAWS.

The last point connected with the Natural Laws, which I consider, is the principle on which punishment for infringement of them, is inflicted in this world.

Every law prescribed to intelligent beings presupposes a superior, who establishes it, and subjects who are called on to obey. The superior may be supposed to act under the dictates of the animal faculties, or under those of the moral sentiments. The former being selfish, whatever they desire is for selfish gratification. Hence laws instituted by a superior inspired by the animal powers, would have for their leading object the individual advantage of the law-giver, with no systematic regard to the enjoyment or welfare of his subjects. The moral sentiments, on the other hand, are altogether generous, disinterested, and just; they delight in the happiness of others, and do not seek individual advantage as their supreme end. Laws instituted by a law-giver inspired by them, would have for their grand object the advantage and enjoyment of those who were required to yield obedience. The story of William Tell will illustrate my meaning. Gessler, an Austrian governor of the canton of Uri, placed his hat upon a pole, and required the Swiss peasants to pay the same honours to it that were due to himself. The object of this requisition was obviously the gratification of the Austrian's Self-Esteem, in witnessing the humiliation of the Swiss. It was framed without the least regard to their happiness; because such abject slavery could gratify no faculty in their minds, and ameliorate no principle of their nature, but, on the contrary, was calculated to cause the greatest pain to their feelings.

Before punishment for breaking a law can be justly inflicted, it seems reasonable that the people called on to obey it should not only possess the power of doing so, but likewise be benefited by their obedience. If it was certain, that, by the very constitution of their minds, it was impossible for the Swiss to reverence the hat of the tyrant, and that, if they had pretended to do so, they would have manifested only baseness and hypocrisy,—then the law was unjust, and all punishment for disobedience was pure tyranny and oppression on the part of the governor. In punishing, he employed Destructiveness as a means of procuring gratification to his Self-Esteem.

Let us imagine, on the other hand, a law promulgated by a sovereign whose sole motive was the happiness of his subjects, and that the edict was, Thou shalt not steal. If the law-giver were placed far above the reach of theft by his subjects, and if respect to each other's rights were indispensable to the welfare of his people themselves, then it is obvious, that, so far as he was personally concerned, their stealing or not stealing would be of no importance whatever, while it would be of the highest moment to themselves. Let us suppose, then, that, in order to prevent the evils which the subjects would bring upon themselves by stealing, he were to add as a penalty, that every man who stole should be locked up, and instructed in his duty until he became capable of abstaining from theft,—the justice and benevolence of this sentence would be unquestionable, because it would prove advantageous both to society and to the offender. Suppose that the latter was born with large organs of Acquisitiveness and Secretiveness, and deficient Conscientiousness, and that when he committed the offence he really could not help stealing,—still there would be no cruelty and no injustice in locking him up, and instructing him in moral duty until he learned to abstain from theft; because, if this were not done, and if all men were to follow his example and only steal, the human race, and he, as a member of it, would necessarily starve and become extinct.

The Creator's natural laws, so far as I have been able to perceive them, are instituted solely on the latter principle; that is to say, there is not the slightest indication of the object of any of the arrangements of creation being to gratify an inferior feeling in the Creator himself. No well-constituted mind, indeed, could con-

ceive him commanding beings whom He called into existence, and whom He could annihilate in a moment, to do any act of homage which had reference merely to the acknowledgment of His authority, solely for His personal gratification, and without regard to their own welfare and enjoyment. We cannot, without absolute outrage to the moral sentiments and intellect, imagine Him doing any thing analogous to the act of the Swiss governor—placing an emblem of His authority on high, and requiring His creatures to obey it, merely to gratify Himself by their homage, to their own disparagement and distress. Accordingly, every natural law, so far as I can discover, appears clearly instituted for the purpose of adding to the enjoyment of the creatures who are called on to obey it. The object of the punishment inflicted for disobedience is to arrest the offender in his departure from the laws; which departure, if permitted to proceed to its natural termination, would involve him in tenfold greater miseries. This arrangement greatly promotes the activity of the faculties; and active faculties being fountains of pleasure, the penalties themselves become benevolent and just. For example,

Under one of the physical laws, all *organic* bodies are liable to combustion. Timber, coal, oils, and animal substances, when heated to a certain extent, catch fire and burn: And the question occurs, Was this quality bestowed on them for a benevolent purpose or not? Let us look to the advantages attending it. By means of fire we obtain warmth in cold latitudes, and light after the sun has set: it enables us to cook, thereby rendering our food more wholesome and savoury; and by its aid we soften and fuse the metals. I need go no farther; every one will acknowledge, that, by the law under which organic bodies are liable to combustion, countless benefits are conferred on the human race.

The human body itself, however, is organized, and in consequence is subject to this law; so that, if placed in a great fire, it is utterly dissipated in a few minutes. Some years ago, a woman, in a fit of insanity, threw herself into an iron smelting-furnace, in full blaze: she was observed by a man working on the spot, who instantly put off the steam-engine that was blowing the bellows, and came to take her out; but he then saw only a small black speck on the surface of the fire, and in a few minutes more even it had disappeared. The effect of a less degree of heat is to disorganize the texture of the body. What mode, then, has the Creator followed to preserve men from the danger to which they are subjected by fire? He has caused their nerves to communicate sensations from heat, agreeable while the temperature is such as to benefit the body; slightly uneasy when it becomes so high as to be in some measure hurtful; positively painful when the heat approaches that degree at which it would seriously injure the organized system; and horribly agonizing whenever it becomes so elevated as to destroy the organs. The principle of all this is very obviously benevolent. Combustion brings us innumerable advanages; and when we place ourselves in *accordance* with the law intended to regulate our relation to it, we reap *unmingled benefits and pleasure*. But we are in danger from its excessive action; and so kind is the Creator, that he does not trust to the guardianship of our own Cautiousness and intellect alone to protect us from infringement, but has established a monitor in every sentient nerve, whose admonitions increase in intensity through imperceptible gradations, exquisitely adjusted to the degrees of danger, till at last, in pressing circumstances, they urge in a voice so clamant as to excite the whole physical and mental energy of the offender to withdraw him from the impending destruction.

Many persons imagine that this mode of admonition would be altogether unexceptionable if the offender always possessed the power to avoid incurring it, but that, on the other hand, when a child, or an aged person, stumbles into the fire, through mere lack of bodily strength to keep out of it, it cannot be just and benevolent to visit him with the tortures that follow from burning. This, however, is a short-sighted objection. If, to remedy the evil supposed, the law of combustion were altogether suspended as to children and old men, so that, as far as they were concerned, fire did not exist, then they would be deprived of the light, warmth, and other benefits which it affords. This would be a fearful deprivation; for warmth is grateful and necessary to them, in consequence of the very feebleness of their frames. Or we may suppose that their nerves were constituted to feel no pain from burning—an arrangement which would effectually guarantee them against the tortures of falling in the fire: But, in the *first* place, nerves feel pain under the same law that enables them to feel pleasure—the agony of burning arises altogether from an excessive degree of the stimulus of heat, which, when moderate, is genial and pleasant; and, *secondly*, if no pain were felt when in the fire, the child and old man would have no urgent motive to keep out of it. Under the present system, the pain would excite an intense desire to escape; it would increase their muscular energy, or make them cry aloud for assistance; in short, it would compel them to get out of the fire, by some means or other, and thus if possible escape from death. As they fell into the fire in consequence of a deficiency of mental or bodily power to keep out of it, the conclusion is obvious, that if no pain attended their contact with the flames, they might repose there as contentedly as on a bed of down; and the fond mother might find a black cinder for her child, or a pious daughter a half-charred mass of bones for her father, although she had been only in an adjoining apartment, from which the slightest cry or groan would have brought her to arrest the calamity.

In this instance, then, the law of combustion under which punishment is inflicted, is benevolent, even when pain visits persons who were incapable of avoiding the offence; because the object of the law is the welfare of these very unconscious offenders themselves, so that if it were subverted, they would be greatly injured, and would loudly petition for its re-establishment.

Let us take another example. Opium, by its inherent qualities, and the relationship established by the Creator between it and the nervous system of man, operates, if taken in one proportion, as a stimulant; if the proportion be increased, it becomes a sedative; and if still increased, it paralyzes the nervous system altogether, and death ensues. Now, it is generally admitted, that there is no want of benevolence and justice, when a full-grown and intelligent man loses his life, if he deliberately swallow an overdose of opium, knowing its qualities and their effects; because, it is said, he exposed himself to these effects voluntarily: When, however, an ignorant child, groping about for something to eat and drink, in order to satisfy the craving of its natural curiosity and appetite, stumbles on a phial of laudanum, intended for the use of some sick relative, pulls the cork, drinks, and dies,—many persons imagine that it is very difficult to discover justice and benevolence in this severe, and, as they say, unmerited catastrophe.

But the real view of the law under which both events happen, appears to me to be this. The inherent qualities of opium, and its relationship to the nervous system, are obviously benevolent, and are the sources of manifest advantages to man. If, in order to avoid every chance of accidents, opium, in so far as children are concerned, were deprived of its qualities, so that their nervous systems received no greater impression from it than from tepid water, it is clear that they would be sufferers. The greatest advantages of the drug are derived from its *scale of efficiency*, by which it can be made to produce, first a stimulating effect, then a gently sedative, and afterwards a higher and a higher degree of sedative influence, until, by insensible degrees, absolute paralysis ensues. A dose which kills in

health will cure in disease; and, if its range were limited to effects beneficial in health, its advantages in disease, arising from higher action, would necessarily be lost—so that children, by the supposed arrangement, would be cut off from its beneficial administration. The parallel between it and the law of combustion is discernible. If we could never have commanded a degree of heat higher than that which gently warms the human body, we must have wanted all the advantages now derivable from the intense heats used in cooking, baking, and manufacturing; if we could never have commanded more than the gently stimulant and sedative effects of opium on the body in a state of health, we should necessarily have been deprived of its powerful remedial action in cases of disease. The proper question then is, Whether is it more benevolent and just that children, after they have been exposed, from whatever cause, to that high degree of its influence, which, although beneficial in disease, is adverse to the healthy action of the nervous system, should be preserved alive in this miserable condition, or that life should at once be terminated? It appears advantageous to the offender himself, that death should relieve him from the unhappy condition into which his organized frame has been brought by the abuse of this substance, calculated, when discreetly used, to confer on him no mean advantages.

The principle that Divine punishments are founded in benevolence, even to the sufferer, is strongly elucidated in the case of the organic laws. When inflammation, for example, has seized any vital organ, if there were no pain, there could be no intimation that an organic law had been infringed; the disease would proceed quietly in its invasions; and death would ensue without the least previous warning. The pain attending an acute disease, therefore, appears to be instituted to warn the sufferer, by the most forcible of all admonitions, to return to obedience to the law which he has infringed. In the case of a broken limb, or a deep cut, the principle becomes exceedingly obvious. The bone of a leg will reunite, if the broken edges be preserved in close contact; and the subsequent serviceable condition of the limb will depend upon the degree of exactness with which they have been made to re-approach and been preserved in their natural position. Now, in the *first* place, the pain attending a broken limb gives a most peremptory intimation that an injury has been sustained; *secondly*, it excites the individual most forcibly to the reparation of it; and, *thirdly*, after the healing process has commenced, it recurs with a degree of violence proportioned to the disturbance of the parts, and thus acts like a sentinel with a drawn sword, compelling the patient to avoid everything that may impede his recovery. The same observations apply to a flesh-wound. The pain serves to intimate the injury, and to excite the patient to have it removed. The dissevered edges of the skin, nerves, and muscles, when skilfully made to re-approach, will, by the organic law, reunite if left in repose. As an accession of pain follows every disturbance of their condition, when in the process of healing, it serves as an effectual and benevolent guardian of the welfare of the individual. If these views be correct, what person would dispense with the pain which attends the infringement of the organic laws, although such a boon were offered for his acceptance? It is obvious, that, if he possessed the least glimmering of understanding, he would thank the Creator for the institution, and beg in mercy to be allowed the benefits attending it; especially if he considered the fact, that, after the possibility of recovery ceases, death steps in to terminate the suffering.

The point to which I request the reader's special attention is, that the power of the individual to avoid or not to avoid the infringement of the law in the particular instance which brings the punishment, is not an indispensable circumstance in rendering the infliction benevolent and just. The infliction is approved of by the moral sentiments and intellect, because the law, in its legitimate operation, is calculated altogether for the advantage of the subject; and because the punishment has no object but *to bring him back to obedience for his own welfare, or to terminate his sufferings when he has erred too widely to return.*

Let us now inquire whether the same principle prevails in regard to the infringement of the Moral and Intellectual Laws. This investigation is attended with great difficulty; and it may be best elucidated by attending, in the first place, to the liability to punishment for their actions, under which the lower animals are placed.

The physical and organic laws affect the inferior creatures in the same manner as they regulate man, so that nothing need be said on these points. The animals are endowed with propensities impelling them to act, and a certain degree of intellect enabling them to perceive the consequences of their actions. These faculties prompt them to inflict punishment on each other for infringement of their rights, although they possess no sentiments pointing out the moral guilt of such conduct. For example, dogs possess Acquisitiveness, which gives them the sense of property: when one is in possession of a bone, and another attempts to steal it, this act instantly excites the Combativeness and Destructiveness of the proprietor of the bone, and he proceeds to worry the assailant. Or a cock, on a dunghill, finds a rival intruding on his domain, and under the instinctive inspiration of Combativeness and offended Self-Esteem, he attacks him and drives him off. I call this inflicting *animal punishment.* In these cases it is not supposed that the aggressors possess moral faculties, intimating that their trespass is wrong, or free will by which they could avoid it. I view them as inspired by their propensities, and rushing blindly to gratification. Nevertheless, in the effect which the aggression produces on the propensities of the animal assailed, we perceive an arrangement instituted by the Creator for checking outrage, and arresting its progress.

Before the penalty inflicted could be viewed by man as just in such cases, it would be necessary to perceive that it was instituted for the benefit of the aggressors themselves; and, in truth, this is observed to be the case. If all dogs neglected to seek bones, and dedicated themselves solely to stealing; and if cocks, in general, deserted their own domains, and gave themselves up only to felonious inroads on each other's territories, it is evident that the races of these animals would soon become extinct. It follows, also, that any individual among them who should habitually abandon himself to such transgressions, would speedily lose his life by violence or starvation. If, then, it is beneficial for the race, and also for the individual offender himself, in these instances, to be arrested in his progress, his chastisement is decidedly benevolent and just.

It is interesting to observe, that various provisions are made, under the animal law, for bringing about substantial justice, even in creatures destitute of the sentiment of Conscientiousness. The lower animals make perfectly sure of punishing only the real offender; for he must be caught in the act, otherwise he is not visited by their resentment. In the next place, it appears to be the general law of animal nature, that, unless the offender has carried his inroad to an extreme extent, the punishment is relaxed the moment he desists; that is to say, the master of the bone or dunghill is generally satisfied with simple defence, and rarely abandons his treasure to pursue the offender for the sake of mere revenge.

Farther, the animals, in inflicting punishment, make no inquiry into the *cause of the offence.* With them it affords no alleviation that the aggressor is himself in a state of the greatest destitution, or that his appetite is irresistible; neither do they concern themselves about

his fate after they have made him undergo the penalty. He may die of the wounds they have inflicted upon him, or of absolute starvation, before their eyes, without their enjoyment being in the least disturbed. This arises from their faculties consisting entirely of those powers which regard only self. They are deficient in the faculties which inquire into causes and trace consequences; and in the moral sentiments, which desire, with a disinterested affection, the welfare of other beings.

Nevertheless, the punishment which they inflict is in itself just, and serves, as we have seen, a decidedly beneficial end. Let us now direct our attention to man.

Man possesses the same animal propensities as those of the lower creatures, and, under their instigation, he inflicts punishment on principles precisely analogous to those under which they chastise. Indeed, it is curious to remark, that hitherto the criminal laws, even of civilized nations, have been framed on the principles of animal punishment exclusively. A thief, for example, breaks into a dwelling-house and steals. The reflecting faculties are employed to discover the offender, and find evidence of the offence. Judges and juries assemble to determine whether the evidence is sufficient; and if they find it to be so, the offender is ordered to be banished, imprisoned, or hanged. We are apt to imagine that there is something moral in the trial. But the sole object of it is to ascertain that a crime has been committed, and that the accused is the offender. The dog and cock make equally certain of both points; because they never punish except when the individual is caught in the offence. Guilt being ascertained, and the offender identified, the dog shakes and worries him, and then lets him go; while man scourges his back, or makes him mount the steps of a tread-mill, and then turns him adrift. If the offender has been very presumptuous and pertinacious in his aggression, the dog sometimes, although rarely, throttles him outright; and man, in similar circumstances, very generally strangles him with a rope, or cuts off his head. The dog, in his proceeding, makes no inquiry into the causes which led to the crime or into the consequences upon the offender, of the punishment which he inflicts. In this also he is imitated by the human race. Man inflicts his vengeance with as little inquiry into the causes which led to the offence,—and, except when he puts him to death, he turns the culprit adrift upon the world after he has undergone his punishment, with as little concern about what shall next befall him as is shewn by his canine prototype. The dog acts in this manner, because he is inspired by animal propensities, and higher faculties have been denied him. Man imitates him, because he too has received animal faculties, and because, although he possesses, in addition to them, moral sentiments and reflecting intellect, he has not yet discovered the practical application of these to the subject of criminal legislation.

The animal punishment is not without advantage even in the case of man, although it is far short, in this respect, of what he might obtain by following the guidance of his moral sentiments and enlightened intellect. Man as a mere animal could not exist in society, unless some check were instituted against abuses of the propensities; and hence it is quite obvious, that animal vengeance, rude as it is, carries with it results beneficial even to the offender, except where it puts him to death—a degree of punishment which, as we have seen, the lower animals rarely inflict on each other of the same species. Unless the outrages of Destructiveness, Acquisitiveness, Self-Esteem, and the other animal faculties, were checked, human society would be dissolved, and by that result the offenders themselves would suffer more grievous calamities than under any moderate form of animal castigation.

The world is arranged, in so far as regards the lower creatures, with a wise relation to the faculties bestowed on them. Accordingly, animal resentment is really effective in their case. In consequence of their not possessing reflecting faculties, they are incapable of forming deep or extensive schemes for mutual aggression, and are not led to speculate on the chances of escaping detection in their misdeeds. Their offences are limited to casual overflowings of their propensities when excited by momentary temptation; which are checked by counter overflowings of other propensities, momentarily excited in the animals aggrieved.

In regard to man, however, the world has been arranged on the principle of supremacy of the moral sentiments and intellect; and, in consequence, animal retribution is not equally effectual in his case. For example, a human offender employs his intellect in devising means to enable him to escape detection, or to defend himself against punishment; and hence, although he sees punishment staring him in the face, his hope deludes him into the belief that he may escape it. Farther, if the real cause of human offences be excessive size and activity of the organs of the animal propensities, it follows that mere punishment cannot put a stop to crime; because it *overlooks the cause, and leaves it to operate with unabated energy after the infliction has been endured.* The history of the world, accordingly, presents us with a regular succession of crimes and punishments, and at present the series appears to be as far removed from a termination as at any previous period of the annals of the race.

If the world, in regard to man, has been arranged on the principle of supremacy of the moral sentiments and intellect, we might expect better success were *moral retribution*, of which I now proceed to treat, resorted to.

The motive which prompts the dog to worry, and the cock to peck and spur his assailant, is, as we have seen, mere animal resentment. His propensities are disagreeably affected, and Combativeness and Destructiveness instinctively start into activity to repel the aggression. The animal resentment of man is precisely analogous. A thief is odious to Acquisitiveness, because he robs it of its treasures; a murderer is offensive to our feelings, because he extinguishes life. And, these faculties being offended, Combativeness and Destructiveness rush to their aid in man while under the animal dominion, as instinctively as in the dog,—and punish the offender on principles, and in a way, exactly similar.

The case is different with the proper human faculties. Benevolence, contemplating outrage and murder, disapproves of them because they are hostile to its inherent constitution, and because they occasion calamities to those who are its objects, and misery to the perpetrators themselves. Conscientiousness is pained by the perception of theft, because its very nature revolts at every infringement of right, and because justice is essential to the welfare of all intelligent beings. Veneration is offended at reckless insult and indignity, because its desire is to respect the intelligent creatures of the God whom it adores, believing that they are all the objects of his love. Hence, when crime is presented to the moral sentiments, they all ardently and instinctively desire that it should be stopped, and its recurrence prevented, because it is in direct opposition to their very nature; and this impression, on their part, is not dependent on the power of the criminal to offend or to forbear. Benevolence grieves at death inflicted by a madman, and calls aloud that it should be averted; Conscientiousness disavows theft, although committed by an idiot, and requires that he should be restrained; while Veneration recoils at the irreverences even of the phrensied. The circumstance of the offenders being involuntary agents, incapable of restraining their propensities, does not alter the aversion of the moral faculties to their actions; and the reasons of this are obvious: *first*, these faculties hate evil because it is contrary to their nature, from whatever source it springs;

and, *secondly*, the circumstance of the aggressor being a necessary agent, does not diminish the calamity inflicted on the sufferer. It is as painful to be killed by a madman as by a deliberate assassin; and it is as destructive to property to be robbed by a cunning idiot, as by an acute and practised thief.

We perceive, therefore, as the first feature of the moral and intellectual law, that the higher sentiments, absolutely and in all circumstances, declare against offences, and demand imperatively that they shall be brought to an end.

There is a great difference, however, between the means which they suggest for accomplishing this object, and those prompted by the propensities. The latter, as I have said, blindly inflict animal resentment without the slightest regard to the *causes* which led to the crime, or the *consequences* of the punishment. They seize the aggressor, and worry, bite, or strangle him; and there their operations begin and terminate.

The moral and intellectual faculties, on the other hand, embrace even the criminal himself within the range of their sympathies. Benevolence desires to render *him virtuous*, and thereafter happy, as well as to rescue his victim. Veneration desires that he should be treated as a man; and Conscientiousness declares that it cannot with satisfaction acquiesce in any administration towards him that does not tend to remove the motives of his misconduct, and to prevent their recurrence. The first step, then, which the moral and intellectual faculties combine in demanding, is a full exposition of the causes of the offence, and the consequences of the mode of treatment proposed.

Let us, then, pursue this investigation; and here it may be observed, that we are now in condition to do so with something like a chance of success; for, by the aid of Phrenology, we have obtained a tolerably clear view of the elementary faculties of the mind, and the effects of organization on their activity and vigour.

The leading fact, then, which arrests our attention in this inquiry, is, that *every crime proceeds from an abuse of some faculty or other*; and the question immediately arises, Whence originates the tendency to abuse? Phrenology enables us to answer, From three sources: *first*, from particular organs being too large and spontaneously too active; *secondly*, from great excitement produced by external causes; or, *thirdly*, from ignorance of what are uses and what are abuses of the faculties.

The moral and intellectual powers next demand, What is the cause of particular organs being too large and too active in individuals? Phrenology, for answer, points to the law of hereditary descent, by which the organs most energetic in the parents determine those which shall predominate in the child. Intellect, then, infers that, according to this view, certain individuals are unfortunate at birth, in having received organs from their parents so ill proportioned, that abuse of some of them is almost an inevitable consequence, if they are left to the sole guidance of their own suggestions. Phrenology replies, that the fact appears to be exactly so. In the Museum of the Phrenological Society is exhibited a large assemblage of skulls and casts of the heads of criminals, collected from Europe, Asia, Africa, and America; and an undeniable feature in them all, is a great preponderance of the organs of the animal faculties over those of the moral sentiments and intellect.

In the next place, great excitement may arise from the individual being pressed by animal want, stimulated by intoxicating liquors, seduced by evil example, and from a variety of similar influences.

And, thirdly, abuses may arise from sheer want of information concerning the constitution of the mind, and its relations to external objects. Persecution for opinion, for example, is a crime obviously referrible to this source.

I have examined the cerebral development of a considerable number of criminals, and inquired into the external circumstances in which they had been placed, and have no hesitation in saying, that if, in the case of every offender, the three sources of crime here enumerated had been investigated, reported on, and published, the conviction would have become general that the individual had been the victim of his nature and external condition, and penitentiaries would be resorted to as the only means of at once abating crime and satisfying the moral feelings of the community. The public err through ignorance, and knowledge only is needed, to ensure their going into the right path.

Moreover, intellect perceives, and the moral sentiments acknowledge, that these causes exist *independently of the will of the offender*. The criminal, for example, is not the cause of the unfortunate preponderance of the animal organs in his own brain; neither is he the creator of the external circumstances which lead his propensities into abuse, or of the ignorance in which he is involved. Nevertheless, the moral and intellectual faculties of the indifferent spectator of his condition do not, on this account, admit that, either for his own sake or for that of society, he should be permitted to proceed in an unrestricted course of crime. They absolutely insist on arresting his progress, and their first question is, How may this best be done? Intellect answers, *By removing the causes which produce the offences.*

The first cause—the great preponderance of the animal organs—cannot, by any means yet known, be summarily removed. Intellect, therefore, points out another alternative—that of supplying, by moral and physical restraint, the control which, in a brain better constituted, is afforded by large moral and intellectual organs; in short, of placing the offender under such a degree of effective control as absolutely to prevent the abuses of his faculties. Benevolence acknowledges this proceeding to be kind, Veneration to be respectful, and Conscientiousness to be just, at once to the offender himself and to society; and Intellect perceives that, whenever it is adopted, it will form an important step towards preventing a repetition of crimes.

The second cause, viz. great excitement from without, may be removed by withdrawing the individual from the influence of the unfavourable external circumstances to which he is exposed. The very restraint and control which serve to effect the first object, will directly tend to accomplish this second one at the same time.

The third cause—namely, ignorance—may be removed by conveying instruction to the intellectual powers.

If these principles be sound, the measures now recommended, when viewed in all their consequences, should be not only the most just and benevolent, but at the same time the *most advantageous that could be adopted.* Let us contrast their results with those of the animal method.

Under the animal system, as we have already seen, no measures except the excitement of terror, are taken to *prevent* the commission of crime. Under the moral plan, as soon as a tendency to abuse the faculties should appear in any individual, means of prevention would be resorted to, because the sentiments could not be satisfied unless this were done. Under the animal system, no inquiry is made into the future proceedings of the offender, and he is turned loose upon society under the unabated influence of all the causes which led to his infringement of the law; and, as effects never cease while their causes continue to operate, he repeats his offence, and becomes the object of a new animal infliction. Under the moral system, the causes would be removed, and the evil effects would cease.

Under the animal system, the propensities of the offender and society are maintained in habitual excitement; for the punishment proceeds from the animal faculties, and is likewise addressed to them. Flogging, for instance, proceeds from Destructiveness, and is ad-

dressed solely to sensation and fear. The tread-mill springs from Destructiveness in a milder form, and, as its sole object is to cause annoyance to the offender, it is obviously addressed only to Cautiousness and his selfish feelings. Hanging and decapitation undeniably spring from Destructiveness, and are administered as terrors to the propensities of persons criminally disposed. These punishments, again, especially the last, are calculated to gratify the animal faculties and none else, in the spectators who witness them. The execution of a criminal obviously interests and excites Destructiveness, Cautiousness, and Self-Esteem, in the beholder, and nothing can be farther removed than such exhibitions from the proper food of Benevolence, Veneration, and Conscientiousness.

Under the moral system, again, the faculties exercised and addressed in restraining and instructing the offender are, as exclusively as possible, the human powers. The propensities are employed merely as the servants of the moral sentiments in accomplishing their benignant purposes, and Benevolence is as actively engaged in behalf of the offender as of society at large. The whole influence of the proceeding is ameliorating and elevating.

Under the animal system the offspring of parents who have been recently engaged in either suffering, inflicting, or witnessing punishment, inherit, by the organic law, large and active animal organs, occasioned by the excitement of these organs in the parents. Thus a public execution, from the violent stimulus which it produces in the lower faculties of the spectators, may, within twenty-four hours of its exhibition, be the direct cause of a new crop of victims for the gallows.

Under the moral system, children born of parents actively engaged in undergoing, executing, or witnessing the elevating and ennobling process of moral reformation, will, by the organic law, inherit an increased development of the moral and intellectual organs, and be farther removed than their parents from the risk of lapsing into crime.

Under the animal system, spectators of crime, and accomplices, need to be bribed with large rewards to induce them to communicate their knowledge of the offence; and witnesses require to be compelled by penalties to bear testimony to what they have seen concerning it. Many will recollect the affecting picture of mental agony drawn by the author of Waverley, when Jeanie Deans, at the bar of the High Court of Justiciary, gives evidence against her sister, which was to deprive that sister of life. Parallel cases occur too frequently in actual experience. The real cause of this aversion to betray, and internal repugnance to give evidence, is, that the moral sentiments are revolted by the delivery of the culprit to the cruelty of animal resentment.

Under the moral system, the higher sentiments and intellect of the spectator of a crime, and those of the nearest relatives of the offender, would unite with those of society in a unanimous desire to deliver him up, with the utmost speed, to the ameliorating influence of moral treatment, as the highest act of benevolence even to himself.

Under the animal system, the office of public executioner is odious, execrable, and universally contemned. If it were *necessary* by the Creator's institutions, it would present the extraordinary anomaly of a *necessary duty* being execrated by the moral sentiments. This would be a direct inconsistency between the dictates of the superior faculties and the arrangements of the external world. But the animal executioner is not acknowledged as necessary by the human faculties. Under the moral system, the criminal would be committed to persons whose duties would be identical with those of the clergyman, the physician, and the teacher. These are the executioners under the moral law; and, just because their avocations are highly grateful to the superior sentiments, they are the most esteemed of mankind.

The highest and the most important object of this long exposition of the principles of punishment under the natural laws, remains to be unfolded.

We are all liable to abuse our faculties; and the inquiry is exceedingly interesting, what, in our cases, are the causes of the infringement of the moral law. The offences which we daily commit, are neither more nor less than minor degrees of abuse of the very same faculties of which crimes are the greater. For example, if in private life we backbite or slander our neighbour, we commit abuses of Self-Esteem and Destructiveness, which, if increased merely in intensity, without at all changing their nature, might end, as in Ireland, in maiming his cattle, or, as in Spain or Italy, in murdering him outright. If, in any transaction of life, we deliberately give false representations as to any article we have for sale, or overcharge it in price, this is just a minor abuse of Secretiveness and Acquisitiveness acting in absence of the moral sentiments, of which abuse pocket-picking and stealing are higher degrees. I need not carry the parallel farther. It is so obvious that every offence against the moral law is an abuse of some faculty or other, and that great crimes are merely great abuses, and smaller offences more slight aberrations, that every one must perceive the fact to be so.

Reverting to what I observed in regard to crime, I repeat that every infringement of the moral law, the smallest as well as the greatest, is denounced by the moral sentiments and intellect, just because it is opposed to their nature, and they desire absolutely to bring all abuses to an end, from whatever source they spring, be they voluntary or involuntary.

Animal resentment is, according to the present practice of society, resorted to as the chief method of dealing with the minor, just as it is with the higher, abuses of our faculties. If one gentleman insults another, the offended party makes no inquiry into the state of mind and other causes that produced the insult, but proceeds to knock him on the head, to challenge and thereafter to shoot him, or to prosecute him in a jury court and inflict pain by depriving him of money. These are the common methods by which men inflict animal retribution on each other, and in their essential character they do not much differ from those followed by the lower creatures.

I do not say that these proceedings are absolutely without beneficial effect. The animal faculties are selfish, and these inroads upon their enjoyment have undoubtedly a tendency to check them. It is painful to a gentleman to be knocked down or shot; and, in consequence, many individuals of low principles, who would not be restrained from insulting their neighbours by the dictates of their own feelings, are induced to modify their conduct by the fear of these forms of retaliation; but here the benefit terminates. The infliction of the chastisement gratifies only the animal faculties of the injured party, and it is addressed exclusively to the animal part of the offender's mind. Habitual morality, however, cannot exist without supreme activity of the moral sentiments; and the whole code of animal law, and animal punishment, does exceedingly little to establish this as a permanent condition of mind.

Under the moral and intellectual law, everything is different. The intellectual faculties inquire into the causes of abuses, and the moral sentiments desire to remove them with kindness and respect even for the offender himself. If one person insult another, the intellect, aided by Phrenology, perceives that he must of necessity do so either from extreme predominance of Combativeness, Destructiveness, and Self-Esteem in his own brain, whence arises an impulsive tendency to insult; just as some ill-natured dogs and horses have a tendency to bite without provocation; or, *secondly*, from excessive external stimulus,—that is to say, from some

aggression offered to his lower faculties by other individuals; or, *thirdly*, from intellectual ignorance,—that is, erroneously supposing unreal motives and intentions in the party whom he insults. If one person cheat another, intellect, with the assistance of Phrenology, perceives that he can do so only because Acquisitiveness and Secretiveness predominate in him over Conscientiousness;—because the external temptation to cheat is too powerful for his faculties to resist;—or because he is ignorant that cheating is equally fatal to his own interest as injurious to that of his victim. In short, no abuse of the animal faculties can be committed that may not be traced to these or similar causes.

But intellect and the moral sentiments desire to remove the *causes* as the most effectual way of putting an end to the effects, and their method is one congenial to their own constitution. If a man be by nature irritable, and prone to injure every one with whom he comes into contact, they desire most sedulously to remove every influence that may tend to exasperate his propensities, and also to surround him with a pure moral and intellectual atmosphere. If he be exposed to temptation, they desire to withdraw it; if he be misinformed, ignorant, or deceived, they desire to instruct him, or to give him correct information. After we have suffered injury from another, if we perceive the causes from which it has proceeded to be really such as I have now explained, and if we comprehend and believe in the supremacy of the moral law, it will be impossible for us to prefer the method of redress by animal resentment.

The question naturally presents itself, What is the distinction between right and wrong, under this system? If offences proceed from unfortunate development of brain, not fashioned by the individual himself,—from external temptations which he did not make,—or from want of knowledge which he never had it in his power to acquire,—how are the distinctions between right and wrong, merit and demerit, to be explained and maintained? The answer is simple.

The *natural distinction between right and wrong*, so far as man is concerned, depends on the constitution of his faculties. The act of wantonly killing another is wrong, because it is in direct opposition to the dictates of Benevolence. The act of appropriating to ourselves effects belonging to another is wrong, because it is directly denounced by Conscientiousness; and so with all other misdeeds. The *authority* of the moral law, in forbidding these offences, depends on the whole arrangements of creation being constituted to enforce its dictates. If Benevolence and Conscientiousness denounce murder, and if the whole other faculties of the mind, and the external order of things, harmonize with their dictates and combine to punish the offender, the foundation and sanctions of the moral law appear abundantly strong. It has been objected, that, in Tartary, to steal from strangers is honourable; but Dr T. Brown has well answered this objection. There are more principles in the mind than Benevolence, Veneration, and Conscientiousness; and it is quite possible to misinform the intellect, and thereby misdirect the propensities and sentiments. For example, the Tartars are taught to believe, that all men beyond their own tribes are their enemies, and would rob and murder them if they could; and, of course, as long as this intellectual conviction lasts, strangers become the objects of their animal resentment. Every foreigner is, in their eyes, a criminal, clearly convicted of deliberate purpose to rob and murder. In Britain, under Lord Ellenborough's act, when men are convicted in a court of this *intention*, they are delivered over to the hangman to be executed; and we might as well maintain, as a general proposition, that the English are fond of hanging one another, as that the Tartars approve of robbery and murder. Strangers whom the latter maltreat in this manner, actually stand convicted in their minds of an intention of using them in the same way if they could. The real method of arriving at a correct view of the question is to suppose the conviction complete in a Tartar's mind, that other men love him and make him an object of their most sedulous benevolence, and then ask him whether he approves of robbing and murdering a benefactor. There is no instance of human nature, in a state of sanity, regarding such a deed as virtuous. The moral law, therefore, when cleared of other principles that may act along with it, but are not part of it, is obviously universal and inflexible in its dictates.*

The views contained in this chapter were printed and distributed among a few friends in 1827, and I was favoured by them with several remarks. Two of these appear to me to merit a reply.

It is objected, that, according to the moral system of treating offenders, punishment would be abrogated and crime encouraged.

I respectfully answer, that if this system be right in itself and suited to the nature of man, it will carry in itself all the punishment that will be needed, or that can serve any beneficial end. I believe that to an individual whose mind consists chiefly of animal propensities and intellect,—confinement, compulsory labour, and the enforcement of moral conduct, will be highly disagreeable, and that this is the punishment which the Creator designed should attend that unfortunate combination of mental qualities. It is analogous to the pain of a wound; the object of which is, to induce the patient to avoid injuring himself again. The irksomeness and suffering to a criminal, inseparable from confinement and forced labour, are intended as inducements to him to avoid infringements of the moral law; and when perceived by himself to arise from the connexion established by the Creator between crime and the most humane means of restraining it, he will learn to submit to the infliction, without those rebellious feelings which are generally excited by pure animal retribution. It appears to me that the call for more suffering than would accompany the moral method of treatment, proceeds to a great extent from the yet untamed barbarism of our own minds; just as it was the savageness of the hearts of our ancestors which led them to regard torture and burning as necessary in their administration of criminal justice. In proportion as the higher sentiments shall gain ascendency among men, severity will be less in demand, and its inutility will be more generally perceived. The Americans, in their penitentiaries, have set an admirable example to Europe in regard to criminal legislation. Their views still admit of improvement, but they have entered on the right path by which success is to be attained. Dr Caldwell of Louisville has offered them excellent counsel, which I hope they will appreciate and follow.

Another objection is, that the views now advocated, even supposing them to be true, are Utopian, and cannot be carried into effect in the present condition of society. I deny the first branch of this objection; but admit the second to be well-founded. No system of morals which is true, can be Utopian—this term being understood to mean visionary and impracticable. But a true system may not be reducible to practice, on its first announcement, by a people who do not know one jot of its principles, and whose guides sedulously divert their minds from studying it. Christianity itself has not yet been generally practised; but does any rational man on this account denounce it as Utopian and worthless? It would be folly to expect judges and juries to abandon the existing practice of criminal jurisprudence, and to adopt that which is here recommended, before they, and the society for whom they act, understand and approve of its principles; and no one who bears in mind by what slow and laborious steps truth makes its way, and how long a period is necessary before it can develope itself in practice, will expect any new system

* This subject is more fully treated of in my work on Moral Philosophy.

to triumph in the age in which it was first promulgated. I have frequently repeated in this work, that, by the moral law, we cannot enjoy the full fruits even of our own intelligence and virtue, until our neighbours have been rendered as wise and amiable as ourselves. No reasonable man, therefore, can expect to see the principles expounded in this work, although true, generally diffused and adopted in society, until the natural means of communicating a knowledge of them, and producing a general conviction of their truth and utility, shall have been perseveringly employed for a period sufficient to accomplish this end. In the mean time, the established practices of society must be supported, if not respected; and he is no friend to the real progress of mankind, who, the moment after he has planted his own principles, would attempt to gather the fruit of them before he has allowed summer and autumn to bring the product to maturity. The rational philanthropist will zealously teach his principles, and introduce them into practice as favourable opportunities occur; not doubting that he will thereby sooner accomplish his object, than by making premature attempts at realizing them, which must inevitably end in disappointment.*

SECT. II.—MORAL ADVANTAGES OF PUNISHMENT.

After the mind has embraced the principles of the Divine administration, wisdom, benevolence, and justice, are discernible in the punishments annexed to the natural laws. Punishment endured by one individual, also serves to warn others against transgression. These facts appear to indicate that one object of the arrangements of creation is the improvement of the moral and intellectual nature of man. So strikingly conspicuous, indeed, is the ameliorating influence of suffering, that many persons have supposed this to be the primary object for which it is sent; a notion which, with great deference, I cannot help regarding as unfounded in principle, and dangerous in practice. If evils and misfortunes are mere mercies of Providence, it follows that a headach consequent on a debauch is not intended to prevent repetition of drunkenness, so much as to prepare the debauchee for the invisible world; and that shipwreck in a crazy vessel is not so directly designed to render the merchant cautious, as to lead him to heaven.

It is undeniable, that in innumerable instances pain and sorrow are the direct consequences of our own misconduct; while at the same time it is obviously benevolent in the Deity to render them beneficial directly, as a warning against future transgression, and indirectly, as a means of leading to the purification of the mind. Nevertheless, if we shall imagine that in some instances pain is dispensed as a direct punishment for particular transgressions, and in others only on account of sin in general, and with the view of ameliorating the spirit of the sufferer, we may ascribe inconsistency to the Creator, and expose ourselves to the danger of attributing our own afflictions to his favour, and those of other men to his wrath; thus fostering in our minds self-conceit and uncharitableness. Individuals who entertain the belief that bad health, worldly ruin, and sinister accidents, befalling them, are not punishments for infringement of the laws of nature, but particular manifestations of the love of the Creator towards themselves, make slight inquiry into the natural causes of their miseries, and bestow few efforts to remove them. In consequence, the chastisements endured by them, neither correct their own conduct, nor deter others from committing similar transgressions. Some religious sects, who entertain these views of the divine government, literally act upon them, and refuse to inoculate their children with the cow-pox, or take other means of avoiding natural calamities. Regarding these as dispensations of Providence sent to prepare them for a future world, they conceive that the more that befall them the better. Farther, these ideas, besides being repugnant to the common sense of mankind, are at variance with the principle that the world is arranged so as to favour virtue and discountenance vice; because favouring virtue means obviously that the favoured virtuous will enjoy more happiness, and negatively suffer fewer misfortunes, than the vicious. The view, therefore, now advocated, appears less exceptionable, viz. that punishment serves a double purpose—directly to warn us against transgression, and indirectly (when rightly apprehended) to subdue our lower propensities, and purify and vivify our moral and intellectual powers.

Bishop Butler coincides in this interpretation of natural calamities. "Now," says he, "in the present state, all which we enjoy, *and a great part of what we suffer, is put in our own power.** For *pleasure and pain are the consequences of our actions;* and we are endued by the Author of our nature with capacities of foreseeing these consequences." "I know not that we have any one kind or degree of enjoyment, but by the means of our own actions. And, *by prudence and care*, we may, for the most part, pass our days in tolerable ease and quiet: or, on the contrary, we may, *by rashness, ungoverned passion, wilfulness, or even by negligence*, make ourselves *as miserable as ever we please.* And many do please to make themselves extremely miserable; *i. e.* they do what they knew beforehand will render them so. They follow those ways, the fruit of which they know, by instruction, example, experience, will be disgrace, and poverty, and sickness, and untimely death. This every one observes to be the general course of things; though it is to be allowed, we cannot find by experience, that *all* our sufferings are owing to our own follies."—*Analogy*, part i. ch. 2. In accordance with this last remark, I have treated of *hereditary* diseases; and evils resulting from earthquakes, volcanoes, hurricanes, and other convulsions of nature, may be added to the same class.

It has been objected that such punishments as the breaking of an arm by a fall, are often so disproportionately severe, that, in appointing them, the Creator must have had in view some other and more important object than that of making them serve as mere motives to the observance of the physical laws; and that that object must be to influence the mind of the sufferer, and draw his attention to concerns of higher import.

In answer I remark, that the human body is liable to destruction by severe injuries; and that the degree of suffering, in general, bears a just proportion to the danger connected with the transgression. Thus, a slight surfeit is attended only with headach or general uneasiness, because it does not endanger life; a fall on any muscular part of the body is followed either with no pain, or with only a slight indisposition, for the reason that it is not seriously injurious to life; but when a leg or arm is broken, the pain is intensely severe, because the bones of these limbs stand high in the scale of utility to man. The human body is so framed that it may fall nine times and suffer little damage, but the tenth time a limb may be broken, which will entail a painful chastisement. By this arrangement the mind is kept alive to danger to such an extent as to ensure general

* The leading ideas expounded in this chapter have been most ably and eloquently followed out by Dr Charles Caldwell, Professor of the Institutes of Medicine in the University of Lexington, Kentucky, in his "New Views of Penitentiary Discipline, and Moral Education and Reformation of Criminals," published at Philadelphia in 1829, and reprinted in the Phrenological Journal, vol. viii. pp. 385, 493. Mr Simpson also has treated the subject with great ability in the same journal, vol. ix. p. 481, and in the appendix to his work on the "Necessity of Popular Education,"—a work in which he has expounded and applied many principles of the present treatise with much acuteness and felicity of illustration. In 1841, Mr M. B. Sampson published a valuable exposition of the same principles under the title of "Criminal Jurisprudence considered in relation to Mental Organization."

* These words are printed in Italics in the original.

safety, while at the same time it is not overwhelmed with terror by punishments too severe and too frequently repeated. In particular states of the body, a slight wound may be followed by inflammation and death; but these are the results not simply of the wound, but of a previous derangement of health, occasioned by departures from the organic laws.

On the whole, therefore, no adequate reason appears for regarding the consequences of physical accidents in any other light than as direct punishments for infringement of the natural laws, and indirectly as a means of accomplishing moral and religious improvement. On page 79 I have pointed out the distinction between merit and demerit in human actions, and do not consider it necessary here to revert to that topic.

In the preceding chapters we have obtained glimpses of some of the *sanctions* of the moral law, which may be briefly recapitulated. If we obey it, many desirable results ensue. In the *first* place, we enjoy the highest gratifications of which our nature is susceptible, in habitual and sustained activity of our noblest faculties. *Secondly*, We become objects of esteem and affection to our fellow-men, and enjoy exalted social pleasure. *Thirdly*, Whatever we undertake, being projected in harmony with the course of nature, will prosper. *Fourthly*, By observing the moral law, we shall place ourselves in the most favourable condition for obeying the organic law, and then enjoy health of body and buoyancy of mind. *Fifthly*, By obeying the moral, intellectual, and organic laws, we shall place ourselves in the best condition for observing the physical laws, and thereby reap the countless benefits conferred by them.

To perceive, on the other hand, the penalties by which the Creator punishes infringements of the moral law, we need only to reverse the picture. There is denial of that elevated, refined, and steady enjoyment, which springs from the supreme activity of the moral sentiments and intellect, and from the perception of the harmony between them and the institutions of creation. By infringing the moral law we become objects of dislike and aversion to our fellow-men; and this carries denial of gratification to many of our social faculties. Whatever we undertake in opposition to the moral law, being an enterprise against the course of nature, cannot succeed; and its fruits must therefore be disappointment and vexation. Inattention to the moral and intellectual law incapacitates us for obedience to the organic and physical laws; and sickness, pain, and poverty overtake us. The whole scheme of creation, then, appears constituted for the purpose of enforcing obedience to the moral law: virtue, religion, and happiness, seem to be founded in the inherent constitution of the human faculties, and in the adaptation of the external world to them; and not to depend on the will, the fancies, or the desires of man.

CHAPTER VII.

ON THE COMBINED OPERATION OF THE NATURAL LAWS.

Combined operation of the natural laws illustrated by reference to the defects of the arrangements for jury trial in Scotland,—the great fires in Edinburgh in 1824,—shipwrecks from ignorance or irrational conduct in the commander,—Captain Lyon's unsuccessful attempt to reach Repulse Bay,—foundering of decayed and ill-equipped vessels at sea,—and the mercantile distress which overspread Britain in 1825-26.

Having now unfolded several of the natural laws, and their effects, and having also attempted to shew that each is inflexible and independent in itself, and requires absolute obedience (so that a man who neglects the physical law will suffer the physical punishment, although he may be very attentive to the moral law; that one who infringes the organic law will suffer organic punishment, although he may obey the physical law; and that a person who violates the moral law will suffer the moral punishment, although he should observe the other two), I proceed to consider the relationship among these laws, and to adduce some instances of their joint operation.

The defective administration of justice is a fertile source of human suffering in all countries; yet it is surprising how rude are the arrangements which are still in use, even in free and enlightened countries, for accomplishing this important end.

A jury in a civil cause in Edinburgh consists of twelve men, eight or ten of whom are frequently summoned from the country, within a distance of twenty or thirty miles round the capital. These individuals hold the plough, wield the hammer or the hatchet, or carry on some other useful and respectable but laborious occupation, for six days in the week. Their muscular systems are in constant exercise, and their brains are rarely called on for any great exertion. They are not accustomed to read beyond the Bible and a weekly newspaper; they are still less in the habit of thinking; and in general they live much in the open air.

In this condition they are placed in a jury-box at ten o'clock in the morning, after having travelled probably from seven to twenty-five miles to reach the court: counsel address long speeches to them; numerous witnesses are examined; and the cause is branched out into complicated details of fact, and wire-worn distinctions in argument. The court is a small and ill-ventilated apartment, and in consequence is generally crowded and over-heated. Without being allowed to breathe fresh air, or to take exercise or food, they are confined to their seats till eight or ten in the evening,—when they retire to return a verdict, by which they may dispose of thousands of pounds, and in which they are required by law to be unanimous.

There is here a tissue of errors which could not exist for a day if the natural laws were generally understood. *First*, the daily habits and occupations of such jurors render their brains inactive, and their intellects consequently incapable of attending to, and comprehending, complicated cases of fact and argument. *Secondly*, their memories cannot retain the facts, while their skill in penmanship and literature is not sufficient to enable them to take notes; and their reflecting faculties are not capable of generalizing. Their education and daily pursuits, therefore, do not furnish them with principles of thinking, and power of mental action, sufficient to enable them to unravel the web of intricacies presented to their understandings. *Thirdly*, protracted confinement in a close apartment, amidst vitiated air, operates injuriously on the most vivacious temperaments:—on such men it has a tenfold effect in lowering the action of the brain and inducing mental incapacity, because it is diametrically opposed to their usual condition. Add to these considerations, that occasionally a jury trial lasts two, three, or even four days, each of which presents a repetition of the circumstances here described; and then the reader may judge whether such jurors are the fittest instruments, and in the best condition, for disposing of the fortunes of a people who boast of their love of justice, and of their admirable institutions for obtaining it.

The influence of the bodily condition of a human being on his mental capacity seems never to have entered the imaginations of our legislators as a matter of importance in the administration of justice. In the Circuit Courts of Scotland, the judges frequently sit for several days in succession in a crowded apartment, intently engaged in business, from ten o'clock in the morning till eight, ten, or twelve at night, without any extensive intermission or exercise. They go to their hotel at these late hours, dine, take wine, retire to bed, and next morning resume their seats on the bench. By the laws of nature, which never cease to operate, the effect

of this conduct is to impair the vigour of the moral and intellectual organs, and, by constraint, want of exercise, and obstruction of the bodily functions, to irritate and exalt the activity of the animal organs; so that, at the close of a circuit, even the strongest and most estimable and talented individual is physically deteriorated, and mentally incapacitated for the distribution of justice, compared with himself when he began his labours. It is accordingly matter of observation, that in proportion as a long and heavy session in circuit advances, irritability, impatience, and intellectual obscuration, appear in the judges. The accused who go to trial first, therefore, have a far higher chance of obtaining justice, than those who appear last on the roll.

In these instances there are evident infringements of the organic and moral laws; and the combined result is the maladministration of justice, of which the country so loudly complains. The proper remedies will be found in educating the people more effectually, in training them to the exercise of their mental faculties, and in observing the organic laws in the structure of court-rooms, and in the proceedings that take place within them.

Another example of the combined operation of the natural laws is afforded by the great fires which occurred in Edinburgh in November 1824, when the Parliament Square and a part of the High Street were consumed. That calamity may be viewed in the following light:—The Creator constituted England and Scotland with such qualities, and placed them in such relationship, that the inhabitants of both kingdoms would be most happy in acting towards each other, and pursuing their separate vocations, under the supremacy of the moral sentiments. We have lived to see this practised, and to reap the reward. But the ancestors of the two nations did not believe in this constitution of the world, and they preferred acting according to the suggestions of the propensities; that is to say, they waged furious wars, and committed wasting devastations on each other's properties and lives. It is obvious from history that the two nations were equally ferocious, and delighted reciprocally in each other's calamities. This was clearly a violent infringement of the moral law; and one effect of it was to render the possession of a stronghold an object of paramount importance. The hill on which the Old Town of Edinburgh is built, was naturally surrounded by marshes, and presented a perpendicular front to the west, capable of being crowned with a castle. It was appropriated with avidity, and the metropolis of Scotland was founded there, obviously and undeniably under the inspiration purely of the animal faculties. It was fenced round with ramparts, built to exclude the fierce warriors who then inhabited the country lying south of the Tweed, and also to protect the inhabitants from the feudal banditti who infested their own soil. The space within the walls, however, was limited and narrow; the attractions to the spot were numerous; and to make the most of it, our ancestors erected the enormous masses of high and crowded buildings which now compose the High Street, and the wynds or alleys on its two sides. These abodes, moreover, were constructed, to a great extent, of timber; for not only the joists and floors, but the partitions between the rooms, were made of massive wood. Our ancestors did all this in the perfect knowledge of the physical law, that wood ignited by fire not only is consumed itself, but envelopes in inevitable destruction every combustible object within its influence. Farther, their successors, even when the necessity for close building had ceased, persevered in the original error; and, though well knowing that every year added to the age of these fabrics increased their liability to burn, they not only allowed them to be occupied as shops filled with paper, spirituous liquors, and other highly inflammable materials, but let the upper floors for brothels,—introducing thereby into the heart of this magazine of combustibles the most reckless and immoral of mankind. The consummation was the two tremendous fires of November 1824 (the one originating in a whisky-cellar, and the other in a garret-brothel), which consumed the Parliament Square and a portion of the High Street, destroying property to the extent of many thousands of pounds, and spreading misery and ruin over a considerable part of the population of the city. Wonder, consternation, and awe, were forcibly excited at the vastness of the calamity; and in the sermons that were preached, and the dissertations that were written upon it, much was said of the inscrutable ways of Providence, which sent such visitations on the people, enveloping the innocent and the guilty in one common scene of destruction.

According to the exposition of the ways of Providence which I have ventured to give, there was nothing wonderful, nothing vengeful, nothing arbitrary, in the whole occurrence. The only reason for surprise was, that it did not take place generations before. The necessity for these fabrics originated in gross violation of the moral law; they were constructed in high contempt of the physical law; and, latterly, the moral law was set at defiance, by placing in them inhabitants abandoned to the worst habits of recklessness and intoxication. The Creator had bestowed on men faculties to perceive all this, and to avoid the calamity, whenever they chose to exert them; and the destruction that ensued was the punishment of following the propensities, in preference to the dictates of intellect and morality. The object of the destruction, as a natural event, was to lead men to avoid repetition of the offences: but the principles of the divine government are not yet comprehended. Acquisitiveness whispers that more money may be made of houses consisting of five or six floors under one roof, than of houses consisting of only two or three; and erections the very counterparts of the former, have since been reared on the spot where the others stood, and, sooner or later, they also will be overtaken by the natural laws, which never slumber or sleep.

The true method of arriving at a sound view of calamities of this kind, is to direct our attention, in the first instance, to the law of nature, from the operation of which they have originated; then to find out the uses and advantages of that law, when observed; and to discover whether or not the evils under consideration have arisen from violation of it. In the present instance, we should never lose sight of the fact, that the houses in question stood erect, and the furniture in safety, by the very same law of gravitation which made them topple to the foundation when it was infringed; and that mankind enjoy all the benefits which result from the combustibility of the timber as fuel, by the very same law which makes it, when unduly ignited, the cause of a destructive conflagration.

This instance affords a striking illustration of the manner in which the physical and organic laws are constituted in harmony with, and in subserviency to, the moral law. The motive which led to the construction of the houses in the Old Town of Edinburgh (with the deprivation of free air, and liability to combustion that attended them), is found in the excessive predominance of Combativeness, Destructiveness, Self-Esteem, and Acquisitiveness, in our ancestors; and although the ancient personages who erected these monuments of animal supremacy had no conception that, in doing so, they were laying the foundations of a severe punishment to themselves and their posterity,—yet, when we compare the comforts and advantages that would have accompanied dwellings constructed under the inspiration of Benevolence, Ideality, and enlightened Intellect, with the contaminating, debasing, and dangerous effects of their actual workmanship, we perceive most clearly that our ancestors were really the instruments of chastising their own transgressions, and of transmitting

that chastisement to their posterity so long as the animal supremacy shall be prolonged. Another example may be given. Men, by uniting under one leader, may, in virtue of the social law, acquire great advantages to themselves, which singly they could not obtain; and, as formerly stated, the condition under which the benefits of that law are permitted is, that the leader shall know and obey the natural laws connected with his enterprise: If he neglect these, then the same principle which gives the social body the benefit of his observing them, involves it in the punishment of his infringement; and this is just, because, under the natural law, the leader must necessarily be chosen by his followers, and they are responsible for not attending to his natural qualities. Some illustrations of the consequences of neglecting this law may be stated, in which the mixed operation of the physical and moral laws will appear.

During the French war, a squadron of English ships was sent to the Baltic with military stores, and, in returning home up the North Sea, they were beset, for two or three days, by a thick fog. It was about the middle of December, and no correct knowledge of their exact situation was possessed. Some of the commanders proposed lying-to all night, and proceeding only during day, to avoid running ashore unawares. The commodore was exceedingly attached to his wife and family, and, stating his determination to pass Christmas with them in England if possible, ordered that the ships should prosecute their voyage. The very same night they all struck on a sand-bank off the coast of Holland; two ships of the line were dashed to pieces, and every man on board perished. The third ship drawing less water, was forced over the bank by the waves and stranded on the beach; the crew were saved, but led to a captivity of many years' duration. These vessels were destroyed under the physical laws; but this calamity owed its origin to the predominance of the animal over the moral and intellectual faculties in the commodore. The gratification which he sought to obtain was individual and selfish; and, if his Benevolence, Veneration, Conscientiousness, and Intellect, had been as alert as his domestic affections, and carried as forcibly home to his mind the welfare of the men under his charge as that of his own family, nay, if these faculties had been sufficiently alive to see the danger to which he exposed even his own life, and the happiness of his wife and children, he never could have followed the precipitate course which consigned himself and so many brave men to a watery grave.

Some years ago, the Ogle Castle, East Indiaman, was offered a pilot coming up the Channel; but the captain refused assistance, professing his own skill to be sufficient. In a few hours the ship ran aground on a sand-bank, and every human being on board perished in the waves. This accident also arose from physical causes; but their unfavourable operation sprang from Self-Esteem, pretending to knowledge which the Intellect did not possess; and, as it is only by employing the latter that obedience can be yielded to the physical laws, the destruction of the ship was indirectly the consequence of the infringement of the moral and intellectual laws.

An old sailor, whom I met on the Queensferry passage, told me that he had been nearly fifty years at sea, and once was in a fifty-gun ship in the West Indies. The captain, he said, was a "fine man;" he new the climate, and foresaw a hurricane coming, by its natural signs;—on one occasion in particular, he struck the topmasts, lowered the yards, lashed the guns, and made each man supply himself with food for thirty-six hours; and scarcely was this done when the hurricane came. The ship lay for four hours on her beam-ends in the water, but all was prepared; the men were kept in vigour during the storm, and fit for every exertion; the ship at last righted, suffered little damage, and proceeded on her voyage. The fleet which she convoyed was dispersed, and a great number of the ships foundered: Here we see the benefits accruing from the supremacy of the moral and intellectual faculties, and discover to what a surprising extent these present a guarantee against even the fury of the physical elements in their highest state of agitation.

A striking illustration of the kind of protection afforded by high moral and intellectual qualities, even amidst the most desperate physical circumstances, is furnished by the following letter written by the late Admiral Lord Exmouth to a friend: "Why do you ask me to relate the wreck of the Dutton?" says his Lordship. "Susan (Lady Exmouth) and I were driving to a dinner-party at Plymouth, when we saw crowds running to the Hoe; and learning it was a wreck, I left the carriage to take her on, and joined the crowd. I saw the loss of the whole five or six hundred men was inevitable without somebody to direct them, for the last officer was pulled on shore as I reached the surf. I urged their return, which was refused; upon which I made the rope fast to myself, and was hauled through the surf on board,—established order, and did not leave her until every soul was saved but the boatswain, who would not go before me. I got safe, and so did he, and the ship went all to pieces."

Indeed, there is reason to believe that the human intellect will, in time, be able, by means of science and observation, to arrive at a correct anticipation of approaching storms, and thus obtain protection against their effects. The New Zealanders, it is said, predict the changes of the weather with extraordinary skill. "One evening, when Captain Cruise and some of his friends were returning from a long excursion up one of the rivers, although the sky was at the time without a cloud, a native, who sat in the boat with them, remarked that there would be heavy rain the next day; a prediction which they were the more inclined to believe by finding, when they returned on board the ship, that the barometer had fallen very much, and which the deluge of the following morning completely confirmed."*

The utility of the marine barometer, or the sympiesometer, in indicating approaching storms, is strikingly shewn by the following extract from the Edinburgh Philosophical Journal.

"The correspondent (Mr Stevenson, civil engineer) to whom we are indebted for the notice regarding the Scotch fisheries, inserted in this number (p. 129), informs us, that having occasion, towards the conclusion of his voyage, in the beginning of September last, to visit the Isle of Man, he beheld the interesting spectacle of about three hundred large fishing-boats, each from fifteen to twenty tons' burden, leaving their various harbours at that island in an apparently fine afternoon, and standing directly out to sea, with the intention of prosecuting the fishery under night. He at the same time remarked, that both the common marine barometer, and Adie's sympiesometer, which were in the cabin of his vessel, indicated an approaching change of weather, the mercury falling to 29.5 inches. It became painful, therefore, to witness the scene; more than a thousand industrious fishermen, lulled to security by the fineness of the day, scattering their little barks over the face of the ocean, and thus rushing forward to imminent danger, or probable destruction. At sunset, accordingly, the sky became cloudy and threatening; and in the course of the night it blew a very hard gale, which afterwards continued for three days successively. This gale completely dispersed the fleet of boats, and it was not without the utmost difficulty that many of them reached the various creeks of the island. It is believed no lives were lost on this occasion; but the boats were damaged, much tackle was destroyed, and the men were unneces-

* Library of Entertaining Knowledge; *The New Zealanders*, p. 381.

sarily exposed to danger and fatigue. During the same storm, it may be remarked, thirteen vessels were either totally lost, or stranded between the Isle of Anglesey and St Bee's Head in Lancashire. Mr Stevenson remarks how much it is to be regretted that the barometer is so little in use in the mercantile marine of Great Britain, compared with the trading vessels of Holland; and observes, that though the common marine barometer is perhaps too cumbersome for the ordinary run of fishing and coasting vessels, yet Adie's sympiesometer is so extremely portable, that it may be carried even in a Manx boat. Each lot of such vessels has a commodore, under whose orders the fleet sails; it would therefore be a most desirable thing that a sympiesometer should be attached to each commodore's boat, from which a preconcerted signal of an expected gale or change of weather, as indicated by the sympiesometer, could easily be given."—*Edin. Phil. Journ.* ii. 196.

Dr Neil Arnot, in mentioning the great utility of the marine barometer, states that he himself was "one of a numerous crew who probably owed their preservation to its almost miraculous warning. It was in a southern latitude. The sun had just set with placid appearance, closing a beautiful afternoon, and the usual mirth of the evening watch was proceeding, when the captain's order came to prepare with all haste for a storm. The barometer had begun to fall with appalling rapidity. As yet the oldest sailors had not perceived even a threatening in the sky, and were surprised at the extent and hurry of the preparations; but the required measures were not completed, when a more awful hurricane burst upon them than the most experienced had ever braved."—"In that awful night, but for the little tube of mercury which had given the warning, neither the strength of the noble ship, nor the skill and energies of the commander, could have saved one man to tell the tale."*

One of the most instructive illustrations of the connection between the different natural laws is presented in Captain Lyon's Brief Narrative of an unsuccessful attempt to reach Repulse Bay, in his Majesty's ship Griper, in the year 1824.

Captain Lyon mentions, that he sailed in the Griper on 13th June 1824, in company with his Majesty's surveying vessel Snap, as a store-tender. The Griper was 180 tons burden, and "drew 16 feet 1 inch abaft, and 15 feet 10 inches forward." On the 26th, he "was sorry to observe that the Griper, from her great depth and sharpness forward, pitched very deeply."—She sailed so ill, that, "in a stiff breeze, and with studding-sails set, he was unable to get above four knots an hour out of her, and she was twice whirled round in an eddy in the Pentland Firth, from which she could not escape."—On the 3d July, he says, "being now fairly at sea, I caused the Snap to take us in tow, which I had declined doing as we passed up the east coast of England, although our little companion had much difficulty in keeping under sufficiently low sail for us, and by noon we had passed the Stack Back." "The Snap was of the greatest assistance, the Griper frequently towing at the rate of five knots, in cases where she would not have gone three."—"On the forenoon of the 16th, the Snap came and took us in tow; but, at noon on the 17th, strong breezes and a heavy swell obliged us again to cast off. We scudded while able, but our depth in the water caused us to ship so many heavy seas, that I most reluctantly brought to under storm stay-sails. This was rendered exceedingly mortifying, by observing that our companion was perfectly dry, and not affected by the sea."—"When our stores were all on board, we found our narrow decks completely crowded by them. The gangways, forecastle, and abaft the mizzen-mast, were filled with casks, hawsers, whale-lines, and stream-cables, while on our straitened lower decks we were obliged to place casks and other stores, in every part but that allotted to the ship's company's messtables; and even my cabin had a quantity of things stowed away in it."—"It may be proper to mention, that the *Fury* and *Hecla*, which were enabled to stow *three* years' provisions, were each exactly *double* the size of the Griper, and the Griper carried two years' and a half's provisions."

Having arrived in the Polar Seas, they were visited by a storm, of which Captain Lyon gives the following description:—"We soon, however, came to fifteen fathoms, and I kept right away, but had then only ten; when, being unable to see far around us, and observing, from the whiteness of the water, that we were on a bank, I rounded to at seven A. M., and tried to bring up with the starboard anchor and seventy fathoms chain, but the stiff breeze and heavy sea caused this to part in half an hour, and we again made sail to the north-eastward; but finding we came suddenly to seven fathoms, and that the ship could not possibly work out again, as she would not face the sea, or keep steerage-way on her, I most reluctantly brought her up with three bowers and a stream in succession, yet not before we had shoaled to five and a half. This was between eight and nine A. M., the ship pitching bows under, and a tremendous sea running. At noon, the starboard-bower anchor parted, but the others held.

"As there was every reason to fear the falling of the tide, which we knew to be from twelve to fifteen feet on this coast, and in that case the total destruction of the ship, I caused the long-boat to be hoisted out, and with the four smaller ones, to be stored to a certain extent with arms and provisions. The officers drew lots for their respective boats, and the ship's company were stationed to them. The long-boat having been filled full of stores which could not be put below, it became requisite to throw them overboard, *as there was no room for them on our very small and crowded decks, over which heavy seas were constantly sweeping.* In making these preparations for taking to the boats, it was evident to all, that the long-boat was the only one that had the slightest chance of living under the lee of the ship, should she be wrecked; but every man and officer drew his lot with the greatest composure, though two of our boats would have swamped the instant they were lowered. Yet, such was the noble feeling of those around me, that it was evident, that, had I ordered the boats in question to be manned, their crews would have entered them without a murmur. In the afternoon, on the weather clearing a little, we discovered a low beach all around astern of us, on which the surf was running to an awful height, and it appeared evident that no human power could save us. At three P. M., the tide had fallen to twenty-two feet (*only six more than we drew*), *and the ship, having been lifted by a tremendous sea, struck with great violence the length of her keel.* This we naturally conceived was the forerunner of her total wreck, and we stood in readiness to take the boats, and endeavour to hang under her lee. She continued to strike with sufficient force to have burst any less fortified vessel, at intervals of a few minutes whenever an unusual heavy sea passed us. And as the water was so shallow, these might be called breakers rather than waves, for each in passing burst with great force over our gangways, and, as every sea 'topped,' our decks were continually, and frequently deeply, flooded. All hands took a little refreshment, for some had scarcely been below for twenty-four hours, and I had not been in bed for three nights. Although few or none of us had any idea that we should survive the gale, we did not think that our comforts should be entirely neglected, and an order was

* Arnot's Elements of Physics, i. 350. Theory of storms, based on numerous and extensive observations, has recently been propounded by Mr Espy of Philadelphia, which explains, on philosophical principles, the causes of the depression of the barometer previous to a hurricane, and also of the succeeding storm itself. There is a prospect, therefore, of the laws which govern even storms being at length ascertained.

therefore given to the men to put on their best and warmest clothing, to enable them to support life as long as possible. Every man, therefore, brought his bag on deck, and dressed himself; and in the fine athletic forms which stood before me, I did not see one muscle quiver, nor the slightest sign of alarm. The officers each secured some useful instrument about them, for the purpose of observation, although it was acknowledged by all that not the slightest hope remained. And now that everything in our power had been done, I called all hands aft, and to a merciful God offered prayers for our preservation. I thanked every one for his excellent conduct, and cautioned them, as we should in all probability soon appear before our Maker, to enter his presence as men resigned to their fate. We then all sat down in groups, and, sheltered from the wash of the sea by whatever we could find, many of us endeavoured to obtain a little sleep. Never, perhaps, was witnessed a finer scene than on the deck of my little ship, when all the hope of life had left us. Noble as the character of the British sailor is always allowed to be in cases of danger, yet I did not believe it to be possible, that, amongst forty-one persons, not one repining word should have been uttered. The officers sat about, wherever they could find a shelter from the sea, and the men lay down conversing with each other with the most perfect calmness. Each was at peace with his neighbour and all the world, and I am firmly persuaded that the resignation which was then shewn to the will of the Almighty, was the means of obtaining his mercy. At about six P. M., the rudder, which had already received some very heavy blows, rose, and broke up the afterlockers, and this was the last severe shock that the ship received. We found by the well that she made no water, and by dark she struck no more. God was merciful to us, and the tide, almost miraculously, fell no lower. At dark heavy rain fell, but was borne in patience, for it beat down the gale, and brought with it a light air from the northward. At nine P. M. the water had deepened to five fathoms. The ship kept off the ground all night, and our exhausted crew obtained some broken rest."—P. 76.

In humble gratitude for his deliverance, he called the place "The Bay of God's mercy," and "offered up thanks and praises to God, for the mercy he had shewn to us."

On 12th September, they had another gale of wind, with cutting showers of sleet, and a heavy sea. "*At such a moment as this*," says Captain Lyon, "*we had fresh cause to deplore the extreme dulness of the Griper's sailing; for though almost any other vessel would have worked off this lee-shore, we made little or no progress on a wind, but remained actually pitching, forecastle under, with scarcely steerage-way*, to preserve which, I was ultimately obliged to keep her nearly two points off the wind."—P. 98.

Another storm overtook them, which is described as follows:—"Never shall I forget the dreariness of this most anxious night. Our ship pitched at such rate, that it was not possible to stand, even below; while on deck we were unable to move, without holding by ropes, which were stretched from side to side. The drift snow flew in such sharp heavy flakes, that we could not look to windward, and it froze on deck to above a foot in depth. The sea made incessant breaches quite fore and aft the ship, and the temporary warmth it gave while it washed over us, was most painfully checked, by its almost immediately freezing on our clothes. To these discomforts were added the horrible uncertainty as to whether the cables would hold until daylight, and the conviction also, that if they failed us, we should instantly be dashed to pieces, the wind blowing directly to the quarter in which we knew the shore must lie. Again, should they continue to hold us, we feared, by the ship's complaining so much forward, that the bits would be torn up, or that she would settle down at her anchors, overpowered by some of the tremendous seas which burst over her. At dawn on the 13th, thirty minutes after four A. M., we found that the best bower cable had parted; and, as the gale now blew with terrific violence from the north, there was little reason to expect that the other anchors would hold long; or, if they did, we *pitched so deeply, and lifted so great a body of water each time, that it was feared the windlass and forecastle would be torn up, or she must go down at her anchors*: although the ports were knocked out, and a considerable portion of the bulwark cut away, she could scarcely discharge one sea before shipping another, and the decks were frequently flooded to an alarming depth.

"At six A. M. all farther doubts on this particular account were at an end; for, having received two overwhelming seas, both the other cables went at the same moment, and we were left helpless, without anchors, or any means of saving ourselves, should the shore, as we had every reason to expect, be close astern. And here, again, I had the happiness of witnessing the same general tranquillity as was shewn on the 1st of September. There was no outcry that the cables were gone; but my friend Mr Manico, with Mr Carr the gunner, came aft as soon as they recovered their legs, and, in the lowest whisper, informed me that the cables had all parted. The ship, in trending to the wind, lay quite down on her broadside, and, as it then became evident that nothing held her, and that she was quite helpless, each man instinctively took his station; while the seamen at the leads, having secured themselves as well as was in their power, repeated their soundings, on which our preservation depended, with as much composure as if we had been entering a friendly port. Here, again, that Almighty power, which had before so mercifully preserved us, granted us his protection."—P. 100.

Nothing can be more interesting and moving than this narrative; it displays a great predominance of the moral sentiments and intellect, but sadly unenlightened as to the natural laws. I have quoted, in Captain Lyon's own words, his description of the Griper, loaded to such excess that she drew sixteen feet water—that she was incapable of sailing—that she was whirled round in an eddy in the Pentland Frith—and that seas broke over her which did not wet the deck of the little Snap, not half her size. Captain Lyon knew all this, and also the roughness of the climate to which he was steering; and, with these outrages of the physical law staring him in the face, he proceeded on his voyage, without addressing, so far as appears from his narrative, one remonstrance to the Lords of the Admiralty on the subject of this infringement of the principles of common prudence. My opinion is, that Captain Lyon was not blind to the errors committed in his equipment, or to their probable consequences; but that his powerful sentiment of Veneration, combined with Cautiousness and Love of Approbation (misdirected in this instance), deprived him of courage to complain to the Admiralty, through fear of giving offence; or that, if he did complain, they prevented him from stating the fact in his narrative. To the tempestuous north he sailed; and his greatest dangers were clearly referrible to the very infringements of the physical laws which he describes. When the tide ebbed, his ship reached to within six feet of the bottom, and, in the hollow of every wave, struck with great violence: but she was loaded at least four feet too deeply, by his own account; so that, if he had done his duty, she would have had four feet of additional water, or ten feet in all, between her and the bottom, even in the hollow of the wave—a matter of the very last importance in such a critical situation. Indeed, with four feet more water, she would not have struck; besides, if less loaded, she would have struck less violently. Again, when pressed upon a lee-shore, her incapability of sailing was a most obvious cause of danger. In short, if Providence is to be regarded as the cause of these calamities, there is no indiscretion

which it is possible for man to commit, that may not, on the same principles, be charged against the Creator.

But the moral law again shines forth in delightful splendour in the conduct of Captain Lyon and his crew, when in the most forlorn condition. Piety, resignation, and manly resolution, then animated them to the noblest efforts. On the principle, that the power of accommodating our conduct to the natural laws depends on the activity of the moral sentiments and intellect, and that the more numerous the faculties that are excited, the greater is the energy communicated to the whole system, I would say, that while Captain Lyon's sufferings were, in a great degree, brought on by his infringements of the physical laws, his escape was greatly promoted by his obedience to the moral law; and that Providence, in the whole occurrences, proceeded on the broad and general principle, which sends advantage uniformly as the reward of obedience, and evil as the punishment of infringement, of every particular law of creation.

That storms and tempests have been instituted for some benevolent end, may, perhaps, be acknowledged when their causes and effects are fully known, which at present is not the case. But even amidst all our ignorance of these, it is surprising how small a portion of evil they would occasion if men obeyed the laws which are actually ascertained. How many ships perish from being sent to sea in an old worn-out condition, and ill-equipped, through mere Acquisitiveness; and how many more, from captains and crews being chosen who are greatly deficient in knowledge, intelligence, and morality, in consequence of which they infringe the physical laws! The London *Courier*, of 29th April 1834, contains a list of ten British brigs of war, mostly employed as packet ships, which had foundered at sea within the preceding twelve years, owing to bad construction and bad condition; while, it is remarked, *not one American private packet ship*, out of the vast number constantly sailing between Liverpool and New York, is recollected to have perished in that manner. Such facts shew how little Nature is to blame for the calamities of shipwreck, and to how great an extent they arise from human negligence and folly. We ought to look to all these matters, before we complain of storms as natural institutions.

The last example of the mixed operation of the natural laws which I shall notice, is the result of the mercantile distress in 1825–6. I have traced the origin of that visitation to excessive activity of Acquisitiveness, and a general ascendency of the animal and selfish faculties over the moral and intellectual powers. The punishments of these offences were manifold. The excesses infringed the moral law, and the chastisement for this, was deprivation of the tranquil steady enjoyment that flows only from the moral sentiments, with severe suffering in the ruin of fortune and blasting of hope. These disappointments produced mental anguish and depression, which occasioned an unhealthy state of the brain. The action of the brain being disturbed, a morbid nervous influence was transmitted to the whole corporeal system; bodily disease was superadded to mental sorrow; and, in some instances, the unhappy sufferers committed suicide to escape from these aggravated evils. Under the organic law, the children produced in this period of mental depression, bodily distress, and organic derangement, will inherit weak bodies, with feeble and irritable minds—a hereditary chastisement for their father's transgressions.

In the instances now given, we discover the various laws acting in perfect harmony, and in subordination to the moral and intellectual laws. If our ancestors had not forsaken the supremacy of the moral sentiments, such fabrics as the houses in the old town of Edinburgh never would have been built; and if the modern proprietors had returned to that law, and kept profligate and drunken inhabitants out of them, the conflagration might still have been avoided. In the case of the ships, we see that wherever intellect and morality have been relaxed, and animal motives permitted to assume the supremacy, evil has speedily followed; and that where the higher powers were called forth, safety had been obtained. And, finally, in the case of the merchants and manufacturers, we trace their calamities directly to placing Acquisitiveness and Self-Esteem above intellect and moral sentiment.

Formidable and appalling, then, as these punishments are,—yet, when we attend to the laws under which they occur, and perceive that the object and legitimate operation of every one of those laws, when observed, is to produce happiness to man, and that the punishments have in view the sole object of forcing him back to happiness,—we cannot, under the supremacy of the moral sentiments and intellect, fail to bow in humility before them, as at once wise, benevolent, and just.

CHAPTER VIII.

INFLUENCE OF THE NATURAL LAWS ON THE HAPPINESS OF INDIVIDUALS.

The objection considered, that although, when viewed abstractly, the natural laws appear beneficent and just, yet they are undeniably the cause of extensive, severe, and unavoidable suffering to individuals—Their justice and benevolence, in reference to individuals, illustrated by imaginary cases of the suspension of various physical, organic, and social laws.

A FORMIDABLE objection has often been stated against the preceding views of the Natural Laws—namely, that although, when considered abstractly, they appear beneficent and just, yet, when applied to individuals, they are undeniably the causes of extensive, severe, and unavoidable suffering: and that while, theoretically, the moral horizon seems to be cleared, nevertheless, practically and substantially, the obscurity and intricacy remain undiminished. In answer, I observe, that, as the whole is but an aggregate of all the parts,—if any natural institution, when viewed in its effects in regard to the race, be just and beneficent, it cannot well be cruel and unjust to individuals, who are the component parts of that whole; a proposition which I humbly conceive admits of something approaching to demonstration. The form of a dialogue is perhaps the best adapted for illustrating the subject; and if, in imitation of some of the classic fabulists, we suppose the suffering individuals to make an appeal to Jupiter, the law of gravitation may be exemplified as follows:

It happened in a remote period, that a slater slipped from the roof of a high building, in consequence of a stone of the ridge having given way as he walked upright along it; he fell to the ground, had a leg broken, and was otherwise severely bruised. As he lay in bed suffering severe pain from his misfortune, he addressed Jupiter in these words: "O Jupiter, thou art a cruel god; for thou hast made me so frail and imperfect a being, that I had not faculties to perceive my danger, nor power to arrest my fall. It were better for me that I had never been." Jupiter, graciously bending his ear, heard the address, and answered, "Of what law of mine dost thou complain?" "Of the law of gravitation," replied the slater; "by its operation, my foot slipt upon a stone, which, unknown to me, was loose, I was precipitated to the earth, and my body, never calculated to resist such violence, was severely injured." "I restore thee to thy station on the roof," said Jupiter; "I heal all thy bruises; and, to convince thee of my benevolence, I suspend the law of gravitation as to thy body and all that is related to it: art thou now content?"

The slater, in deep emotion, offered up gratitude and thanks, and expressed the profoundest reverence for so just and beneficent a deity. In the very act of doing so, he found himself in perfect health, erect upon the ridge of the roof; and, rejoicing, gazed around. His wonder at so strange an event having at last abated, he endeavoured to walk along the ridge to arrive at the spot which he intended to repair. But the law of gravitation was suspended, and his body did not press upon the roof. There being no pressure, there was no resistance, and his legs moved backwards and forwards in the air without any progress being made by his body. Alarmed at this occurrence, he stooped, seized his trowel, lifted it full of mortar, and made the motion of throwing it on the slates; but the mortar, freed from the trowel, hung in mid air—the law of gravitation was suspended as to it also. Nearly frantic with terror at such unexpected novelties, he endeavoured to descend in order to seek relief; but the law of gravitation was suspended as to his body, and it hung poised at the level of the ridge, like a balloon in the air. He tried to fling himself down, to get rid of the uneasy sensation, but his body floated erect, and would not move downwards.

In an agony of consternation, he called once more upon Jupiter. The god, ever kind and compassionate, heard his cry and pitied his distress; and asked, "What evil hath befallen thee now, that thou art not yet content? have I not suspended, at thy request, the law which made thee fall? Now thou art safe from bruises and from broken limbs; why, then, dost thou still complain?"

The slater answered: "In deep humiliation, I acknowledge my ignorance and presumption; restore me to my couch of pain, but give me back the benefits of thy law of gravitation."

"Thy wish is granted," said Jupiter in reply. The slater in a moment lay on his bed of sickness, endured the castigation of the organic law, was restored to health, and again mounted to the roof that had caused his recent suffering. He thanked Jupiter anew, from the depths of his soul, for the law of gravitation with its numberless benefits; and applied his faculties to study and obey it during the remainder of his life. This study opened up to him new and delightful perceptions of the Creator's beneficence and wisdom, of which he had never before even dreamed; and these views so excited and gratified his moral and intellectual powers, that he seemed to himself to have entered on a new existence. Ever afterwards he observed the law of gravitation; and, in a good old age, when his organic frame was fairly worn out by natural decay, he transmitted his trade, his house, and much experience and wisdom, to his son, and died, thanking and blessing Jupiter for having opened his eyes to the true theory of his scheme of creation.

The attention of Jupiter was next attracted by the loud groans and severe complaints of a husbandman, who addressed him thus: "O Jupiter, I lie here racked with pain, and pass the hours in agony without relief. Why hast thou created me so miserable a being?" Jupiter answered: "What aileth thee, and of what institution of mine dost thou complain?" "The earth which thou hast made," replied the husbandman, "will yield me no food, unless I till and sow it; and no increase, except it be watered by thy rain. While I guided my plough in obedience to thy law, thy rain came, and it fell not only on the earth, but also on me; it penetrated through the clothes which I had been obliged to make for myself, because thou hadst left me naked; it cooled my skin, which thou hadst rendered delicate and sensible; it disordered all the functions of my body; and now rheumatic fever parches my blood, and agonises every muscle. O Jupiter, thou art not a kind father to thy children."

Jupiter heard the complaint, and graciously replied: "My physical and organic laws were established for thy advantage and enjoyment, and thou hast grievously infringed them; the pain thou sufferest is intended to reclaim thee to thy duty, and I have constituted thy duty the highest joy of thy existence: but say, what dost thou desire?"

The husbandman answered: "What, O Jupiter, signify the purposes of thy laws to me, when thou hast denied me faculties competent to discover and obey them?—Frail and fallible as I am, they cause me only pain; deliver me from their effects, and I ask no other boon."

"Thy prayer is granted," said Jupiter: "I restore thee to perfect health; and, for thy gratification, I suspend the laws that have offended thee. Henceforth water shall not wet thee or thine, thy skin shall feel cold no more, and thy muscles shall never ache. Art thou now content?"

"Most gracious Jupiter," said the husbandman, "my soul is melted with deepest gratitude, and I now adore thee as supremely good."

While he spoke he found himself afield behind his team, healthful and vigorous, jocund and gay, and again blessed Jupiter for his merciful dispensation. The season was spring, when yet the chill blast of the north, the bright blaze of a powerful sun, and passing showers of rain, interchanged in quick and varying succession. As he drove his team along, the rain descended, but it wet not *him*; the sharp winds blew, but they chilled no fibre in *his* frame; the flood of heat next poured upon his brow, but no perspiration started from its pores: the physical and organic laws were suspended as to him.

Rejoicing in his freedom from annoyance and pain, he returned gladly home to meet his smiling family, after the labours of the day. It had been his custom in the evening to put off the garments in which he had toiled, to clothe himself in fresh linen, to sup on milk prepared by his wife with savoury fruits and spices, and to press his children to his bosom with all the fervour of a parent's love; and he used to feel a thrill of pleasure pervading every nerve, as they acknowledged and returned the affectionate embrace.

He looked to find the linen clean, cool, delicately dressed, and lying in its accustomed place; but it was not there. He called to his wife to fetch it, half chiding her for neglect. With wonder and dismay depicted in every feature, she narrated a strange adventure. With the morning sun she had risen to accomplish her wonted duty, but, although the water wetted every thread that clothed other individuals, it moistened not a fibre of his. She boiled it over a powerful fire, and applied every means that intellect, stimulated by affection, could devise; but the result was still the same: the water glided over his clothes and would not wet them. "The physical law," said the husband within himself, "is suspended as to me; henceforth water wetteth not me or mine." He said no more, but placed himself at table, smiling over his lovely family. He lifted the youngest child upon his knee, a girl just opening in her bloom,—pressed her to his bosom, and kissed her ruddy cheek. But he started when he experienced no sensation. He saw her with his eyes, and heard her speak, but had no *feeling* of her presence. His knee was as stone, his bosom as marble, and his lips as steel; no *sensation* penetrated through his skin. He placed her on the floor, looked wistfully on her form, graceful, vivacious, and instinct with love; and, as if *determined* to enjoy the well-remembered pleasure now withheld, he clasped her to his bosom with an embrace so ardent that she screamed with pain. Still he was all adamant; no sensation reached his mind. Heaving a deep sigh, he sent her away, and again the thought entered the very depths of his soul—"The organic law is suspended as to me!" Recollecting well the sweet gratifications of his evening meal, he seized a bowl, and delicately began to sip, exciting every papilla of the tongue to catch the grateful savour. But no savour was perceptible; the liquid glided over his gustatory

organs like quicksilver over the smooth surface of a mirror, without impression, and without leaving a trace behind. He now started in horror, and his spirit sank within him when he thought that thenceforth he should live without sensation. He rushed into the fields, and called aloud on Jupiter: "O Jupiter, I am the most miserable of men; I am a being without sensation. Why hast thou made me thus?"

Jupiter heard his cry and answered: "I have suspended the physical and organic laws, to which thou didst ascribe thy fever and thy pain; henceforth no pang shall cause thy nerves to ache, or thy muscles to quiver: why, then, art thou thus unhappy, and why discontented with thy new condition?"

"True, O Jupiter," replied the husbandman; "but thou hast taken away from me sensation: I no longer feel the grateful breath of morn fanning my cheek as I drive my team afield; the rose diffuses its fragrance for me in vain; the ruddy grape, the luscious fig, and the cooling orange, to me are now savourless as adamant or air; my children are as stones: O Jupiter, I am utterly wretched; I am a man without sensation!"

"Unhappy mortal," replied the god, how can I afford thee satisfaction? When I gave thee nerves to feel, and muscles to execute the purposes of thy mind,—when I bestowed on thee water to refresh thy palate, and made thy whole frame one great inlet of enjoyment,—thou wert not content. I made thy nerves liable to pain, to warn thee of thy departures from my laws. The rain that was sent fell to fructify and refresh the earth, and not to injure thee. I saw thee, while the showers descended, stay abroad, regardless of its influence on thy frame. The northern blast received from me its piercing cold, to warn thee of its effects; and yet I saw thee, wet and shivering, stand in its course, regardless of its power. In the voice of the storm I spake to thy understanding, but thou didst not comprehend me. The fever that parched thy blood was sent to arrest thee in thy departures from my organic laws. If I restore thee to the benefit of my institutions, thou mayst again forget my ways, and in misery impeach my justice."

"O most gracious Jupiter," cried the husbandman, "now I see thy power and wisdom, and my own folly and presumption. I accept thy laws, and gratefully acknowledge that, even in the chastisements they inflict, they are beneficent. Restore to me the enjoyments of sensation; permit me once more to reap the advantages that flow from the just uses of my nerves and muscles, and I bow with resignation to the punishment of misapplying them." Jupiter granted his request. His fever and pains returned, but by medicine he was relieved. He slowly recovered health and strength, and never afterwards embraced his children, or enjoyed a meal, without pouring forth a deeper offering of gratitude than he had done before. He was now instructed concerning the sources of his enjoyments; he studied the laws of his nature and obeyed them; and when he suffered for occasional deviations, he hastened back to the right path, and never again underwent so severe a punishment.

Just as the husbandman resumed his wonted labours, a new voice was heard calling loudly to Jupiter for relief. It proceeded from a young heir writhing in agony, who cried, "O Jupiter, my father committed debaucheries, for which my bones are pierced with aching pains; gout teareth my flesh asunder; thou actest not justly in punishing me for his transgressions: deliver me, O Jupiter, or renounce thy character for benevolence and justice." "Thou complainest of my law of hereditary descent?" said Jupiter; "hast thou derived from thy father any other quality besides liability to gout?" "O Jupiter," replied the sufferer, "I have derived nerves that feel sweet pleasure when the gout ceaseth its gnawing, muscles that execute the purposes of my will, senses that are inlets of joy, and faculties that survey and rejoice in thy fair creation: But why didst thou permit gout to descend from him who sinned, to me?"

"Short-sighted mortal," said Jupiter, "thy father was afflicted because he infringed my institutions; by my organic law, thou hast received a frame constituted as was that of thy father when thy life commenced; the delicate sensibility of his nerves transmitted the same susceptibility to thine; the vigour of his muscles has been transferred into thine; and by the same law, the liability to pain that existed in his bones from debauchery, constitutes an inseparable element of thine: If this law afflict thee, speak the word, and I shall suspend it as to thee."

"Bountiful Jupiter!" exclaimed the sufferer; "but tell me first—if thou suspendest thy law, shall I lose all that I inherited by it from my father; vigour of nerves, muscles, senses, and faculties, and all that constitutes my delight when the gout afflicteth me not?"—"Assuredly thou shalt," said Jupiter; "but thy body will be free from pain."

"Forbear, most bounteous deity," replied the sufferer; "I gratefully accept the gift of thy organic laws, with all their chastisements annexed: But say, O Jupiter, if this pain was inflicted on my father for transgressing thy law, may it not be lessened or removed if I obey?"

"The very object of my law," said Jupiter, "is that it should be lessened. Hadst thou proceeded as thy father did, thy whole frame would have become one great centre of disease. The pain was transmitted to thee to guard thee by a powerful monitor from pursuing his sinful ways, that thou mightst escape this greater misery. Adopt a course in accordance with my institutions, and then thy pain shall abate, and thy children shall be free from its effects."

The heir expressed profound resignation to the will of Jupiter, blessed him for his organic law, and entered upon a life of new and strict obedience. His pain in time diminished, and his enjoyments increased. Ever after he was grateful for the law.

A feeble voice next reached the vault of heaven: it was that of a child, sick and in pain. "What is thy distress, poor boy," said Jupiter, "and of what dost thou complain?" Half drowned in sobs, the feeble voice replied, "I suffer under thy organic law. A father's sickness, and the disorders of a mother's frame, have been transmitted in combined intensity to me. I am all over exhaustion and pain." "Hast thou received no other gift," inquired Jupiter, "but sickness and disease—no pleasure to thy nerves, thy muscles, or thy mental powers?" "All are so feeble," replied the child, "that I exist, not to enjoy, but only to suffer." "Poor victim," said Jupiter, "my organic law shall soon deliver thee, and I will take thee to myself." The organic law instantly operated; the body of the child lay a lifeless mass, and suffered no more; its spirit dwelt with Jupiter.

The next prayer was addressed by a merchant struggling on the Mediterranean waves, and near sinking in their foam. "What evil dost thou charge against me," said Jupiter, "and what dost thou require?"

"O Jupiter," answered the supplicant, "I sailed from Tyre to Rome in a ship, which thou seest on fire, loaded with all the merchandise acquired by my previous toils. As I lay here at anchor off the port of Syracuse, whither business called me, a sailor, made by thee, thirsted after wine, stole it from my store, and, in intoxication, set my ship and goods on fire; and I am now plunged in the waves to die by drowning, to escape the severer pain of being consumed by fire. Why, if thou are just, should the innocent thus suffer for the guilty?"

"Thou complainest, then," said Jupiter, "of my social law? Since this law displeaseth thee, I restore thee to thy ship, and suspend it as to thee."

The merchant, in a moment, saw his ship entire; the

blazing embers restored to vigorous planks; himself and all his crew sound in limb, and gay in mind, upon her deck. Joyous and grateful, he addressed thanksgiving to the god, and called to his crew to weigh the anchor, set the sails, and turn the helm for Rome. But no sailor heard him speak, and no movement followed his words. Astonished at their ndolence and sloth, he cried in a yet louder voice, and inquired why none obeyed his call. But still no answer was given. He saw the crew move and speak, act and converse; but they seemed not to observe *him*. He entreated, remonstrated, and upbraided; but, notwithstanding all his efforts, could obtain no reply. All seemed unconscious of his presence. Unconscious of his presence! The awful thought rushed into his mind, that the social law was suspended as to him. He now saw, in all its horror, the import of the words of Jupiter, which before he had not fully comprehended. Terrified, he seized a rope, and set a sail. Every physical law was in force, and obeyed his will. The sail filled, and strained forward from the mast. He ran to the helm—it obeyed his muscles, and the ship moved as he directed it. But its course was short: the anchor was down, and stopped its progress in the sea. He lowered the sail, seized a handspoke, and attempted to weigh; but in vain. The strength of ten men was required to raise so ponderous an anchor. Again he called to his crew; but again he found that the social law was suspended as to him: he was absolved thenceforth from all suffering caused by the misconduct of others, but he was cut off from every enjoyment and advantage derivable from their assistance.

In despair he seized the boat, rowed it into the port of Syracuse, and proceeded straight to his commercial correspondent there, to beg his aid in delivering him from the indolence of his crew. He saw his friend, addressed him, and told him of his fruitless endeavours to leave the anchorage; but his friend seemed quite unconscious of his presence. He did not even look upon him, but proceeded in business of his own, with which he seemed entirely occupied. The merchant, wearied with fatigue, and almost frantic with alarm, hurried to a tavern on the quay, where he used to dine; and, entering, called for wine to recruit his exhausted strength. But the servants seemed unconscious of his presence; no movement was made; and he remained as if in a vast solitude, amidst large companies of merchants, servants, and assistants, who all bustled in active gaiety, each fulfilling his duty in his own department. The merchant now comprehended all the horrors of his situation, and called aloud to Jupiter—"O Jupiter, death in the waves, or by consuming flame, were better than the life thou hast assigned to me. Let me die, for my cup of misery is full beyond endurance; or restore me the enjoyments of thy social law, and I shall cease to complain of the pains which it inflicts."

"But," said Jupiter, "if I restore to thee my social law, thy ship will be consumed, thou and thy crew will escape in a boat, but thou shalt be a very beggar; and, in thy poverty, thou wilt upbraid me for dealing unjustly by thee."

"O bountiful Jupiter," replied the merchant, "I never knew till now what enjoyments I owed to thy social law; how rich it renders me, even when all else is gone; and how poor I should be, with all the world for a possession, if denied its blessings. True, I shall be poor; but my nerves, muscles, senses, propensities, sentiments, and intellect, will be left me: now I see that employment of these is the only pleasure of existence; poverty will not cut me off from exercising these powers in obedience to thy laws, but will rather add new motives exciting me to do so. Under thy social law, will not the sweet voice of friendship cheer me in poverty; will not the aid of kindred and of my fellow-men sooth the remainder of my days? and, besides, now that I see thy designs, I shall avoid employing my fellow-men in situations unsuitable to their talents, and thereby escape the penalties of infringing thy social law. Most merciful Jupiter, restore to me the benefit of all thy laws, and I accept the penalties attached to their infringement." His request was granted; afterwards he made Jupiter's laws and the nature of man his study; he obeyed those laws, became moderately rich, and found himself happier than he had ever been in his days of selfishness and ignorance.

Jupiter was assailed by many other prayers from unfortunate sufferers under the effects of infringement of his laws; but, instead of hearing each in endless succession, he assembled his petitioners, and introduced to them the slater, the husbandman, the young heir, and the merchant, whom he requested to narrate their knowledge and experience of the natural laws; and he intimated, that if, after listening to their account, any petitioner should still be dissatisfied with his condition, he would suspend for him the particular law which caused the discontent. But no application followed. Jupiter saw his creatures employ themselves with earnestness in studying and conforming to his institutions, and ever afterwards they offered up to him only gratitude and adoration for his infinite goodness and wisdom.

CHAPTER IX.

ON THE RELATION BETWEEN SCIENCE AND SCRIPTURE.

Science, being an exposition of the Creator's works, cannot be at variance with Scripture correctly interpreted—Archbishop Whately and Professor Sedgwick quoted on the impropriety of testing science by Scripture—In all ages, new doctrines have been branded as impious—Christianity itself no exception—Phrenology may be expected to lead to the abandonment of prevailing interpretations of some parts of Scripture—Bearing of Phrenology upon the realization of practical Christianity—New direction to the pursuits of the religious instructors of mankind anticipated—History demonstrates that Christianity, while unaided by arts and science, was corrupted itself, and had little influence in improving the human race—The inefficacy of Scripture alone to produce moral and rational conduct, illustrated by a narrative of the persecutions for witchcraft in the fifteenth, sixteenth, and seventeenth centuries—Necessity for using all our lights in searching for the meaning of Scripture—Illustrative quotations from Bishop Taylor, on the obscurity of Scripture, the corruptions which the text has undergone, and the difficulty of translating it accurately—Another illustration cited from the Rev. Dr Fraser—Consideration of the objection, That, according to the doctrine of the natural laws, prayer must be irrational and useless. This objection grounded on the false assumption that the object of prayer is to influence the Deity—Decision of the General Assembly of the Church of Scotland, that prayer has no effect but upon the mind of the supplicant—This taught by Drs Leechman and Blair—Opinion of Lord Kames on prayer, and on public worship—The natural effects of great size and activity in the moral organs mistaken by some persons for the direct influence of the Holy Spirit in causing pure and religious emotions to spring up in the mind.

Since the first edition of this work was published, objections have been stated that the views maintained in it are at variance with Scripture, and hostile to the interests of religion. It is gratifying, however, to know, that these objections have not been urged by any individual of the least eminence in theology, or countenanced by persons of enlarged views of Christian doctrine. On the contrary, many excellent individuals, of unquestionable piety and benevolence, have widely recommended this work as containing the philosophy of practical Christianity, and have aided in its diffusion. It is therefore rather on account of the interest of the inquiry itself, than from any feeling of the necessity of a defence, that I enter into the following discussi of the relation between Scripture and Science; and as in a question of this nature authorities are entitled to

great weight, I shall commence by citing the opinion of one of the most learned, talented, and accomplished divines of the present day, the Archbishop of Dublin.

A few years ago, a Professorship of Political Economy was founded in Oxford by Mr Drummond, with a novel constitution. The professor holds his office for only five years, and it is a condition that one lecture, at least, shall be published every year. Dr Whately, now Archbishop of Dublin, was the second individual elected to the chair, and, in compliance with the statute, he published, in 1831, eight lectures on the science. They are introductory in their character, being intended chiefly to dispel popular prejudices against political economy, and to unfold its objects. They contain several admirable observations, calculated to remove prejudices against new truths, directly applicable to the subject of the present work. On this account I present them to the reader.

"It has been my first object," says Dr Whately, in his preface, "to combat the prevailing prejudices against the study, and especially those which represent it as unfavourable to religion."

"In proportion," he continues, "as any branch of study leads to important and useful results,—in proportion as it gains ground in public estimation,—in proportion as it tends to overthrow prevailing errors,—in the same degree it may be expected to call forth angry declamation from those who are trying to despise what they will not learn, and wedded to prejudices which they cannot defend. Galileo probably would have escaped persecution, if his discoveries could have been disproved, and his reasonings refuted." "That political economy should have been complained of as hostile to religion, will probably be regarded a century hence (should the fact be then on record) with the same wonder, almost approaching to incredulity, with which we, of the present day, hear of men sincerely opposing, on religious grounds, the Copernican system. But till the advocates of Christianity shall have become universally much better acquainted with the true character of their religion, than, universally, they have ever yet been, we must always expect that every branch of study, every scientific theory that is brought into notice, will be assailed on religious grounds, by those who either have not studied the subject, or who are incompetent judges of it; or again, who are addressing themselves to such persons as are so circumstanced, and wish to excite and to take advantage of the passions of the ignorant. *Flectere si nequeo superos, Acheronta movebo.* Some there are who sincerely believe that the Scriptures contain revelations of truths the most distinct from religion. Such persons procured, accordingly, a formal condemnation (very lately rescinded) of the theory of the earth's motion, as at variance with Scripture. In Protestant countries, and now, it seems, even in Popish, this point has been conceded; but that the erroneous principle—that of appealing to revelation on questions of physical science—has not yet been entirely cleared away, is evident from the objections which most of you probably may have heard to the researches of geology. The objections against astronomy have been abandoned, rather, perhaps, from its having been made to appear, that the Scripture accounts of the phenomena of the heavens may be reconciled with the conclusions of science, than from its being understood that Scripture is not the test by which the conclusions of science are to be tried." "It is not a sign of faith—on the contrary, it indicates rather a want of faith, or else a culpable indolence—to decline meeting any theorist on his own ground, and to cut short the controversy by an appeal to the authority of Scripture. For, if we really are convinced of the truth of Scripture, and consequently of the falsity of any theory (of the earth, for instance) which is really at variance with it, we must needs believe that that theory is also at variance with observable phenomena; and we ought not therefore to shrink from trying the question by an appeal to these." "God has *not* revealed to us a system of morality, such as would have been needed for a being who had no other means of distinguishing right and wrong. On the contrary, the inculcation of virtue and reprobation of vice in Scripture, are in such a tone as seems to presuppose a natural power, or a capacity for acquiring the power, to distinguish them. And if a man, denying or renouncing all claims of natural conscience, should practise without scruple every thing he did not find expressly forbidden in Scripture, and think himself not bound to do any thing that is not there expressly enjoined, exclaiming at every turn—

"Is it so nominated in the Bond,"

he would be leading a life very unlike what a Christian's should be. Since, then, we are bound to use our own natural faculties in the search after all truth that is within the reach of those faculties, most especially ought we to try, by their own proper evidence, questions which form no part of revelation properly so called, but which are incidentally alluded to in the Sacred Writings. If we appeal to the Scriptures on any such points, it should be merely as to an ancient book, not in reference to their sacred character; in short, not as Scripture."—Pp. 29–36.

These observations are highly philosophical and worthy of attention; the more so that their author is a divine, and now a high dignitary in the church of Ireland.

The science of geology, also, has been fiercely attacked as hostile to religion, and been ably defended by the Rev. Adam Sedgwick, one of its most eminent professors. In the Appendix to his Discourse on the Studies of the University of Cambridge, he has published some valuable and instructive notes, in the last of which he reproves, with great eloquence and severity, the bigoted and ignorant individuals who "dare to affirm that the pursuits of natural science are hostile to religion." He also chastises those writers who have endeavoured to falsify the facts and conclusions of geology, for the purpose of flattering the religious prejudices of the public. "There is another class of men," says he, "who pursue geology by a nearer road, and are guided by a different light. Well-intentioned they may be; but they have betrayed no small self-sufficiency, along with a shameful want of knowledge of the fundamental facts they presume to write about: hence they have dishonoured the literature of this country by *Mosaic Geology*, *Scripture Geology*, and other works of cosmogony with kindred titles, wherein they have overlooked the aim and end of revelation, tortured the book of life out of its proper meaning, and wantonly contrived to bring about a collision between natural phenomena and the word of God."—P. 150.

The following observations of the same author are exceedingly just:—"A Brahmin crushed with a stone the microscope that first shewed him living things among the vegetables of his daily food. The spirit of the Brahmin lives in Christendom. The bad principles of our nature are not bounded by *caste* or climate; and men are still to be found, who, if not restrained by the wise and humane laws of their country, would try to stifle by personal violence, and crush by brute force, every truth not hatched among their own conceits, and confined within the narrow fences of their own ignorance.

"We are told by the wise man *not to answer a fool according to his folly*; and it would indeed be a vain and idle task to engage in controversy with this school of false philosophy—to waste our breath in the forms of exact reasoning unfitted to the comprehension of our antagonists—to draw our weapons in a combat where victory could give no honour. Before a geologist can condescend to reason with such men, they must first learn geology.* It is too much to call upon us to scat-

* This remark is peculiarly applicable to those who oppose

ter our seed on a soil at once both barren and unreclaimed—it is folly to think that we can in the same hour be stubbing up the thorns and reaping the harvest. All the writers of this school have not indeed sinned against plain sense to the same degree. With some of them, there is perhaps a perception of the light of natural truth, which may lead them after a time to follow it in the right road: but the case of others is beyond all hope from the powers of rational argument. Their position is impregnable while they remain within the fences of their ignorance, which is to them as a wall of brass: for (as was well said, if I remember right, by Bishop Warburton, of some bustling fanatics of his own day) there is no weak side of common sense whereat we may attack them. If cases like these yield at all, it must be to some treatment which suits the inveteracy of their nature, and not to the weapons of reason. As psychological phenomena, they are, however, well deserving of our study; teaching us, among other things, how prone man is to turn his best faculties to evil purposes—and how, at the suggestions of vanity and other bad principles of his heart, he can become so far deluded as to fancy that he is doing honour to religion, while he is sacrificing the common charities of life, and arraigning the very workmanship of God."—Pp. 151, 152.

After the examples which these passages afford, of misdirected zeal for religion leading to opposition against the most useful and interesting investigations, we need not be surprised that the doctrine of the natural laws has met with a similar reception. The charge is made that it leads to infidelity, and that its principles are irreconcilable with Scripture.

It may be useful to observe, that in all ages new doctrines have been branded as impious, and that Christianity itself has offered no exception to this rule. The Greeks and Romans charged Christianity with "impiety and novelty." In Cave's *Primitive Christianity*, we are informed that "the Christians were everywhere accounted a pack of *Atheists*, and their religion the *Atheism*." They were denominated "mountebank impostors," and "men of a desperate and unlawful faction." They were represented as "destructive and pernicious to human society," and were accused of "sacrilege, sedition, and high treason." The same system of misrepresentation and abuse was practised by the Roman Catholics against the Protestants, at the Reformation: "Some called their dogs Calvin; and others transformed Calvin into Cain." In France, "the old and stale calumnies, formerly invented against the first Christians, were again revived by Demochares, a doctor of the Sorbonne, pretending that all the disasters of the state were to be attributed to Protestants alone."

If the views of human nature expounded in this work be untrue, the proper answer to them is a demonstration of their falsity. If they be true, they are mere enunciations of the institutions of the Creator; and it argues superstitious, and not religious, feelings to fear evil consequences from the knowledge of what Divine Wisdom has appointed. The argument that the *results* of the doctrine are obviously at variance with Scripture, and that *therefore* the doctrines *cannot be true*, is not admissible; "for," in the words of Dr Whately, "if we really are convinced of the truth of Scripture, and consequently of the falsity of any theory (of the earth, for instance) which is really at variance with it, we must needs believe that that theory is also at variance with observable phenomena; and we ought not therefore to shrink from trying the question by an appeal to these."

Galileo was told, from high authority in the church, that his doctrine of the revolution of the globe was obviously at variance with Scripture, and that therefore it *could not be true*; but, as his opinions were founded on palpable facts, which could be neither concealed nor denied, they necessarily prevailed. If there had been a real opposition between Scripture and nature, the only result would have been a demonstration that Scripture in this particular instance was erroneously interpreted; because the evidence of physical nature is imperishable and insuperable, and cannot give way to any authority whatever. The same consequence will evidently happen in regard to Phrenology. If any fact in physiology does actually and directly contradict any interpretation of Scripture, it is not difficult to perceive which must yield. The human understanding cannot resist evidence founded on observation; and even if it did resist, Nature would not bend, but continue to operate in her own way in spite of the resistance, and a new and more correct interpretation of Scripture would ultimately become inevitable. Opposition between science and religion must be impossible, when facts in nature are correctly observed, and Scripture is rightly interpreted. I put the case thus strongly to call the attention of serious persons to the mischievous consequences of rashly denouncing, as adverse to religion, any doctrine professing to be founded on natural facts. Every instance in which the charge is made falsely, is an outrage against religion itself, and tends to lead men to regard it as an obstacle to the progress of science and civilization.

All existing interpretations of Scripture have been adopted in ignorance of the facts, that every person in whose brain the animal organs preponderate greatly over the moral and intellectual organs, has a native and instinctive tendency to immoral conduct, and *vice versa*; and that the influence of organization is fundamental—that is to say, that no means are yet known by which an ill-formed brain may be made to manifest the moral and intellectual faculties with the same success as a brain of an excellent configuration. An individual possessing a brain like that of Melancthon, represented on p. 41, is naturally adapted to receive, comprehend, and practise the precepts of Christianity; whereas it will be found extremely difficult to render persons with brains like those of Hare, p. 41, Pope Alexander VI., p. 42, Vitellius, p. 43, or the Carib, p. 50, practical Christians amidst the ordinary temptations of the world. Only phrenologists, who have observed, for many years, in various situations, and under different influences, the conduct of individuals constituted in these different ways, can conceive the importance of the relative development of the cerebral organs; but after it is discovered, the inferences from it are irresistible. The religious teachers of mankind are yet ignorant of the most momentous fact which nature presents in regard to the moral and intellectual improvement of the race. I have heard it said that Christianity affords a better and a more instantaneous remedy for human depravity, than improvement of the cerebral organization; because the moment a man is penetrated by the love of God in Christ, his moral and religious affections become far stronger and more elevated, whatever his brain may be,—than those of any individual whatever without that love, however noble his cerebral development, and however much he may be instructed in natural knowledge. I observe, however, that in this life a man cannot become penetrated by the love of God, except through the aid of sound and efficient material organs. This fact is directly proved by cases of madness and idiocy. Disease in the organs is the cause of insanity, and mere deficiency of their size is one and an invariable cause of idiocy. See figure of idiot head on p. 52. In neither of these states can the mind receive the advantages of the Christian doctrine. It is, therefore, obvious that the power of receiving and appreciating Christianity itself is modified by the condition of the brain; and I venture to affirm, that the influence of the organs does not terminate with these extreme cases, but operates in all circumstances and in every individual, aiding or impeding the reception and efficacy of every doctrine.

Phrenology and the doctrine of the Natural Laws. Such of them as are serious, do so in profound ignorance of the whole subject.

If this were not the case, there would be in operation a power capable of influencing the human mind, during life, without the intervention of material organs; and, accordingly, many excellent persons believe this to be scriptural truth, and matter of experience also. But those who entertain this opinion are not instructed in the functions of the brain; they are not aware of the universally admitted facts, which establish that while life continues the mind cannot act or be acted upon except through the medium of organs; nor do they bring forward one example of idiots and madmen being rendered pious, practical, and enlightened Christians by this power, notwithstanding the state of their brains. Cases indeed occur in which religious feelings co-exist with partial idiocy or partial insanity; but in them the organs of these sentiments will be discovered to be well developed,—and if the feelings be sane, the organs will be found unaffected by disease.

Serious persons who are offended by this doctrine, constantly forget that the reciprocal influence of the mind and brain is not of man's devising, but that God himself established it, and conferred on the organs those qualities which He saw to be necessary for executing the purposes to which He had appointed them. If the statements now made be unfounded, I shall be the first to give them up; but, believing them to be true, I cannot avoid adhering to them. When, therefore, I add, that I have never seen an individual with large organs of the animal, and small organs of the moral and intellectual, faculties, whose conduct was steadily moral, under the ordinary temptations of life, however high his religious professions might be, I merely state a fact which the Creator himself has decreed to exist. Indeed, I have seen several striking instances of persons, who, after making a great profession of religion, ultimately disgraced it; and I have observed that in all these instances, without one exception, the organs of the inferior propensities were large, and those of one or more of the moral sentiments deficient; and I am convinced that the same conclusion, after sufficiently accurate and extensive observations, will force itself upon all candid and reflecting minds.

My inference, therefore, is, that the Divine Spirit, mentioned in Scripture as a power influencing the human mind, invariably acts in harmony with the laws of organization; because the latter, *as emanating from the same source*, can never be in contradiction with the former; and because a well-constituted brain is a condition essential to the manifestation of Christian dispositions. If this be really the fact, and if the constitution of the brain be in any degree regulated by the laws of physiology, it is impossible to doubt that a knowledge of the natural laws is destined to exercise a vast influence in rendering men capable of appreciating and practising Christianity. The *manner* in which it will do so, is explained in Dr Combe's treatise on "Physiology applied to Health and Education," already alluded to. That work contains an exposition of the laws of action of the brain, and its connexion with, and influence on, the rest of the system, and, therefore, of its relations generally to human improvement.

An admirable portion of Christianity is that in which the supremacy of the moral sentiments is explained and enforced as a practical doctrine. Love thy neighbour as thyself; all mankind are thy neighbours; blessed are the meek and the merciful; love those that hate you and despitefully use you; seek that which is pure, and holy, and of good report;—these are precepts to be found in Scripture. Now, I have endeavoured to shew, that the human faculties, and external nature, are so constituted as to admit of such precepts being reduced to practice on earth—an idea which few philosophers have believed to be practicable. If the philosophy now explained shall carry home to rational men the conviction that the order of nature fairly admits of the practical exemplification of these precepts by the development of its inherent resources, a new direction must necessarily be given to the pursuits of the religious instructors of mankind. Christianity, after its establishment by Constantine, was left to exert its own influence over the Roman Empire, unaided by printing and natural science. It is recorded in history, that it did not suffice to arrest the decline of morals and the downfall of the State, but was itself corrupted and perverted. In the dark ages which followed the subversion of that Empire, it was again left, unaided by human learning, to do its best for the regeneration of mankind; and it became a vast system of superstition. Nor was it till after the invention of printing, and the revival of letters, that the barbarous superstructures which had been raised on the simple foundations of the Gospel were cleared away. But the period from the revival of letters to the present day, has been the age of scholastic learning, as contradistinguished from that of philosophy and science. Christianity stands before us, therefore, at present, as interpreted by men who knew extremely little of the science of either external nature or the human mind. They have represented it as a system of spiritual influences, of internal operations on the soul, and of repentant preparation for another life; rather than an exposition of pure and lofty principles addressed to responding faculties in human nature itself, and therefore capable of being practically applied in this world.

It is a common accusation against philosophy, that the study of it renders men infidels; and this alleged fact is brought forward as a proof that human nature is corrupt, blind, and perverse, turning what ought to be its proper food into mortal poison. But if this were really a well-founded charge, the conclusion which I should draw from it would be, that there must be essential errors in the popular interpretations of Scripture, when the effect of a knowledge of nature on the mind is to lead to infidelity. Science is of modern growth; and, down to the present hour, the mass of Christians in every country have embraced their faith without the possibility of comparing it with the revelation of the Divine Will contained in the constitution of external nature, which, philosophically speaking, was unknown to them. The facts unfolded by science were unknown to the divines who first denied the capability of mankind to attain, by the development of their natural powers, a higher moral condition than any they have hitherto reached; and, hence, their decision against the capabilities of human nature has been pronounced *causâ non cognitâ* (the merits being unknown), and must be open for reconsideration. If Christianity was freed from many errors by the revival and spread of mere scholastic learning in the fifteenth, sixteenth, and seventeenth centuries, much more may we expect that the interpretations of Scripture will be farther purified, corrected, and elucidated, by the flood of light which the sciences of human and physical nature, now in the course of cultivation, will one day shed upon religion.

According to my view, the study of the human constitution, of external nature, and of their relations, will become an object of paramount importance, with reference to a just appreciation of the true meaning of Scripture. Civilized man sees infinitely more of true and practical wisdom in Scripture than the savage of the wilderness, even supposing that the latter could read and understand the words of the sacred volume; and, in like manner, man, when thoroughly instructed in his own constitution and in that of external nature, will discover still profounder truths and more admirable precepts in that record, than are found in it by ignorant, contentious, blind, conceited man, such as he has hitherto existed.

History is full of instruction concerning the insufficiency of mere theological knowledge to protect men from practical errors, when their understandings are unenlightened in regard to philosophy and the constitu-

tion of nature. The part which the religious teachers of Europe acted in regard to witchcraft, affords one striking proof of the truth of this remark.

It was not till towards the close of the 15th century, that persecutions for witchcraft began to prevail in Europe. By a bull of Pope Innocent VIII. in 1484, death was, for the first time, denounced without mercy to all who should be convicted of witchcraft, or of dealings with Satan; and a form of process for the trial was regularly laid down by a wretch of the name of Sprenger, whom the Pope had placed at the head of a commission of fire and sword. The succeeding Popes, Alexander VI. and even Leo X. lent their aid in accelerating the course of this havoc-spreading engine. So far, however, were the commissions from being attended with beneficial consequences, that their only effect was to render the evil every day more formidable; till, at last, if we are to believe the testimony of contemporary historians, Europe was little better than a large suburb of Pandemonium. One-half of the population was either bewitching or bewitched. About the year 1515, 500 witches were executed in Geneva in three months. A thousand were executed in one year in the diocese of Como; and they went on burning at the rate of 100 per annum for some time after. In Lorraine, from 1580 to 1595, Remigius boasts of having burned 900. In France, the multitude of executions about 1520 is incredible. One historian calls it "an almost infinite number of sorcerers."

Germany was so fertile a soil for the supernatural, that, from the publication of Innocent's bull to the suppression of persecution for witchcraft, the number of victims could not be less than 100,000! In the town of Wurtzburg alone, in the course of two years—1627-29—there were twenty-nine acts of conflagration, and more than 157 persons burnt; including not only old women, but even children as young as nine years. In Lindheim, from 1660 to 1664, a twentieth part of the whole population was consumed. Other places furnished their full contingent; and so familiarized was the public with these atrocious scenes, that it relished and gloried in them: singing the events of them to popular airs, and representing them in hideous engravings, with devils dragging away "*their own*;" while the clergy preached solemn discourses, called "witch-sermons," upon occasion of every sacrifice—the effect of which was, of course, to inspire with fresh zeal to collect fuel for another.

England was not free from the same madness. Three thousand victims were executed during the reign of the Long Parliament alone; and it is a melancholy spectacle to find a man like Sir Matthew Hale condemning wretches to destruction, on evidence which a child would now be disposed to laugh at. A better order of things commenced with the Chief-Justiceship of Holt, in consequence of whose firm charge to the jury on one of these trials, a verdict of not guilty—almost the first then on record in a trial for witchcraft—was found. In about ten other trials by Holt, from 1694 to 1701, the result was the same. Yet, in 1716, a Mrs Hicks, and her daughter aged nine, were hanged at Huntingdon for selling their souls to the devil, and raising a storm by pulling off their stockings and making a lather of soap! With this crowning atrocity, the catalogue of murders in England closes, the penal statutes against witchcraft being repealed in 1736, and the *pretended* exercise of such arts being punished in future by imprisonment and pillory.

Barrington, in his observations on the statute of 20th Henry VI., does not hesitate to estimate the number of individuals put to death in England, on the charge of witchcraft, at 30,000.

Scotland, too, must bear her share of the bloody stain of these abominable doings. Till the Reformation, little or no regard was paid to this subject; but soon after that event, a raging thirst for destruction took possession of the nation. In 1563, an act of Parliament was passed, enacting the punishment of death against witches and consultors with witches. The consequences of this authoritative recognition of the creed of witchcraft became immediately obvious in the reign of James VI., which followed. Witchcraft became the all-engrossing topic of the day; and it was the ordinary accusation resorted to, whenever it was the object of one individual to ruin another. A number of the trials are reported in Mr Pitcairn's recent and valuable publication of the records of the Court of Justiciary. The first case is in 1572, of which no particulars are given, except the name of the unfortunate woman, and the doom—"*convict and brynt*." Thirty-five trials are recorded subsequently, to the end of James's reign, in all of which the horrid result is the same. The trials proceeded, during many years, and the confessions were obtained by torture with thumbscrews and boots, and prickling with sharp instruments; while stranglings and burnings followed of course. The scene darkens towards the close of the reign of Charles I., with the increasing dominion of the puritans. In 1640, the General Assembly passed an act, that all ministers should take particular note of witches and charmers, and that the commissioners should recommend to the supreme judicature the unsparing application of the laws against them. In 1643, after setting forth the increase of the crime, they recommended the granting of a standing commission from the Privy Council or Justiciary, to "*any* understanding gentlemen or magistrates," to apprehend, try, and *execute justice* against delinquents. By the urgency of the General Assembly, who resumed the subject in 1644, 1645, and 1649, an act of Parliament was passed in the last-named year, confirming and extending the statute of Queen Mary, passed in 1563. As was to be expected, convictions, which had been fewer since James's time, increased, and the cases were more horrible. Thirty trials appear on the record between 1649 and 1660, in which there seems to have been only *one* acquittal; while at one western circuit, in 1659, seventeen persons were convicted and burnt for the imputed crime. Numerous, however, as are the cases in the records of Justiciary, these afford a most inadequate idea of the extent to which this pest prevailed over the country; for the Privy Council was in the habit of granting commissions to resident gentlemen and ministers, to examine, and afterwards to try and execute, witches all over Scotland; and so numerous were these commissions, that one author expresses his astonishment at the number found in the registers. Under these commissions, multitudes were burnt in every part of the kingdom.

It is matter of history, that, in cases of this kind, the clergy displayed the most intemperate zeal. It was before them that the poor wretches were first brought for examination,—in most cases after a preparatory course of solitary confinement, cold, famine, want of sleep, or actual torture. On some occasions, the clergy themselves actually performed the part of the prickers, and inserted long pins into the flesh of the witches, in order to try their sensibility; and, in all cases, they laboured with the most persevering investigations to obtain from the accused a confession which might afterwards be used against them on their trial, and which, in more than one instance, formed, although retracted, the sole evidence on which the conviction took place.

After 1662, the violence of the mania in Scotland began to decline; and to the great lawyers of the time is due the credit of first stemming the foul torrent. "From the horridness of the crime," says Sir George Mackenzie in his Criminal Law, "I do conclude, that of all crimes it requires the clearest relevancy and most convincing probature; and I condemn, next to the wretches themselves, those cruel and too forward judges, who *burn persons by thousands* as guilty of this crime." The trials after this became fewer and fewer, and the

last execution took place at Dornoch in 1722. The statutes were finally repealed in 1735.*

So little light did the Bible afford regarding the atrocity of the proceedings against witches, that the Secession Church of Scotland, comprising many intelligent clergymen and a large number of the most serious and religious of the people, complained, in their annual Confession of personal and national sins (printed in an act of their Associate Presbytery at Edinburgh in 1743), of "the penal statutes against witches having been repealed by Parliament, *contrary to the express law of God*." This defection is classed by Dr John Brown of Haddington, one of the great leaders of the Secession Church about the middle and end of last century, among "the practical backslidings from the once attained to and covenanted work of reformation, which have happened in the preceding and present age, as abuses of the singular favours of God."

During the whole of these proceedings, the Scriptures were in the hands of the clergy, both Catholic and Protestant, as fully and freely as they are at the present day; and nearly a century before their cessation, the Reformation had been completed, and the *people*, in Scotland in particular, had been put in possession of the Bible, and taught to read it with intelligence. Not only so, but the Bible itself was perversely used by both the clergy and laity as the warrant of their atrocities, and religion itself was employed to fan the flame of cruelty and superstition. If any facts can prove that the Creator intended man to use his intellectual faculties, and to study the revelation of His will contained in the works of nature, in addition to the Bible, as a guide to his conduct,—and that the Bible is not calculated to supersede the necessity of all other knowledge, —those now detailed must have this effect. The great difference between Christians of the present day, who regard these executions as great crimes, and the pious ministers who inflicted and the serious people who witnessed them, consists in the superior knowledge possessed by the moderns, of physical science, which has opened up to their understandings views of nature and of God, widely different from those entertained by their ancestors under the guidance of the Bible alone.

Nothing can afford more striking evidence of the necessity of using all the lights in our power, by which to ascertain the true meaning of Scripture and the soundness of our interpretations of it, than the wide diversity of the opinions which even the most learned and pious divines have based upon the Bible. Another fact of some importance in relation to this subject is, that the manuscripts which have handed down the sacred writings to us from ancient times, vary in many important passages, sometimes through the ignorance and carelessness of transcribers, and sometimes in consequence of wilful corruption and interpolations by contending sects. The following passages, extracted from a celebrated treatise by one of the greatest ornaments of the Church of England, Bishop Taylor, are instructive on this subject. "There are," says he, "so many thousands of copies, that were written by persons of several interests and persuasions,—such different understandings and tempers,—such distinct abilities and weaknesses,—that it is no wonder there is so great a variety of readings both in the Old Testament and in the New. In the Old Testament, the Jews pretend that the Christians have corrupted many places, on purpose to make symphony between both the Testaments. On the other side, the Christians have had so much reason to suspect the Jews, that when Aquila had translated the Bible in their schools, and had been taught by them, they rejected the edition, many of them, and some of them called it heresy to follow it. And Justin Martyr justified it to Tryphon, that the Jews had defalked many sayings from the books of the old prophets....I shall not need to urge, that there are some words so near in sound that the scribes might easily mistake.... The instances of this kind are too many, as appears in the variety of readings in several copies, proceeding from the negligence or ignorance of the transcribers, or the malicious endeavour of heretics, or the inserting marginal notes into the text, or the nearness of several words....But so it is that this variety of reading is not of slight consideration; for although it be demonstrably true, that all things necessary to faith and good manners are preserved from alteration and corruption, because they are of things necessary, and they could not be necessary unless they were delivered to us,—God, in his goodness and his justice, having obliged himself to preserve that which he hath bound us to observe and keep; yet, in other things which God hath not obliged himself so punctually to preserve, in these things, since variety of reading is crept in, every reading takes away a degree of certainty from any proposition derivative from those places so read: and if some copies, especially if they be public and notable, omit a verse or a tittle, every argument from such a tittle or verse loses much of its strength and reputation."—Discourse of the Liberty of Prophesying, sect. iii. § 4.

As to consulting the Scriptures in the original tongues, this, says the Bishop, "is to small purpose: for indeed it will expound the Hebrew and the Greek, and rectify translations; but I know no man that says that the Scriptures in Hebrew and Greek are easy and certain to be understood, and that they are hard in Latin and English: the difficulty is in the thing, however it be expressed—the least is in the language. If the original languages were our mother-tongue, Scripture is not much the easier to us; and a natural Greek or a Jew can with no more reason or authority obtrude his interpretations upon other men's consciences, than a man of another nation. Add to this, that the inspection of the original is no more certain way of interpretation of Scripture now, than it was to the fathers and primitive age of the Church; and yet he that observes what infinite variety of translations were in the first ages of the Church (as St Jerome observes), and never a one like another, will think that we shall differ as much in our interpretations as they did, and that the medium is as uncertain to us as it was to them; and so it is: witness the great number of late translations, and the infinite number of commentaries, which are too pregnant an argument that we neither agree in the understanding of the words nor of the sense." "Men," he adds most justly, "do not learn their doctrines from Scripture, but come to the understanding of Scripture with preconceptions and ideas of doctrines of their own; and then no wonder that scriptures look like pictures, wherein every man in the room believes they look on him only, and *that* wheresoever he stands or how often soever he changes his station."—Sect. iv. § 5, 6.

The error of setting up any isolated passage of Scripture against truths brought to light by experiment and observation, is rendered still more obvious by what Bishop Taylor says respecting the extreme difficulty of discovering the real meaning of many parts of the Bible, even where there are sufficient grounds for believing the text to be genuine. "Since there are in Scripture," he observes, "many other mysteries, and matters of question, upon which there is a veil; since there are so many copies with infinite varieties of reading; since a various interpunction, a parenthesis, a letter, an accent, may much alter the sense; since some places have divers literal senses, many have spiritual, mystical, and allegorical meanings; since there are so many tropes, metonymies, ironies, hyperboles, proprieties and improprieties of language, whose understanding depends upon such circumstances that it is almost impossible to know the proper interpretation, now that the knowledge of

* These particulars respecting persecutions for witchcraft are given on the authority of a learned and elaborate article, understood to be from the pen of Professor Moir of Edinburgh, in the 11th Number of the Foreign Quarterly Review.

such circumstances and particular stories is irrevocably lost: since there are some mysteries which, at the best advantage of expression, are not easy to be apprehended; and whose explication, by reason of our imperfections, must needs be dark, sometimes weak, sometimes unintelligible: and, lastly, since those ordinary means of expounding Scripture, as searching the originals, conference of places, parity of reason, and analogy of faith, are all dubious, uncertain, and very fallible; he that is wisest, and, by consequence, the likeliest to expound truest in all probability of reason, will be very far from confidence; because every one of these, and many more, are like so many degrees of improbability and uncertainty, all depressing our certainty of finding out truth in such mysteries, and amidst so many difficulties. And therefore a wise man, that considers this, would not willingly be prescribed to by others; and therefore, if he also be a just man, he will not impose upon others; for it is best every man should be left in that liberty from which no man can justly take him, unless he could secure him from error."—Sect. iv. § 8.

On this subject the reader is referred also to an able "Essay on the Plenary and Verbal Inspiration of the Holy Scriptures, by Donald Fraser, D.D., Minister of the Gospel, Kennoway, Fifeshire."* The following passage illustrates the propriety of acting upon Bishop Taylor's suggestions:—"Be it observed, that when the New Testament writers, in quoting from the Old, affirm that the Scripture was *fulfilled*, they do not always mean than an ancient prediction was literally accomplished. In some instances they apply this term to the verification of a type; as when John, after relating the circumstance of the soldiers not breaking the legs of Jesus, adds a quotation respecting the paschal lamb: 'These things were done that the Scripture should be fulfilled, A bone of him shall not be broken.' (Chap. xix. 36, compared with Exod. xii. 36.) In other places they only accommodate the citation to the subject of their narrative. Thus, Matthew, after relating Herod's cruel murder of the babes in Bethlehem and its vicinity, immediately adds: 'Then was fulfilled that which was spoken by Jeremy the prophet, saying, In Rama was there a voice heard, lamentation, and weeping, and great mourning, Rachel weeping for her children, and would not be comforted, because they are not.' (Matth. ii. 17, 18, compared with Jer. xxxi. 15.) That is to say, the great lamentation and inconsolable grief amongst the mothers of Bethlehem, occasioned by Herod's embruing his hands in the blood of their unoffending children, may be happily illustrated by the prophet's description of the sorrows attending the Babylonish captivity; where, by a beautiful figure, he represents Rachel as bitterly deploring the loss of her offspring.

"An important critical observation of the late Dr Campbell's must not be here omitted. He justly observes, that, in many passages of the New Testament, it would have been proper to render the original term πληρόω by the English word *verify*, in preference to *fulfil*; for this last word 'has a much more limited signification, and gives a handle to cavillers where the original gives none. It makes the sacred penmen appear to call those things predictions which plainly were not, and which they never meant to denominate predictions.' *Verify* is, accordingly, the term which that distinguished interpreter usually prefers in his own Translation of the Four Gospels."—Chap. iii. § 7.

In the remarks offered in the present chapter I do not depreciate the importance of the Bible; I only very humbly endeavour to vindicate the study of the Creator's will in his works as well as in his word,—to shew that the human mind needs illumination from both to direct our conduct towards virtue,—and to prove that, without knowledge of the former, we may grievously misunderstand the meaning of the latter. In the words of Archbishop Whately, I consider that "we are bound to use our own natural faculties in the search after all that is within the reach of these faculties: and that most especially ought we to try, by their own proper evidence, questions which form no part of revelation properly so called, but which are incidentally alluded to in the Sacred Writings." "If it be true that man's duty coincides with his real interest, both in this world and in the next, the better he is qualified, by intellectual culture and diffusion of knowledge, to understand his duty and his interests, the greater prospect there would seem to be (other points being equal) of his moral improvement."

An objection has been stated against the doctrine of the divine government of the world by established laws, that it is inconsistent with belief in the efficacy of prayer. This objection has been often urged and answered; indeed it has been deliberately settled by the Church of Scotland itself, in harmony with the views advocated in this treatise. In a Sermon on Prayer, by the Rev. William Leechman, D.D., Principal, and Professor of Divinity, in the College of Glasgow, the following passage occurs:—"It is objected," says he, "That, since God is infinite in goodness, he is always disposed to bestow on his creatures whatever is proper for them; and, since he is infinite in wisdom, he will always choose the fittest time, and best manner of bestowing it. To what purpose, then, do we entreat him to do what he certainly will do without any solicitation or importunity? To this it may be answered, That, as it is not the design of prayer to give information to our Creator of things he was not acquainted with before; so neither is it the design of it to move his affections, as good speakers move the hearts of their hearers, by the pathetic arts of oratory; nor to raise his pity, as beggars, by their importunities and tears, work upon the compassion of the bystanders. God is not subject to those sudden passions and emotions of mind which we feel; nor to any change of his measures and conduct by their influence: he is not wrought upon and changed by our prayers; for *with him there is no variableness nor shadow of turning*. Prayer only works its effect upon *us*, as it contributes to change the temper of *our* minds, to beget or improve right dispositions in them, to lay them open to the impressions of spiritual objects, and thus qualify us for receiving the favour and approbation of our Maker, and all those assistances which he has promised to those who call upon him in sincerity and in truth. The efficacy of prayer does not lie in the mere asking; but in its being the means of producing that frame of mind which qualifies us to receive."*

Dr Leechman was prosecuted for the alleged heresy of these doctrines before the Presbytery of Glasgow, in February 1744. The opinion of the Presbytery was unfavourable; but the question was appealed to the Synod, which "found no reason to charge the said Professor with any unsoundness in the faith, expressed in the passages of the sermon complained of." The case was afterwards carried by appeal to the General Assembly. "That Court," says Dr Wodrow, in his Life of Dr Leechman, prefixed to the Sermons, "when the cause came before them, wisely referred it to a select committee, and adopted their judgment without a vote. They found, 'That the Synod of Glasgow and Ayr had sufficient reason to take into their own hands the cognizance of the inquiry touching the sermon.' They confirmed the judgment passed by that Synod, and 'prohibited the Presbytery of Glasgow to commence or carry on any further or other proceedings against the Professor, on account of that sermon.'"

Since this decision, the views delivered by Professor Leechman have been unhesitatingly taught by Scotch divines. Dr Blair, in his sermon "On the Unchange-

* Affleck, Edinburgh, and Rutherglen and Co. Glasgow, 1834.

* Dr Leechman's Sermons, Lond. 1789, Serm. iii. p. 192.

ableness of the Divine Nature," observes: "It will be proper to begin this head of discourse by removing an objection which the doctrine I have illustrated may appear to form against religious services, and, in particular, against the duty of prayer. To what purpose, it may be urged, is homage addressed to a Being whose purpose is unalterably fixed; to whom *our righteousness extendeth not;* whom by no arguments we can persuade, and by no supplications we can mollify? The objection would have weight, if our religious addresses were designed to work any alteration on God; either by giving him information of what he did not know, or by exciting affections which he did not possess; or by inducing him to change measures which he had previously formed. But they are only crude and imperfect notions of religion which can suggest such ideas. The change which our devotions are intended to make, is upon ourselves, not upon the Almighty. Their chief efficacy is derived from the good dispositions which they raise and cherish in the human soul. By pouring out pious sentiments and desires before God, by adoring his perfection and confessing our own unworthiness, by expressing our dependence on his aid, our gratitude for his past favours, our submission to his present will, our trust in his future mercy, we cultivate such affections as suit our place and station in the universe, and are thereby prepared for becoming objects of the divine grace."—Vol. ii.

The same views were taught by the philosophers of the last century. "The Being that made the world," says Lord Kames, "governs it by laws that are inflexible, because they are the best; and to imagine that he can be moved by prayers, oblations, or sacrifices, to vary his plan of government, is an impious thought, degrading the Deity to a level with ourselves." His Lordship's opinion relative to the advantage of public worship, shews that he did not conceive the foregoing view of prayer to be in the least inconsistent with its reasonableness and utility. "The principle of devotion," he says, "like most of our other principles, partakes of the imperfection of our nature; yet, however faint originally, it is capable of being greatly invigorated by cultivation and exercise. Private exercise is not sufficient. Nature, and consequently the God of nature, require public exercise or public worship; for devotion is communicative, like joy or grief; and, by mutual communication in a numerous assembly, is greatly invigorated. A regular habit of expressing publicly our gratitude and resignation never fails to purify the mind, tending to wean it from every unlawful pursuit. This is the true motive of public worship; not what is commonly inculcated—that it is required from us as a testimony to our Maker of our obedience to his laws; God, who knows the heart, needs no such testimony."*

These views are also very ancient. St Augustine, in his 130th Epistle "To Proba,"† says, "It may surprise us, until we understand, that our Lord and God does not wish our will to be made clear to Him, which he cannot but know, but that, our desire being exercised in prayers, we may be able to receive what he prepares to give." * * * "We ask God in words, at certain intervals of hours and times, that by these outward signs *we may admonish ourselves*, and may see ourselves, what progress we have made in this desire, and *may stimulate ourselves* the more to heighten it."

In closing this chapter, I may observe, that many excellent and sincere Christians, to whom I am most anxious to avoid giving offence, labour under great disadvantages in judging of the truth and importance of several of the views stated in this Work, in consequence of their ignorance of the functions of the brain, and the laws of its activity. Many of them have been educated in the belief, that human nature is entirely corrupt and wicked; and when, in consequence of private or public devotion, they become conscious of vivid love to God and benevolence to men, and of aspirations after general purity and excellence, springing up in their minds, they ascribe these emotions exclusively to the direct influence of the Divine Spirit,—without being in the least aware of the extent to which a large development of the moral organs, combined with an active temperament, contributes to this effect. The organs are the means by which these emotions are experienced, and the emotions themselves vary in power and intensity according to the size and condition of the organs. Deficiency in size is accompanied by feebleness, deficiency in activity by dulness, while excess in size and activity often leads to fanaticism and a persuasion of inspiration, such as occurred in Bunyan, Swedenborg, and the late Edward Irving. I examined the head of the Rev. Edward Irving before he had become known to the public, and noted the organs of Imitation, Wonder, Ideality, Veneration, Self-Esteem, Conscientiousness, and Firmness as large: Wonder, Self-Esteem, and Firmness predominated; and these appear to have attained almost to diseased activity in the latter years of his life. Diseased activity produces belief in actual communication with heaven. Christianity cannot fail to be benefited by the light which Phrenology is shedding on the organs in a state of health as well as of disease.*

* Sketches, B. iii. Sk. 3. Ch. iii. § 1.

† Quoted in "The Church of the Fathers," 1840, p. 260

CONCLUSION.

What is the practical use of Phrenology, even supposing it to be true?—Its utility pointed out in reference to politics, legislation, education, morals and religion, and the professions, pursuits, hours of exertion, and amusements of individuals—The precepts of Christianity impracticable in the present state of society—Improvement anticipated from the diffusion of the true philosophy of mind—The change, however, will be gradual—What ought education to embrace?—and what religious instruction?

The question has frequently been asked, What is the practical use of Phrenology, even supposing it to be true? A few observations will suffice to answer this inquiry, and, at the same time, to present a brief summary of the doctrine of the preceding work.

Prior to the age of Copernicus, the earth and sun presented to the eye phenomena exactly similar to those which they now exhibit; but their motions appeared in a very different light to the understanding.

Before the age of Newton, the revolutions of the planets were known as matter of fact; but mankind was ignorant of the principle of their motions.

Previously to the dawn of modern chemistry, many of the qualities of physical substances were ascertained by observation: but their ultimate principles and relations were not understood.

Knowledge, as I observed in the Introduction, may be made beneficial in two ways—either by rendering the substance discovered directly subservient to human enjoyment; or, where this is impossible, by modifying human conduct in harmony with its qualities. While knowledge of any department of nature remains imperfect and empirical, the unknown qualities of the objects comprehended in it, may render our efforts either to apply, or to act in accordance with those which are known, altogether abortive. Hence it is only after ultimate principles have been discovered, their relations ascertained, and this knowledge systematised, that science can attain its full character of utility. The

* See on this subject Dr Andrew Combe's Observations on Mental Derangement, pp. 184-189; System of Phrenology, section on Wonder; Remarks on Demonology and Witchcraft, in the Phren. Jour. vi. 504; and, in the 44th and 45th Numbers of the same Journal, "Observations on Religious Fanaticism, illustrated by a Comparison of the Belief and Conduct of noted Religious Enthusiasts with those of Patients in the Montrose Lunatic Asylum. By W. A. F. Browne, Esq. Medical Superintendent of that Institution."

merits of Copernicus and Newton consist in having rendered this service to astronomy.

Before the appearance of Drs Gall and Spurzheim, mankind were practically acquainted with the feelings and intellectual operations of their own minds, and anatomists knew the appearances of the brain. But the science of mind was very much in the same state as that of the heavenly bodies prior to the times of Copernicus and Newton.

First, No unanimity prevailed among philosophers concerning the elementary feelings and intellectual powers of man. Individuals deficient in Conscientiousness, for instance, denied that the sentiment of justice was a primitive mental quality: others, deficient in Veneration, asserted that man was not naturally prone to worship, and ascribed religion to the invention of priests.

Secondly, The extent to which the primitive faculties differ in strength, in different individuals, was matter of dispute, or of vague conjecture; and, concerning many attainments, there was no agreement among philosophers whether they were the gifts of nature or the results of mere cultivation.

Thirdly, Different modes or states of the same feeling were often mistaken for different feelings; and modes of action of all the intellectual faculties were mistaken for distinct faculties.

Fourthly, The brain, confessedly the most important organ of the body, and that with which the nerves of the senses, of motion, and of feeling communicate, had no ascertained functions. Mankind were ignorant of its uses, and of its influence on the mental faculties. They indeed still dispute that its different parts are the organs of different mental powers, and that the vigour of each faculty bears a proportion, *cæteris paribus*, to the size of its organ.

If, in physics, imperfect and empirical knowledge renders the unknown qualities of bodies liable to frustrate the efforts of man to apply or to accommodate his conduct to their known qualities,—and if only a complete and systematic exhibition of ultimate principles, and their relations, can confer on science its full character of utility,—the same doctrine applies with equal or greater force to the philosophy of mind.

The science of POLITICS embraces forms of government, and the relations between different states. All government is designed to combine the efforts of individuals, and to regulate their conduct when united. To arrive at the best means of accomplishing this end, systematic knowledge of the nature of man seems highly important. A despotism, for example, may restrain some abuses of the propensities, but it assuredly impedes the exercise of reflection, and others of the highest and noblest powers. A form of government can be suited to the nature of man only when it is calculated to permit the legitimate use, and to restrain the abuses, of all his mental feelings and capacities: and how can such a government be devised, while these faculties, with their spheres of action and external relations, are imperfectly known? Again, all relations between different states must also be in accordance with the nature of man, to prove permanently beneficial; and the question recurs, How are these to be framed while that nature is a matter of conjecture? Napoleon disbelieved in a sentiment of justice as an innate quality of the mind, and, in his relations with other states, relied on fear and interest as the grand motives of conduct: but that sentiment existed, and, combined with other faculties which he outraged, prompted Europe to hurl him from his throne. If Napoleon had comprehended the principles of human nature, and their relations, as forcibly and clearly as the principles of mathematics, in which he excelled, his understanding would have greatly modified his conduct, and Europe would have escaped prodigious calamities.

LEGISLATION, civil and criminal, is intended to regulate and direct the human faculties in their efforts at gratification; and laws, to be useful, must accord with the constitution of these faculties. But how can salutary laws be enacted, while the subject to be governed, or human nature, is not accurately understood? The inconsistency and intricacy of the laws, even in enlightened nations, have afforded themes for the satirist in every age;—yet how could the case be otherwise? Legislators provided rules for directing the qualities of human nature, which they conceived themselves to know; but either error in their conceptions, or the effects of other qualities unknown or unattended to, defeated their intentions. The law, for example, punishing heresy with burning, was addressed by our ancestors to Cautiousness and the Love of Life; but, Intellect, Veneration, Conscientiousness, and Firmness, were omitted in their estimate of human principles of action;—and these set the law at defiance. There are many laws still in the statute-book, equally at variance with the nature of man.

EDUCATION is intended to enlighten the intellect, to train it and the moral sentiments to vigour, and to repress the too great activity of the selfish feelings. But how can this be successfully accomplished, when the faculties and sentiments themselves, the laws to which they are subjected, and their relations to external objects, are unascertained? Accordingly, the theories and practices observed in education are innumerable and contradictory; which could not happen if men knew the constitution of the object which they were training.

In an "Essai sur la Statistique morale de la France," by Mons. A. M. Guerry, published at Paris in 1833, it is stated that crimes against property and person are most numerous in proportion to the population in those departments of France—the north and east—in which the people are the best educated, the richest, and the most industrious. This must be owing in part to the increased power which education confers of doing either good or evil, and partly to defects in the education afforded.* The philosophy of man being unknown, chil-

* It is proper to remark, however, that M. Guerry's statement, supposing it to be grounded on sufficient data, does not shew that education tends to increase rather than diminish crime; for, as a writer in the Phrenological Journal observes, "until it be proved that education has the same kind of subjects to operate on in every part of France, its effects cannot be judged of from such data as those furnished by M. Guerry." After stating reasons for concluding that the generality of heads are better in some parts of France than in others, the writer adds: "Now, this important fact ought not to be overlooked, as it has hitherto been, in judging of the influence of education; for it can hardly be doubted, that educated but inferior minds will display less morality than minds which are uneducated but naturally much superior. What should we say of a man who should call in question the efficacy of medical treatment, because a patient tainted from birth with consumption, and who had been long under the care of a physician, was not so healthy as a person with naturally sound lungs, who had never taken medical advice in his life? But for the treatment, the consumptive man would have been much worse than he actually was, and probably would have died in early youth. To judge correctly, therefore, of the question at issue, we must compare the present amount of crime in particular departments of France, with its amount *in the same departments* when there was either very little instruction or none at all. In this manner we shall also avoid being misled by the effects of other influences; such as the density or thinness of the population,—the employment of the people in agriculture or manufactures, and their residence on the coast, in the interior, or in mountainous or fertile districts. Were such a trial made, I think it would almost without exception be found, in cases where no great change of circumstances had occurred, that in exact proportion to the increase of education there had been an obvious diminution of crime. I am well aware that, by the system of instruction generally pursued, the moral feelings, which restrain from crime, are wholly neglected: but cultivation even of the intellect appears favourable to morality; *first*, by giving periods of repose to the lower pro-

dren are not taught any rational views of the plan of life; they are not instructed in the constitution of society, and obtain no sufficient information concerning the sources of real enjoyment. They are not taught any system of morals based on the nature of man and his social relations, but are left each to grope his way to happiness according to the dictates of his individual mind. They see the rich pursuing pleasure and fashion; and, if they follow such examples, they must resort to crime for the means of gratification: yet there is no solid instruction given to them, sufficient to satisfy their understandings that the rich themselves are straying from the paths that lead to solid and lasting happiness, and that it is to be found only in other and higher occupations.

MORALS and RELIGION, also, cannot assume a systematic and thoroughly demonstrable character, until the elementary faculties of the mind, and their relations, shall be ascertained.

It is presumable that the Deity, in creating the moral powers and the external world, really adapted the one to the other; and that individuals and nations, in pursuing morality, must, in every instance, be promoting their best interests, while, in departing from it, they must be sacrificing them to passion or to illusory notions of advantage. But, until the nature of man, and the relationship between it and the external world, shall be scientifically ascertained, and systematically expounded, it will be impossible to support morality by the powerful demonstration that interest coincides with it. The tendency in most men to view expediency as not always coincident with justice, affords a striking proof of the limited knowledge of the constitution of man and the external world still existing in society.

The diversities of doctrine in religion, too, obviously owe their origin to ignorance of the primitive faculties and their relations. The relative strength of the faculties differs in different individuals, and each person is most alive to objects and views connected with the powers predominant in himself. Hence, in reading the Scriptures, one is convinced that they establish Calvinism; another, possessing a different combination of faculties, discovers in them Lutheranism; and a third is satisfied that Unitarianism is the only true interpretation. These individuals have, in general, no distinct conception that the views which strike them most forcibly, appear in a different light to minds differently constituted. A correct interpretation of Scripture must harmonize with all the faculties acting harmoniously, or in cases of conflict, with the dictates of the moral sentiments and well-informed intellect, holding the animal propensities in subordination. It may legitimately go beyond what they, unaided, could reach; but it cannot contradict them: because this would be setting the Bible in opposition to the legitimate dictates of faculties constituted by the Creator. Mankind, however, will never reach general agreement in their interpretations, while each individual takes his own mind as a standard of human nature in general, and conceives that his own impressions are identical with absolute truth. The establishment of the philosophy of man, therefore, on a scientific basis, and in a systematic form, must aid the cause both of morality and religion.

The PROFESSIONS, PURSUITS, HOURS OF EXERTION, and AMUSEMENTS of individuals, ought also to bear reference to their physical and mental constitution; but hitherto no guiding principle has been possessed, to regulate practice in these important particulars—another evidence that the science of man has been unknown.

In consequence of the want of a philosophy of man, there is little harmony between the different departments of human pursuit. God is one; and as He is intelligent, benevolent, and powerful, we may reasonably conclude that creation is one harmonious system, in which the physical is adapted to the moral, the moral to the physical, and every department of these grand divisions to the whole. But at present, many principles clearly revealed by philosophy are impracticable because the institutions of society have not been founded with a due regard to their existence. An educated lady, for example, or a member of one of the learned professions, may perceive with the clearest conviction that God, by the manner in which he has constituted the body, and connected the mind with the brain, has positively enjoined muscular exertion, as indispensable to the possession of sound health, the enjoyment of life, and the rearing of a healthy offspring; and, nevertheless, they may find themselves so hedged round by routine of employment, the fashions of society, the influence of opinion, and the positive absence of all arrangements suited to the purpose, that they may be rendered nearly as incapable of yielding this obedience to God's law as if they were imprisoned in a dungeon.

By religion we are commanded to set our affections on things above, and not to permit our minds to be engrossed with the cares of this world; we are desired to seek godliness, and eschew selfishness, contention, and the vanities of life. These precepts must have been intended to be practically followed, otherwise it was a mockery of mankind to give them forth: But if they were intended to be practised, God must have arranged the inherent constitution of man, and that of the world, in such a manner as to admit of their being obeyed,—and not only so, but to render men happy in proportion as they should practise, and miserable as they should neglect them. Nevertheless, when we survey human society in the forms in which it has hitherto existed, and in which it now exists, these precepts appear to have been, and to be now, absolutely impracticable to ninety-nine out of every hundred of civilized men. Suppose the most eloquent and irresistibly convincing discourse on the Christian duties to be delivered on Sunday to a congregation of Manchester manufacturers and their operatives, or to London merchants, Essex farmers, or Westminster lawyers, how would they find their respective spheres of life adapted for acting practically on their convictions? They are all commanded to love God with their whole heart and soul, and to resist the world and the flesh, or, in philosophical language, to support their moral affections and intellectual powers in habitual activity—to direct them to noble, elevating, and beneficial objects—and to resist the subjugation of these higher attributes of their minds to animal pleasure, sordid selfishness, and worldly ambition. The moral and intellectual powers assent to the reasonableness of these precepts, and rejoice in the prospect of their practical application; but, on Monday morning, the manufacturers, owing to the institutions of society, and the department of life into which they have been cast before they had either reason or moral perception to direct their choice, must commence a course of ceaseless toil,—the workmen that they may support life, and the masters that they may avoid ruin, or accumulate wealth. Saturday evening finds them worn out with mental and bodily exertion, continued through all the intermediate days, and directed to pursuits connected with this world alone. Sunday dawns upon them in a state of mind widely at variance with the Christian condition. In like manner, the merchant must devote himself to his bargains, the farmer to his plough, and the lawyer to his briefs, with corresponding assiduity; so that their moral powers

pensities, of whose excessive activity crime is the result; *secondly*, by promoting the formation of habits of regularity, subordination, and obedience; and, *thirdly*, by strengthening and informing the intellect, and thereby enabling it to see more clearly the dangerous consequences of crime. No doubt there are criminals on whom an excellent intellectual education has been bestowed; but instead of thence inferring that education increases the liability of mankind to crime, I think it may with great reason be asked, whether, had the same individuals wanted education altogether, their crimes would not have been ten times more atrocious."—*Phren. Jour.* vol. ix. p. 268.

have neither objects presented to them, nor vigour left for enjoyments befitting their nature and desires. It is in vain to say to individuals that they err in acting thus: individuals are carried along in the great stream of social institutions and pursuits. The operative labourer is compelled to follow his routine of toil under pain of absolute starvation. The master-manufacturer, the merchant, the farmer, and the lawyer, are pursued by competitors so active, that if they relax in selfish ardour, they will be speedily plunged into ruin. If God has so constituted the human mind and body, and so arranged external nature, that all this is unavoidably necessary for man, then the Christian precepts are scarcely more suited to human nature and circumstances in this world, than the command to fly would be to the nature of the horse. If, on the other hand, man's nature and circumstances do in themselves admit of the Christian precepts being realized, it is obvious that a great revolution must take place in our notions, principles of action, practices, and social institutions, before this can be accomplished. That many Christian teachers believe this improvement possible, and desire its execution, I cannot doubt; but through want of knowledge of the constituent elements of human nature, and their relations—through want, in short, of a philosophy of mind and of physical nature—they have never been able to perceive what God has rendered man capable of attaining,—how it may be attained,—or on what principles the moral and physical government of the world in regard to man is conducted. Consequently, they have not acted generally on the idea of religion being a branch of an all-comprehending philosophy; they have relied chiefly on inculcating the precepts of their Master, threatening future punishments for disobedience, and promising future rewards for observance,—without proving philosophically to society, not only that its institutions, practices, and principles, must be erected on loftier ground than they are at present before it can become truly Christian,—but that these improvements are actually within the compass of human nature, aided by science and Scripture. Individuals in whom there is a strong aspiration after the realization of the Christian state of society, but whose intellects cannot perceive any natural means by which it can be produced, take refuge in the regions of prophecy, and expect a miraculous reign of saints in the Millennium. How much more profitable would it be to study the philosophy of man's nature, which is obviously the work of God, and endeavour to introduce morality and happiness by the means appointed by Him in creation! Supernatural agency has long since ceased to interfere with human affairs; and whenever it shall operate again, we may presume that it will be neither assisted nor retarded by human opinions and speculations.

We need only attend to the scenes daily presenting themselves in society, to obtain an irresistible conviction that many evil consequences result from the want of a true theory of human nature, and its relations. Every preceptor in schools—every professor in colleges—every author, editor, and pamphleteer—every member of Parliament, councillor, and judge—has a set of notions of his own, which, in his mind, holds the place of a system of the philosophy of man; and although he may not have methodised his ideas, or even acknowledged them to himself as a theory, yet they constitute a standard to him by which he practically judges of all questions in morals, politics, and religion: he advocates whatever views coincide with them, and condemns all that differ from them, with as unhesitating a dogmatism as the most pertinacious theorist on earth. Each also despises the notions of his fellows, in so far as they differ from his own. In short, the human faculties too generally operate simply as impulses, exhibiting all the confliction and uncertainty of mere feeling, unenlightened by perception of their own nature and objects. Hence public measures in general, whether relating to education, religion, trade, manufactures, the poor, criminal law, or any other subject linked with the dearest interests of society, instead of being treated as branches of one general system of economy, and adjusted on scientific principles each in harmony with all the rest, are supported or opposed on narrow and empirical grounds, and often call forth displays of ignorance, prejudice, selfishness, intolerance, and bigotry, that greatly obstruct the progress of improvement. Indeed, any important approach to unanimity, even among sensible and virtuous men, will be impossible, so long as no standard of mental philosophy is admitted to guide individual feelings and perceptions. But the state of things now described could not exist, if education embraced a true system of human nature and its relations.

If, then, the doctrine of the natural laws here expounded be true, it will, when matured, supply the deficiencies now pointed out.

But here another question naturally presents itself—How are the views explained in this work, supposing them to contain some portion of truth, to be rendered practical? Sound views of human nature and of the divine government come home to the feelings and understandings of men; they perceive them to possess a substantive existence and reality, which rivet attention and command respect. If the doctrine unfolded in the present treatise be in any degree true, it is destined to operate on the character of all public instruction,—especially that from the pulpit. Individuals whose minds have embraced the views which it contains, inform me that many sermons appear to them inconsistent in their different propositions, at variance with sound views of human nature, and so vague as to have little relation to practical life and conduct. They partake of the abstractedness of the scholastic philosophy. The first divine of comprehensive intellect and powerful moral feelings who shall take courage and introduce the natural laws into his discourses, and teach the people the works and institutions of the Creator, will reap a great reward in usefulness and pleasure. If this course shall, as heretofore, be neglected, the people, who are daily increasing in knowledge of philosophy and practical science, will in a few years look with disrespect on their clerical guides, and probably force them, by "pressure from without," to remodel the entire system of pulpit-instruction.

The institutions and manners of society indicate the state of mind of the influential classes at the time when they prevail. The trial and burning of old women as witches, point out clearly the predominance of Destructiveness and Wonder over Intellect and Benevolence, in those who were guilty of such cruel absurdities. The practices of wager of battle, and ordeal by fire and water, indicate great activity of Combativeness, Destructiveness, and Veneration, in those who permitted them, combined with lamentable ignorance of the natural constitution of the world. In like manner, the enormous sums willingly expended in war, and the small sums grudgingly paid for public improvements,—the intense energy displayed in the pursuit of wealth,—and the general apathy evinced in the search after knowledge and virtue,—unequivocally proclaim activity of Combativeness, Destructiveness, Acquisitiveness, Self-Esteem, and Love of Approbation, with comparatively moderate vivacity of Benevolence and Conscientiousness in the present generation. Before, therefore, the practices of mankind can be altered, the state of their minds must be changed. It is an error to impose institutions on a people greatly in advance of their mental condition. The rational method is, first to instruct the intellect, then to interest the sentiments, and, last of all, to form arrangements in harmony with these and resting on them as their basis.

The views developed in the preceding chapters, if founded in nature, may be expected to lead, ultimately, to considerable changes in many of the customs and

pursuits of society; but to accomplish this effect, the principles themselves must first be ascertained to be true; next they must be sedulously taught; and only thereafter will they be practically applied. It appears to me that a long series of years will probably elapse before even nations now regarded as civilized, will model their institutions and manners in harmony with the natural laws.

The first step should be to teach these laws to the young. Their minds, not being occupied by prejudice, will recognise them as congenial to their constitution; the first generation that shall embrace them from infancy will proceed to modify the institutions of society into accordance with their dictates; and in the course of ages they may at length be found to be practically useful. A perception of the importance of the natural laws will lead to their observance, and this will be attended with an improved development of brain, thereby increasing the desire and capacity for obedience. All true theories have ultimately been adopted and influenced practice; and I see no reason to fear that the present, if true, will prove an exception. The failure of all previous systems is the natural consequence of their having been unfounded; if this resemble them, it will deserve, and assuredly will meet, a similar fate.

The present work may be regarded as, in one sense, an introduction to an essay on education. If the views unfolded in it be in general sound, it will follow that education has scarcely yet commenced. If the Creator has bestowed on the body, on the mind, and on external nature, determinate constitutions, and has arranged them to act on each other, and to produce happiness or misery to man, according to certain definite principles, —and if this action goes on invariably, inflexibly, and irresistibly whether men attend to it or not,—it is obvious that the very basis of useful knowledge must consist in an acquaintance with these natural arrangements;—and that education will be valuable in the exact degree in which it communicates such information, and trains the faculties to act upon it. Reading, writing, and accounts, which make up the instruction enjoyed by the lower orders, are merely *means of acquiring knowledge*, but do not *constitute* it. Greek, Latin, and mathematics, which are added in the education of the middle and upper classes, are still only *means* of obtaining information: hence, with the exception of the few who pursue physical science, society dedicates very little attention to the study of the natural laws. In attempting to give effect to the views now discussed, I respectfully recommend that each individual, according as he becomes acquainted with the natural laws, should obey them, and communicate his experience of their operations to others; avoiding at the same time, the subversion, by violence, of established institutions, and all outrages on public sentiment by intemperate discussions. The doctrines before unfolded, if true, authorize us to predicate that the most successful method of ameliorating the condition of mankind will be that which appeals most directly to their moral sentiments and intellect; and I may add from experience and observation, that, in proportion as any individual becomes acquainted with the real constitution of the human mind, will his conviction of the efficacy of this method increase.

Finally, if it be true that the natural laws must be obeyed as a preliminary condition to happiness in this world, and if virtue and happiness be inseparably allied, the religious instructors of mankind may probably discover in the general and prevalent ignorance of these laws, one reason of the limited success which has hitherto attended their efforts to improve the condition of mankind; and they may perhaps perceive it to be not inconsistent with their sacred office, to instruct men in the natural institutions of the Creator, as well as in Scripture doctrines, and to recommend obedience to both. They exercise so vast an influence over the best members of society, that their countenance may hasten, or their opposition retard, by a century, the general adoption of the natural laws as sound guides to human conduct.

If the excessive toil of the manufacturer be inconsistent with that elevation of the moral and intellectual faculties of man which is commanded by religion, and if the moral and physical welfare of mankind be not at variance with each other (which they cannot be), the institutions of society out of which the necessity for that labour arises, must, philosophically speaking, be pernicious to the interests of the state as a political body, and to the temporal welfare of the individuals who compose it; and whenever we shall be in possession of a correct knowledge of the elements of human nature, and the principles on which God has constituted the world, the *philosophical evidence* that these practices are detrimental to *our temporal welfare*, will be as clear as that of their inconsistency with our religious duties. Until, however, divines shall become acquainted with this relation between philosophy and religion, they will not possess adequate means of rendering their precepts practical in this world; they will not carry the intellectual perceptions of their hearers fully along with them; they will be incapable of controlling the force of the animal propensities; and they will never lead society to the fulfilment of its highest destinies. At present, the animal propensities are fortified in the strong entrenchments of social institutions: Acquisitiveness, for example, is protected and fostered by our arrangements for accumulating wealth; a worldly spirit, by our constant struggle to obtain the means of subsistence; pride and vanity, by our artificial distinctions of rank and fashion; and Combativeness and Destructiveness by our warlike professions. The divine assails the vices and inordinate passions of mankind by the denunciations of the Gospel; but as long as society shall be animated by different principles, and maintain in vigour institutions whose spirit is diametrically opposite to its doctrines, so long will it be difficult for him to effect the realization of his precepts in practice. Yet it appears to me, that, by teaching mankind the philosophy of their own nature and of the world in which they live—by proving to them the coincidence between the dictates of this philosophy and Christian morality, and the inconsistency of their own practices with both—they may be induced to modify the latter, and to entrench the moral powers in social institutions; and then the triumph of virtue and religion will be more complete. Those who advocate the exclusive importance of spiritual religion for the improvement of mankind, appear to me to err in overlooking too much the necessity for complying with the natural conditions on which all improvement depends; and I anticipate, that when schools and colleges shall expound the various branches of philosophy as portions of the institutions of the Creator—when the pulpit shall deal with the same principles, shew their practical application to man's duties and enjoyments, and add the sanctions of religion to enforce the observance of the natural laws—and when the busy scenes of life shall be so arranged as to become a field for the practice at once of our philosophy and of our religion—then will man assume his station as a rational being, and Christianity achieve her triumph.

APPENDIX.

No. I.—Natural Laws.

Text, p. 8.

It is mentioned in the text that many philosophers have treated of the Laws of Nature. The following are examples :—

Montesquieu introduces his Spirit of Laws with the following observations :—"Laws in their most general signification, are the necessary relations derived from the nature of things. In this sense, all beings have their laws; the Deity has his laws; the material world its laws; the intelligences superior to man have their laws; the beasts their laws; man his laws.

"Those who assert that a blind fatality produced the various effects we behold in this world, are guilty of a very great absurdity; for can anything be more absurd than to pretend that a blind fatality could be productive of intelligent beings?

"There is, then, a primitive reason; and laws are the relations which subsist between it and different beings, and the relations of these beings among themselves.

"God is related to the universe as creator and preserver; *the laws by which he has created all things are those by which he preserves them. He acts according to these rules* because he knows them; he knows them because he has made them, and he made them because they are relative to his wisdom and power, &c.

"*Man, as a physical being, is, like other bodies, governed by invariable laws.*"—Spirit of Laws, b. i. c. i.

Justice Blackstone observes, that "Law, in its most general and comprehensive sense, signifies a rule of action; and *is applied indiscriminately to all kinds of action, whether animate or inanimate, rational or irrational.* Thus we say the laws of motion, of gravitation, of optics, or mechanics, as well as the laws of nature and of nations."—"Thus, when the supreme Being formed the universe and created matter out of nothing, he impressed certain *principles* upon that matter, from which it can never depart, and without which it would cease to be. When he put that matter into motion, he established *certain laws of motion*, to which all moveable bodies must conform."—"If we farther advance from mere inactive matter to *vegetable and animal life*, WE SHALL FIND THEM STILL GOVERNED BY LAWS: more numerous, indeed, but *equally fixed and invariable.* The whole progress of plants from the seed to the root, and from thence to the seed again—the method of animal nutrition, digestion, secretion, and all other branches of vital economy—are *not left to chance*, or the will of the creature itself, but are performed in a wondrous involuntary manner, and *guided by unerring rules laid down by the great Creator.* This, then, is the general signification of law, a rule of action dictated by some superior being; and, in those creatures that have neither power to think nor to will, such laws must be invariably obeyed, so long as the creature itself subsists; for its existence depends on that obedience."—*Blackstone's Commentaries on the Laws of England*, vol. i. sect. 2.

"The word *law*," says Mr Erskine, "is frequently made use of, both by *divines and philosophers*, in a large acceptation, to express *the settled method of God's providence*, by which he preserves the order of the MATERIAL WORLD *in such a manner, that nothing in it may deviate from that uniform course which he has appointed for it.* And as brute matter is merely passive, without the least degree of choice upon its part, *these laws are* INVIOLABLY OBSERVED *in the material creation, every part of which continues to act, immutably, according to the rules that were from the beginning prescribed to it by infinite wisdom.* Thus philosophers have given the appellation of *law* to that motion which incessantly pervades and agitates the universe, and is ever changing the form and substance of things; dissolving some, and raising others, as from their ashes, to fill up the void; yet so that, amidst all the fluctuations by which particular things are affected, the universe is still preserved without diminution. Thus also they speak of the *laws* of fluids, of gravitation, &c. and *the word is used in this sense in several passages of the Sacred Writings;* in the book of Job, and in Proverbs viii. 29, where God is said to have given *his law* to the seas that they should not pass his commandment."—*Erskine's Institutes of the Law of Scotland*, book i. tit. i. sect. 1.

Cowper, in his *Table Talk*, after stating that vice disposes the mind to submit to the usurped command of tyranny, exclaims—

> "A dire effect, by one of Nature's laws,
> Unchangeably connected with its cause."

Discussions about the Laws of Nature, rather than inquiries into them, were common in France at the time of the Revolution; and, having become associated in imagination with the crimes and horrors of that period, they continue to be regarded, by some individuals, as inconsistent with religion and morality. A coincidence between the views maintained in the preceding pages, and a passage in Volney, has been pointed out to me as an objection to the whole doctrine. Volney's words are the following :—"It is a law of nature, that water flows from an upper to a lower situation; that it seeks its level; that it is heavier than air; that all bodies tend towards the earth; that flame rises towards the sky; that it destroys the organization of vegetables and animals; that air is essential to the life of certain animals; that, in certain cases, water suffocates and kills them; that certain juices of plants and certain minerals, attack their organs, and destroy their life; and the same of a variety of facts.

"Now, since these facts, and many similar ones, are constant, regular, and immutable, they become so many real commands, to which man is bound to conform under the express penalty of punishment attached to their infraction, or well-being connected with their observance. So that if a man were to pretend to see clearly in the dark, or is regardless of the progress of the seasons, or the action of the elements; if he pretends to exist under water without drowning, to handle fire without burning himself, to deprive himself of air without suffocating, or to drink poison without destroying himself; he receives, for each infraction of the law of nature, a corporal punishment proportioned to his transgression. If, on the contrary, he observes these laws and founds his practice on the precise and regular relation which they bear to him, he preserves his existence, and renders it as happy as it is capable of being rendered: and since all these laws, considered in relation to the human species, have in view only one common end, that of their preservation and their happiness, it has been agreed to assemble together the different ideas, and express them by a single word, and call them collectively by the name of the *Law of Nature.*"—Volney's *Law of Nature*, 3*d edit.* p. 21–24.

I feel no embarrassment on account of this coinci-

dence; but remark, *first*, That various authors, quoted in the text and in this note, advocated the importance of the laws of nature, long before the French Revolution was heard of; *secondly*, That the existence of the laws of nature is as obvious to the understanding, as the existence of the external world, and of the human body itself, to the senses; *thirdly*, That these laws, being inherent in creation, must have proceeded from the Deity; *fourthly*, That if the Deity is powerful, just, and benevolent, they must harmonize with the constitution of man; and, *lastly*, That if the laws of nature have been instituted by the Deity, and been framed in wise, benevolent, and just relationship to the human constitution, they must at all times form the highest and most important subjects of human investigation, and remain altogether unaffected by the errors, follies, and crimes of those who have endeavoured to expound them: just as religion continues holy, venerable, and uncontaminated, notwithstanding the hypocrisy, wickedness, and inconsistency of individuals professing themselves her interpreters and friends.

That the views of the natural laws themselves, advocated in this work, are diametrically opposite to the practical conduct of the French revolutionary ruffians, requires no demonstration. My fundamental principle is, that man can enjoy happiness on earth only by preserving his habitual conduct under the direction of the moral sentiments and intellect, and that this is the *law of his nature*. No doctrine can be more opposed than this to fraud, robbery, blasphemy, and murder.

It may be urged, that all past speculations about the laws of nature have proved more imposing than useful; and that, while the laws themselves afford materials for elevated declamation, they form no secure guides even to the learned, and much less to the illiterate, in practical conduct. In answer, I would respectfully repeat what has frequently been urged in the text, that before we can discover the laws of nature applicable to man, we must know, *first*, the constitution of man himself; *secondly*, the constitution of external nature; and, *thirdly*, we must compare the two. But, until the discovery of Phrenology, the mental constitution of man was a matter of vague conjecture and endless debate; and the connexion between his mental powers and his organized system was involved in the deepest obscurity. The brain, the most important organ of the body, had no ascertained functions. Before the introduction of this science, therefore, men were rather impressed with the unspeakable importance of the knowledge of the laws of nature, than extensively acquainted with those laws themselves; and even the knowledge of the external world actually possessed, could not, in many instances, be rendered available, on account of its relationship to the qualities of man being unascertained, and unascertainable so long as these qualities themselves were unknown.

The adaptation of the constitution of man and animals to the circumstances in which they are placed, has been noticed by former writers.

Lord Kames observes, that "The wisdom of Providence is in no instance more conspicuous than in adjusting the constitution of man to his external circumstances."—(*Sketches*, b. i. sk. 7.); and again, "The hand of God is nowhere more visible than in the nice adjustment of our internal frame to our situation in this world."—B. iii. sk. 2. chap. i. sect. i.

Mr Stewart says: "To examine the economy of nature in the phenomena of the lower animals, and to compare their instincts with the physical circumstances of their external situation, forms one of the finest speculations of Natural History; and yet it is a speculation to which the attention of the natural historian has seldom been directed. Not only Buffon, but Ray and Derham, have passed it over slightly; nor, indeed, do I know of any one who has made it the object of a particular consideration but Lord Kames, in a short Appendix to one of his Sketches."—*Elements of the Philosophy of the Human Mind*, vol. iii. p. 368.

Mr Stewart also uses the following words:—"Numberless examples shew that Nature has done no more for man than was necessary for his preservation, leaving him to make many acquisitions for himself, which she has imparted immediately to the brutes.

"My own idea is, as I have said on a different occasion, that both *instinct* and *experience* are here concerned, and that the share which belongs to each in producing the result, can be ascertained by an appeal to facts alone."—Vol. iii. p. 338.

The following is extracted from the *Quarterly Review*, vol. xxxi. p. 51:—"Each must coincide in the desire of the Stoic to harmonize his conduct with the physical and moral order of the universe. When to the knowledge of each the Christian adds a deeper insight into the government of the Almighty, and learns that to act in concert with the system of the universe is to promote his own eternal as well as his temporal happiness, his inducements are still stronger to employ the powers of self-government with which he has been gifted, in conforming his feelings and actions to the plan of the great Architect."

No. II.—Muscular Labour.

Text, p. 13.

So little ought the necessity for bodily exertion to be regarded as a curse, that in reality (as Dr Thomas Brown has eloquently illustrated in his 66th lecture) there is no human desire more powerful and universal than *the desire of action*, and none the denial of whose gratification is productive of greater uneasiness.

"To be happy," says Dr B., "it is necessary that we be occupied; and, without our thinking of the happiness which results from it, nature has given us a constant desire of occupation. We must exert our limbs, or we must exert our thought; and when we exert neither, we feel that languor of which we did not think before, but which, when it is felt, convinces us how admirably our desire of action is adapted for the prevention of this very evil, of which we had not thought; as our appetites of hunger and thirst are given to us for the preservation of health, of which we think as little during the indulgence of our appetites, as we think, during our occupation, of the languor which would overwhelm us if wholly unoccupied. How wretched would be the boy if he were to be forced to lie even on the softest couch during a whole day, while he heard at intervals the gay voices of his playmates without, and could distinguish, by these very sounds, the particular pastimes in which they were engaged! How wretched, in these circumstances, is man himself; and what fretfulness do we perceive even on brows of more deliberate thought—on brows, too, perhaps, that, in other circumstances, are seldom overcast—if a few successive days of wet and boisterous weather have rendered all escape into the open air, and the exercises which this escape would afford, impossible!

"Without the knowledge of the pleasure that is thus felt in mere exertion, it would not be easy for us to look with satisfaction on the scene of human toil around us—which assumes instantly a different aspect when we consider this happy principle of our mental constitution. Though we are apt to think of those who are labouring for others, as if they were not labouring for themselves also—and though unquestionably, from our natural love of freedom, any task which is *imposed* cannot be as agreeable as an occupation spontaneously chosen—we yet must not think that the labour itself is necessarily an evil from which it would be happiness for man to be freed. Nature has not dealt so hardly with the *great multitude*; in comparison with whom the *smaller number*, for whose accommodation she seems to have formed

a more sumptuous provision, are truly insignificant..... How different would the busy scene of the world appear, if we could conceive that no pleasure attended the occupations to which so great a majority of our race would then seem to be *condemned*, almost like slaves that are fettered to the very instruments of their daily task! How different from that scene, in which, though we perceive many labouring and a few at rest, we perceive in the labourer a pleasure of occupation, which those who rest would often be happy to purchase from him, and which they *do* sometimes endeavour to purchase, by the same means by which he has acquired it; by exercises as violent and unremitted as his, and which have the distinction only of being of less advantage to the world than those toils by which *he* at once promotes his own happiness and contributes to the accommodation of others! It is pleasing thus to perceive a source of enjoyment in the very circumstance which might seem most hostile to happiness; to perceive in the labour itself, of which the necessity is imposed on man, a consolation for the loss of that very freedom which it constrains."—*Lectures on the Philosophy of the Human Mind*, vol. iii. p. 409-412.

No. III.—Progress of Phrenology.

Text, p. 29.

On its first introduction into Britain, in 1815, Phrenology was received by the press and the public with a unanimous shout of derision. The Edinburgh Review took the leading part in the work of abuse, boldly denouncing it as "trash," "despicable trumpery," "a collection of mere absurdities, without truth, connexion, or consistency," and "a piece of thorough quackery from beginning to end." To Phrenology, the following sentence, applied by Dr Chalmers to the philosophy of Sir Isaac Newton, is equally applicable:—"Authority scowled upon it, and taste was disgusted by it, and fashion was ashamed of it, and all the beauteous speculation of former days was cruelly broken up by this new announcement of the better philosophy, and scattered like the fragments of an aerial vision, over which the past generations of the world had been slumbering their profound and their pleasing reverie."—(*Astronom. Discourses*, ii. 55.) For a few years, the progress of Phrenology was completely stopped; but Dr Spurzheim having published a decisive reply to the reviewer, and in his lectures convinced many that the science had been most unfairly dealt with, the study was eagerly taken up in Edinburgh and other parts of Britain. The Phrenological Society, projected by the Rev. David Welsh, now Professor of Church History in the University of Edinburgh, was instituted in that city on the 22d of February 1820; and, in 1823, several of its members commenced the publication of a quarterly periodical, "The Phrenological Journal and Miscellany," which has now (July 1835) extended to forty-four numbers, or nearly nine octavo volumes. In 1824, the Society printed a volume of Transactions. The effect of these and other phrenological publications—and of the lectures of various phrenologists in different parts of the kingdom, particularly those of Dr Spurzheim himself—has been to diffuse the science far more rapidly than even its most sanguine advocates ventured fifteen years ago to anticipate. In France, a Phrenological Journal has for several years been published, under the superintendence of the Phrenological Society of Paris; and, in October 1833, there appeared at Boston, U. S., the first number of a periodical entitled "Annals of Phrenology," conducted by members of the Boston Phrenological Society, and a volume of which is now complete. In Britain, Phrenology has been from time to time attacked by various writers; but the effect has always been a decided acceleration of its progress—the defences of phrenologists having apparently been considered triumphant by the public.

The following is a list of places in which, so far as I am aware, Phrenological Societies have been formed:—

Scotland.—1820; Edinburgh.—1826; Glasgow, Dundee, Kilmarnock.—1828; Dunfermline.—1833; Greenock.—1834; Alyth, Stirling.

England.—1824; London, Wakefield, Exeter.—1827; Hull.—1829; Liverpool.—1830; Manchester.—1832: Portsmouth.—1834; Warwick.

Ireland.—1826: Belfast.—1829; Dublin.

France.—1831; Paris.

India.—1825; Calcutta.

United States.—1824; Philadelphia.—1826, Washington.—1832; Boston.—1834; Hingham, Nantucket, Brunswick, Andover, Amherst, Hanover, Reading, Leicester, Worcester, Providence, Hartford, Oneida.

Other Phrenological Societies, of which I have not heard, have probably been instituted elsewhere; and it is understood that some of those mentioned in the foregoing list are at present in a dormant condition.

Among the members of the medical profession, Phrenology has many talented defenders and admirers. Professor Elliotson of London declares that "Gall has the immortal honour of having discovered particular parts of the brain to be the seat of different faculties, sentiments, and propensities."—(*Transl. of Blumenbach's Physiology*, 4th edit. p. 204.) Mr Abernethy says, "I readily acknowledge my inability to offer any rational objections to Gall and Spurzheim's system of Phrenology, as affording a satisfactory explanation of the motives of human actions."—(*Reflections on Gall and Spurzheim's System, &c.* p. 48.)—Dr Barlow, Physician to the Bath United Hospital and Infirmary, alludes to Phrenology as a science in which he "has no hesitation to avow his firm belief; and which, justly estimated, has more power of contributing to the welfare and happiness of mankind, than any other with which we are acquainted."—(*Cyclop. of Pract. Med.*, art. Education, Physical.) Dr Conolly, lately one of the Medical Professors in the London University, and now President of the Phrenological Society of Warwick, says, "I can see nothing which merits the praise of being philosophical in the real or affected contempt professed by so many anatomists and physiologists," for the science of Phrenology.—(*On the Indications of Insanity*, p. 135.) Dr Mackintosh says, "Although I must confess that I have had neither time nor opportunity to examine the system of those distinguished anatomists and physiologists, Gall and Spurzheim, with that care and attention which the importance of the subject demands, and which might enable me to give a decided opinion respecting the truth of all its parts, yet experience and observation oblige me to state, that much of their doctrines appears to be true, and that science owes a great deal to the labours of the gentlemen who have been engaged in phrenological inquiry."—(*Principles of Pathology*, 3d edit. ii. 4.) "The science," says Mr Macnish, "is entirely one of observation; by that it must stand or fall, and by that alone ought it to be tested. The phrenological system appears to me the only one capable of affording a rational and easy explanation of the phenomena of mind. It is impossible to account for dreaming, idiocy, spectral illusions, monomania, and partial genius, in any other way. For these reasons, and for the much stronger one, that having studied the science for several years with a mind rather hostile than otherwise to its doctrines, and found that nature invariably vindicated their truth, I could come to no other conclusion than that of adopting them as a matter of belief, and employing them for the explanation of phenomena which they alone seem calculated to elucidate satisfactorily. The system of Gall is gaining ground rapidly among scientific men, both in Europe and America. Some of the ablest physiologists in both quarters of the globe have admitted its accordance with nature; and, at this moment, it boasts a

greater number of proselytes than at any previous period of its career. The prejudices still existing against it result from ignorance of its real character. As people get better acquainted with the science, and the formidable evidence by which it is supported, they will think differently."—(*Philosophy of Sleep*, 2d edition, preface.) Similar passages might be quoted from other esteemed medical writers; but it is sufficient to add, that Andral, one of the highest medical authorities in Europe, was recently President of the Phrenological Society of Paris; that the celebrated Broussais expounds and defends the science in his lectures; that the Medico-Chirurgical Review, which is unquestionably at the head of the British medical periodicals, has for many years adopted Phrenology as founded in nature; and that a conviction of the truth and importance of the science is daily forcing itself upon many, who, before making themselves acquainted with it, were among its bitter opponents. The simplicity and practical character of the phrenological *philosophy* have induced not a few to doubt the possibility of its being founded on *physiological* error. If, as has been well remarked, the truth and beauty of Gall and Spurzheim's philosophical opinions be admitted, one of two conclusions is inevitable: We must either grant the soundness of the organology from which those opinions sprung, or ascribe to the individuals who first taught them an amount of knowledge and talent which they would have blushed to hear attributed to them, and their possession of which is far more incredible than the entire body of phrenological science.

No. IV.—Organic Laws.

Text, p. 33.

On the subject of the sufferings of women in childbed, the following authorities may be referred to:—

"One thing," says Mr Alison, "is very remarkable, and occurs in most cases of concealment and child-murder, viz. the strength and capability for exertion evinced by women in the inferior ranks shortly after childbirth—appearances so totally different from those exhibited in the higher orders, that, to persons acquainted only with cases among the latter, they would appear incredible. In the case just mentioned (that of Catherine Butler or Anderson, at Aberdeen, in spring 1829), the mother, two or three days after her delivery, walked from Inverury to Huntly, a distance of twenty-eight miles, in a single day, with her child on her back. Similar occurrences daily are proved in cases of this description. It is not unusual to find women engaged in reaping retire to a little distance, effect their delivery by themselves, return to their fellow-labourers, and go on with their work during the remainder of the day, without any other change of appearance but looking a little paler and thinner. Such a fact occurred in the case of Jean Smith, Ayr, spring 1824. Again, in the case of Ann Macdougall, Aberdeen, spring 1823, it appeared that the pannel, who was sleeping in bed with two other servants, rose, was delivered, and returned to bed, without any of them being conscious of what had occurred. Instances have even occurred in which women have walked six and eight miles on the very day of their delivery, without any sensible inconvenience. Many respectable medical practitioners, judging from what they have observed among the higher ranks, would pronounce such facts impossible; but they occur so frequently among the labouring classes as to form a point worthy of knowledge in criminal jurisprudence; and to render perfectly credible what is said of the female American Indians, that they fall behind for a little, on their journeys through the forests, deliver themselves, and shortly make up to their husbands, and continue their journey with their offspring on their back."—*Alison's Principles of the Criminal Law of Scotland*, pp. 161, 162.

Mr Lawrence observes, that "the very easy labours of Negresses, native Americans, and other women in the savage state, have been often noticed by travellers. This point is not explicable by any prerogative of physical formation; for the pelvis is rather smaller in these dark-coloured races than in the European and other white people. Simple diet, constant and laborious exertion, give to these children of nature a hardiness of constitution, and exempt them from most of the ills which afflict the indolent and luxurious females of civilized societies. In the latter, however, the hard-working women of the lower classes in the country often suffer as little from childbirth as those of any other race. Analogous differences, from the like causes, may be seen in the animal kingdom. Cows kept in towns, and other animals deprived of their healthful exercise, and accustomed to unnatural food and habits, often have difficult labours, and suffer much in parturition."—*Lawrence's Lectures on Physiology, Zoology, and the Natural History of Man*. 1822. Vol. ii. p. 190.

Among the Araucanian Indians of South America, "a mother, immediately on her delivery, takes her child, and going down to the nearest stream of water, washes herself and it, and returns to the usual labours of her station."—*Stevenson's Twenty Years' Residence in South America*. Vol. i. p. 9.

No. V.—Hereditary Descent of National Peculiarities.

Text, p. 45.

National *features* descend unchanged through many centuries, as is shewn by Dr W. C. Edwards, in his work on "The Physiological Characters of Races of Mankind considered in their relations to History," published at Paris in 1829. An excellent abstract of this work, by Dr William Gregory, will be found in the Phrenological Journal, vol. ix. p. 97. Dr Edwards has adduced, as an example, the Jews. "In the first place, Jews in all countries resemble each other, and differ from the people among whom they live. Secondly, at distant periods, they had the same external characters. In the Last Supper of Leonardo da Vinci, this painter, who was an excellent naturalist and close observer, has painted faces which might be portraits of living Jews. This was 300 years ago; but we have evidence, that 3000 years ago the Jews had the same characters.

"In the copy of the paintings adorning the tomb of an Egyptian king, exhibited in London about ten years ago, there are representations of four different races in procession:—1*st*, The natives, very numerous, of a dark brown tint, but without the woolly hair of the Negro; 2*d*, Negroes, with the black skin, thick lips, and woolly hair of that race; 3*d*, Persians; and, 4*th*, Jews, distinguished, says Belzoni, by their complexion and physiognomy. Dr Edwards says, 'I had seen, on the previous day, Jews in the streets of London; I thought that I now saw their portraits.'"

No. VI.—Hereditary Complexion.

Text, p. 47.

Mr W. B. Stevenson, in his "Narrative of Twenty Years' Residence in South America," vol. i. p. 286, says, that he has "always remarked, that in cases where parents are of different castes, the child receives more of the colour of the father than of the mother." He made extensive observations during a long residence in Lima; a place, he remarks, than which there cannot be any more favourable for an examination of the influence of "the configuration of the human face, or of its colour, on the intellectual faculties." He gives the following Table, shewing the mixture of the different castes, under their common or distinguishing names. But "this table," says he, "which I have endeavoured to make as correct as possible from personal observation, must be considered as general, and not including particular cases."

Father.	*Mother.*	*Children.*	*Colour.*
European	European	Creole	White.
Creole	Creole	Creole	White.
White	Indian	Mestiso	6-8ths White, 2-8ths Indian—Fair.
Indian	White	Mestiso	4-8ths White, 4-8ths Indian.
White	Mestiso	Creole	White—often very fair.
Mestiso	White	Creole	White—but rather sallow.
Mestiso	Mestiso	Creole	Sallow—often light hair.
White	Negro	Mulatto	7-8ths White, 1-8th Negro—often fair.
Negro	White	Zambo	4-8ths White, 4-8ths Negro—dark copper.
White	Mulatto	Quarteron	6-8ths White, 2-8ths Negro—Fair.
Mulatto	White	Mulatto	5-8ths White, 3-8ths Negro—Tawny.
White	Quarteron	Quinteron	7-8ths White, 1-8th Negro—very fair.
Quarteron	White	Quarteron	6-8ths White, 2-8ths Negro—Tawny.
White	Quinteron	Creole	White—light eyes, fair hair.
Negro	Indian	Chino	4-8ths Negro, 4-8ths Indian.
Indian	Negro	Chino	2-8ths Negro, 6-8ths Indian.
Negro	Mulatto	Zambo	5-8ths Negro, 3-8ths White.
Mulatto	Negro	Zambo	4-8ths Negro, 4-8ths White.
Negro	Zambo	Zambo	15-16ths Negro, 1-16th White—Dark.
Zambo	Negro	Zambo	7-8ths Negro, 1-8th White.
Negro	Chino	Zambo-Chino	15-16ths Negro, 1-16th Indian.
Chino	Negro	Zambo-Chino	7-8ths Negro, 1-8th Indian.
Negro	Negro	Negro	

No. VII.—Hereditary Transmission of Qualities.

Text, p. 48.

Fortified by the observations made at the commencement of the second section of Chapter V., I venture to cite some additional authorities, and to record some farther facts, observed by myself or communicated by persons on whose accuracy reliance may be placed, in support of the doctrine of the transmission of qualities by hereditary descent.

"The advice which I am now about to give, is indeed no other than what hath been given by those who have undertaken this argument before me. You will ask me, what is that? 'Tis this, that no man keep company with his wife for issue sake, but when he is sober—as not having before either drunk any wine, or, at least, not to such a quantity as to distemper him; for they usually prove winebibbers and drunkards whose parents begot them when they were drunk: wherefore Diogenes said to a stripling somewhat crack-brained and half-witted, Surely, young man, thy father begot thee when he was drunk."—*Plutarch's Morals*, translation published at London, 1718, vol. i. p. 2.

It is remarked by Burton in his *Anatomy of Melancholy*, that "if a drunken man gets a child, it will never, likely, have a good brain."

The passion for intoxicating liquors is sometimes hereditary. Dr Gall mentions a Russian family, in which the father and grandfather fell victims in early life to their propensity to drunkenness. The son, although he foresaw the consequences of this pernicious habit, continued to abandon himself to it, in spite of every resolution to the contrary; and the grandson, who was only five years of age when Dr Gall wrote, displayed even then a most decided inclination for spirituous liquors.—*Sur les Fonctions du Cerveau*, i. 410. As these facts can hardly be explained by referring to the influence of example, it follows that a peculiar state of the organization, giving rise to the mental peculiarity, was in this case transmitted from one generation to another. In point of fact, Dr Caldwell has shewn much reason for considering the irresistible desire for intoxicating liquors as a symptom of cerebral disease, having its special seat probably in the organ of Alimentiveness. As long as this disease exists, the desire is strongly felt, and every appeal to the understanding of the repentant and unhappy patient is in vain. "Am I asked," says Dr Caldwell, "how drunkenness then is to be cured, and the tormenting propensity which leads to it eradicated? I answer, by the same means which are found successful in the treatment of other forms of insanity where the cerebral excitement is preternaturally high. These are, seclusion and tranquillity, bleeding, puking, purging, cold water, and low diet. In this prescription I am serious; and if it be opportunely adopted and resolutely persevered in, I freely peril my reputation on its success.....If interrogated on the subject, the resident physician of the Kentucky Lunatic Asylum will state that he finds, in the institution he superintends, no difficulty in curing *mania a potu* by the treatment here directed."—*Transylvania Journal of Medicine* for July, August, and September, 1832, p. 332–3. See also *Pharm. Jour.* vol. viii. p. 624. Dr Caldwell admits, however, that it is only recent and acute cases which can be speedily cured; those of long standing are much less tractable, and occasionally the disease may be found incurable. He thinks very justly, that nothing would tend more to diminish the prevalence of habitual drunkenness, than to have it deemed and proclaimed a form of madness, and dealt with accordingly. Hospitals erected for the reception of drunkards, and authority given to confine them there, would be among the most important institutions that could be established, and would effect an immense saving of live, health, property, and reputation. In regard to the hereditary transmission of this miserable tendency, Dr Caldwell observes:—"Every constitutional quality, whether good or bad, may descend, by inheritance, from parent to child. And a long-continued habit of drunkenness becomes as essentially constitutional, as a predisposition to gout or pulmonary consumption. This increases, in a manifold degree, the responsibility of parents in relation to temperance. By habits of intemperance, they not only degrade and ruin *themselves*, but transmit the elements of like degradation and ruin to their posterity. This is no visionary conjecture, the fruit of a favourite and long-cherished theory. It is a settled belief resulting from observation—an inference derived from innumerable facts. In hundreds and thousands of instances, parents, having had children born to them while their habits were temperate, have become afterwards intemperate, and had other children subsequently born. In such cases, it is a matter of notoriety, that the younger children have become addicted to the practice of intoxication much more frequently than the elder—in the proportion of five to one. Let me not be told that this is owing to the younger children being neglected, and having corrupt and seducing examples constantly before them. The same neglects and profligate examples have been extended to all; yet all have not been equally injured by them. The children of the earlier births have escaped, while those of the subsequent ones have suffered. The reason is plain. The latter children had a deeper animal taint than the former."—*Transylvania Journal*, p. 341–2.

The following case is recorded in the Phrenological Journal:—"I now proceed to give some facts strongly illustrative of the doctrine, that the faculties which predominate in power and activity in the parents, when the organic existence of the child commences, determine its future mental dispositions. This is a doctrine to which, from its great practical importance, I would beg leave to call your serious attention. It was remarked by the celebrated Esquirol, 'that the children whose existence dated from the horrors of the first French Revolution, turned out to be weak, nervous, and irritable in mind, extremely susceptible of impressions, and liable to be thrown by the least extraordinary excitement into absolute insanity.' Sometimes, too, family calamities produce serious effects upon the offspring. A very intelligent and respectable mother, upon hearing this principle expounded, remarked, that there was a

very wide difference in the intellectual and moral development between one of her children and the others; and accounted for this difference by the fact, that, during pregnancy, she received intelligence that the crew of the ship, on board of which was her son, had mutinied —that when the ship arrived in the West Indies, some of the mutineers, and also her son, had been put in irons —and that they were all to be sent home for trial. This intelligence acted so strongly upon her, that she suffered a temporary alienation of judgment. The report turned out to be erroneous, but this did not avert the consequences of the agitated state of the mother's feelings upon the daughter she afterwards gave birth to. That daughter is now a woman, but she is and will continue to be a being of impulses, incapable of reflection, and in other respects greatly inferior to her sisters."

Shakspeare seems to recognise the law of the transmission of temporary mental qualities, so much insisted on in the text:—

> "Come on, ye cowards; ye were got in fear,
> Though ye were born in Rome."
>
> *Coriolanus*, Act 1. Sc. 6.

A gentleman, who has paid much attention to the rearing of horses, informed me, that the male race-horse, when excited, but not exhausted, by running, has been found by experience to be in the most favourable condition for transmitting swiftness and vivacity to his offspring. Another gentleman stated, that he was himself present when the pale grey colour of a male horse was objected to; that the groom thereupon presented before the eyes of the male another female from the stable, of a very particular but pleasing variety of colours, asserting that the latter would determine the complexion of the offspring; and that in point of fact it did so. The experiment was tried in the case of a second female, and the result was so completely the same, that the two young horses, in point of colour, could scarcely be distinguished although their spots were extremely uncommon. The account of Laban and the peeled rods laid before the cattle to produce spotted calves, is an example of the same kind.

The subjoined observations are extracted from "Outlines of the Veterinary Art, by Delabere Blaine," 3d edition, London, 1826, p. 327:—"That the organization of the mare, her qualities, and even her diseases, are imprinted on her offspring, is hardly to be wondered at; but how are we to account for the effects which even her imagination has over the young within?—and that such is the case, we have innumerable proofs. As early as the patriarchal time, the fact was known and acted on. These anomalies in the gestation of the horse are less frequent than in the more closely domesticated animals, as dogs; yet there are not wanting instances of these mental impressions sinking deeply into the mind of the mare also, and being called into recollection and action in every future pregnancy. Lord Morton bred from a male quagga and a chestnut mare. The mare was afterwards bred from by a black Arabian horse; but still the progeny exhibited, in colour and mane, a striking resemblance to the quagga. D. Giles, Esq. had a sow of the black and white kind, which was bred from by a boar of the wild breed, of a deep chestnut colour: the pigs produced by this intercourse were duly mixed, the colour of the boar being in some very predominant. The sow was afterwards bred from by two of Mr Western's boars, and in both instances chestnut marks were prevalent in the latter, which in other instances had never presented any appearance of the kind. —*Phil. Trans.* 1821. See many other instances detailed in the *Canine Pathology*, 3d edition, p. 94."

The same writer gives some interesting details to shew the necessity for attending to the qualities of both parents in the breeding of horses. "The general characteristic form of the animal," says he, "is arbitrarily settled by nature, but the individualities of character in the separate organs is divided between the parents in nearly equal proportions.* This is exemplified in the breed which arises from the intermixture of the blood with the cart breed, where the extreme difference in form and character is nicely blended, yet the peculiarities of each remain distinguishable.† This proves the great error committed by the generality of farmers and small breeders, who, careless about the dam, breed from any mare they happen to possess or can procure, though it may even be unfitted for work by disease or age; and expect, provided they gain a leap from a tolerable stallion, to procure a valuable progeny. But it is in vain to hope for good form and useful qualities under such circumstances; for it will be generally found that the properties of each parent are equally proportioned in the progeny—and this fact is so well known to judicious breeders that they select both sire and dam with equal care. This dependence on the law by which the distribution of form and qualities is equally dependent on both parents, leads to the correction of defects in particular breeds, by selecting one parent eminent for a form or quality for which the other is as notoriously defective. Should a mare, otherwise valuable, present a low heavy forehand beyond even that which is her sexual characteristic, by choosing her a male more than usually thin and elevated in his crest, the defect will be remedied; whereas, if this be not attended to, whatever other properties each may possess, a serious defect is propagated and increased, and the produce can be of little value. It is also by a judicious attention to these circumstances that particular breeds are preserved with their original integrity, or new varieties introduced."—"It is by the choice of such parents as have the specified and definite form in the greatest perfection that we are enabled in the progeny to perpetuate the same, and by future selections to improve it. The merits and defects of each parent should be previously subjected to careful examination; and it is only by a judicious balancing of the one against the other that perfect success is to be expected. It is thus that our racers have outstripped all competitors; it is thus that a Russell, a Coke, a Bakewell, and an Ellman, have raised our ruminants to their present state; and it is by the same art that a Meynell, a Rivers, or a Topham, have produced unrivalled dogs. Our power over the animal form and qualities, by the selection of parents, and subjecting their progeny to particular nurture, careful domestication, restraint and discipline, is truly surprising. The shepherd's dog is in some breeds born with a short tail; thus the very base of the machine, that which of all the parts is the least subjected to alteration by any physical or moral agency, the bones, even become subjected to our caprice. The Hereford ox can be bred to a white face, or a half white face, and the length of the horns of others can be ensured to an inch. The Spitalfields weavers assert that they can ensure almost to a certainty in the Marlborough breed of spaniels, which flourishes among them, any given quantity of colour, length of coat and texture of it, and regulate its disposition to curl or remain straight. The colour of the game-cock is arbitrarily imposed by the handler and

* "It is by no means intended here to deny that the external characters of some breeds are not principally derived from the male, and of others from the female; but these anomalies, for which we cannot account, do not tend to alter the general similitude observed towards both parents. In the multiparous animals, it is often observed that the influence of one parent preponderates in a part of the progeny, and of the other in another part of it. Thus it happens that, when a pointer and setter breed together, it is not unusual to find part of the whelps almost perfect pointers, and the remainder as nearly true setters."

† "The hybrid mule divides in equal proportions the equine and asinine characters; at the same time it must be allowed that the hinny, or produce of the stallion and ass, is more allied to the horse than the mule, or progeny from the male ass and mare."

feeder; and the experienced pigeon-fancier can breed to a feather. It should not be lost sight of, that qualities, as well mental as personal, are also to be cultivated and handed down in the breed. Many qualities may be considered as dependent on the organization; such are hardihood, particular excellence in one pace, &c. These, it may be expected, *a priori*, might be perpetuated; and we are not surprised at a son of Eclipse or Matchem having speed in his gallop, or the produce of a Norfolk trotter excelling in that pace; but it is not equally taken into the account that temper, courage, docility, and patience under restraint, are equally handed down in hereditary descent as the peculiarities of form." —P. 321–328.

Mr Blaine expresses himself not hostile to in-and-in breeding; in defence of which he adduces several arguments and authorities, as well as his own experience, and says he "could quote innumerable other authorities" to the same effect. "But candour," he adds, "obliges me also to own, that there exists a large number of able antagonists to it also. My limits only allow me to add, that many practical breeders who are averse to breeding in succession from near relationship by blood, are favourable to it in a remote degree, which is particularly the case with some rearers of game-fowls, who seek the intercourse of a third remove, which they call a '*nick*.' From these conflicting testimonies, the matter will, with many, be considered as problematical. With me, the only arguments against it which it appears cannot be satisfactorily answered are, that as hereditary diseases in some breeds are considerable, by this mode of breeding they would be perpetuated and probably increased; and likewise, that when breeding by relationship is a settled practice, accidental defects are too apt to be passed over unobserved."—P. 325.

Mr Blaine notices also a very important circumstance in relation to hereditary transmission—what is popularly denominated *breeding back*: that is to say, the appearance in the second or third generation, of qualities of the progenitors, not observable in the first generation. "It is observed," he says, "that the progeny of the horse, of man, and of most domestic animals, shall bear a more striking resemblance to the grand-dam or grandfather than to their own immediate parents. It is evident that this is more likely where a common character has been preserved during successive generations, or, in turf language, where the blood has been preserved pure. A practical hint naturally presents itself on the extreme importance, therefore, of admitting no accidental admixture of blood, where it is peculiarly requisite that it should flow in true lineal descent; seeing that its debasing consequences are carried through whole generations, and unexpectedly appear in a third or fourth."—P. 326.

Dr Elliotson, in a note to the fourth edition of his Translation of Blumenbach's Physiology, p. 569, observes, that "experience teaches us that changes brought about in an animal after birth are not in general transmitted to the offspring. The causes of change in a species must therefore operate, not by altering the parents, but by disposing them to produce an offspring more or less different from themselves. Such is John Hunter's view of the question, and it is certainly confirmed by every fact. I fear that John Hunter has not generally the credit of this observation, but the following passage shews it to be clearly his:—'As animals are known to produce young which are different from themselves in colour, form, and disposition, arising from what may be called the unnatural mode of life, it shews this curious power of accommodation in the animal economy, that although education can produce no change in the colour, form, or disposition of the animal, yet it is capable of producing a principle which becomes so natural to the animal, that it shall beget young different in colour and form; and so altered in disposition as to be more easily trained up to the offices in which they have been usually employed; and having these dispositions suitable to such changes of form.'—Hunter *on the Wolf, Jackal, and Dog*." Dr Elliotson adds a variety of illustrations, to which the reader is referred.

It is stated by Dr W. C. Edwards, in the work alluded to in No. V. of this appendix, that when animals of different species are crossed, they produce an animal of an intermediate type, or a mule; but that when different varieties of the same species are mixed, the result is often quite different. M. Coladon of Geneva, he says, made a very striking experiment, which bears strongly on this point. He procured a great number of white mice, as well as of common brown mice, studied their habits, and found means to cause them to breed. In his experiments he always put together mice of different colours, expecting a mixed race; but this did not occur in one instance. All the young mice were either white or brown, but each type was produced always in a state of purity. Even in the case of varieties of the same species, adds Dr Edwards, we have an intermediate type or mule; but this is when the varieties differ most from each other: when, as in the case of the mice, they approach very nearly, mules are not produced. In both cases we see one common principle, namely, that the mother often produces a being of a type different from her own—less so, however, in the latter case. This principle is seen even in the same variety; for here also the mother, in producing a male, gives birth to a being whose type differs, and in some cases differs very much, from her own. Now, says Dr E., the same is observed in man. The varieties which differ most strongly, such as the Negro and white, when crossed, produce mulattoes; and when varieties more nearly resembling each other are crossed, the descendants sometimes resemble one parent, sometimes the other, sometimes both. This Dr Edwards looks upon as the cause of the great variety observable in modern nations; among which, however, he thinks we can always observe specimens of the pure types which have entered into their composition. Thus, even if two races having considerable resemblance to each other, and in equal numbers, were to mix without limitation, the original types would still, in his opinion, frequently occur in their descendants. Dr Edwards very ingeniously applies to the elucidation of history, these and other principles connected with the physiological characteristics of races of mankind. For details, I refer to the Phrenological Journal, vol. ix. p. 97–108.

In the Quarterly Journal of Agriculture, No. I., there are several valuable articles illustrative of hereditary transmission in the inferior animals. I select the following examples:—

"Every one knows that the hen of any bird will lay eggs although no male be permitted to come near her; and that those eggs are only wanting in the vital principle which the impregnation of the male conveys to them. Here, then, we see the female able to make an egg, with yolk and white, shell and every part, just as it ought to be, so that we might, at the first glance, suppose that here, at all events, the female has the greatest influence. But see the change which the male produces. Put a Bantam cock to a large-sized hen, and she will instantly lay a small egg; the chick will be short in the leg, have feathers to the foot, and put on the appearance of the cock: so that it is a frequent complaint where Bantams are kept, that they make the hens lay small eggs, and spoil the breed. Reverse the case; put a large dunghill cock to Bantam hens, and instantly they will lay larger eggs, and the chicks will be good-sized birds, and the Bantam will have nearly disappeared. Here, then, are a number of facts known to every one, or at least open to be known by every one, clearly proving the influence of the male in some animals; and as I hold it to be an axiom that nature never acts by contraries, never outrages the law

clearly fixed in one species, by adopting the opposite course in another—therefore, as in the case of an equilateral triangle on the length of one side being given, we can with certainty demonstrate that of the remaining; so, having found these laws to exist in one race of animals, we are entitled to assume that every species is subjected to the self-same rules—the whole bearing, in fact, the same relation to each other as the radii of a circle."

Very young hens lay small eggs; but a breeder of fowls will never set these to be hatched, because the animals produced would be feeble and imperfectly developed. He selects the largest and freshest eggs, and endeavours to rear the healthiest stock possible.

"*A method of obtaining a greater number of One Sex, at the option of the Proprietor, in the Breeding of Live Stock.*"—Extracted from the Quarterly Journal of Agriculture, No. I. p. 63.

"In the Annales de l'Agriculture Française, vols. 37 and 38, some very interesting experiments are recorded, which have lately been made in France, on the Breeding of Live Stock. M. Charles Girou de Buzareingues proposed at a meeting of the Agricultural Society of Séverac, on the 3d of July 1826, to divide a flock of sheep into two equal parts, so that a greater number of males or females, at the choice of the proprietor, should be produced from each of them. Two of the members of the Society offered their flocks to become the subjects of his experiments, and the results have now been communicated, which are in accordance with the author's expectations.

"The first experiment was conducted in the following manner:—He recommended very young rams to be put to the flock of ewes, from which the proprietor wished the greater number of females in their offspring; and also, that, during the season when the rams were with the ewes, they should have more abundant pasture than the other; while, to the flock from which the proprietor wished to obtain male lambs chiefly, he recommended him to put strong and vigorous rams four or five years old. The following tabular view contains the result of this experiment:—

FLOCK FOR FEMALE LAMBS.			FLOCK FOR MALE LAMBS.		
Age of the Mothers.	*Sex of the Lambs.*		*Age of the Mothers.*	*Sex of the Lambs.*	
	Males.	Females.		Males.	Females.
Two years,	14	26	Two years,	7	3
Three years,	16	29	Three years,	15	14
Four years,	5	21	Four years,	33	14
Total,	35	76	Total,	55	31
Five years and older, -	18	8	Five years and older, -	25	24
Total,	53	84	Total,	80	55
N. B. There were three twin-births in this flock. Two rams served it, one fifteen months, the other nearly two years old.			N. B.—There were no twin-births in this flock. Two strong rams, one four, the other five years old, served it.		

"The general law, as far as we are able to detect it, seems to be, that, when animals are in good condition, plentifully supplied with food, and kept from breeding as fast as they might do, they are most likely to produce females. Or, in other words, when a race of animals is in circumstances favourable for its increase, nature produces the greatest number of that sex which, in animals that do not pair, is most efficient for increasing the numbers of the race: But if they are in a bad climate or on stinted pasture, or if they have already given birth to a numerous offspring, then nature, setting limits to the increase of the race, produces more males than females. Yet, perhaps, it may be premature to attempt to deduce any law from experiments which have not yet been sufficiently extended. M. Girou is disposed to ascribe much of the effect to the age of the ram, independent of the condition of the ewe."

No. VIII.—Laws relative to Marriage and Education in Germany.

Text, p. 49.

"It cannot be altogether foreign to natural history," says Mr Loudon, "to notice the influence of climate, food, and political and religious regulations, on the human species; and we are unwilling to leave Germany without saying something on so interesting a people as the Germans. It will not be denied that man is subject to the same laws as other animals, and that his natural or inborn character must depend principally on the climate and products of the soil where he is placed. His factitious or civilized character will as certainly depend on his education, taking that word in its most extensive sense, as including parental care and example, scholastic tuition, religion, and government. In warm fertile countries, where nature produces everything spontaneously, man becomes inactive, and has naturally few labours and few enjoyments. In extremely cold and inhospitable climates, the enjoyments of man are also few, because the labour necessary to overcome natural objects is too great for his powers. It would seem, therefore, that intermediate climates are more favourable for human happiness than either extremes; but whether such are at all times temperate, as those of many parts of Italy and Spain, or such as are alternately temperate and severe, as those of the south of Germany and the north of France, are the best, may perhaps be doubted. It appears that a climate where the winters are severe, has a considerable influence on the human character, by the necessity which it induces of forethought, in the laying up a provision of food for winter, and the greater attention and labour that are requisite in the article of clothing for that season. It is certain, on the other hand, that, in climates at all times temperate, the health, other circumstances being alike, must be better than in severe climates, where it is impaired by the artificial atmosphere of apartments during the winter season; and constant good health must necessarily have a considerable influence on the character. Supposing, therefore, all the artificial circumstances to be the same in two climates, such as that of the south of Germany, and that of Italy or the central parts of France, it seems reasonable to conclude that man would attain to a higher degree of perfection in the latter climates than in the former. So much for our theory of the influence of soil and climate on man; and, for farther details, we refer the reader to Dr Falconer's work on the subject.

"Of all the artificial or accidental circumstances which influence the character, personal education must be allowed to be the greatest; and next, religion and government. Manner of life, occupations, and pursuits, and even amusements, have an important influence. To do more than premise these matters, would be unsuitable to this Magazine; but what has been said became necessary as an introduction to what is to follow.

"Applying the above theory to the three states of Germany which we have passed through, Wurtemberg, Bavaria, and Baden, the climate and soil of these states seem favourable in the second degree; education, to a certain extent, is there universal; religion is, on the whole, more simple than in some other countries; and the laws and governments seem, at least, equal, in constitutional merits and impartial administration, to those of any people in Europe. The manner of life, or occupation, is chiefly agricultural; which, though not favourable to luxury or refinement, seems, without doubt, for the great mass of the people, the happiest mode of existence. Local and personal attachments are universally felt to be essential sources of happiness: and in no way can this feeling be gratified so easily and effectually as by the possession of land. In the three countries named, the great majority of the population are occupiers, in perpetuity, of a portion of the soil, either as absolute

proprietors or as perpetual renters. This state of things is far from being favourable to what is called making money; but it is highly favourable to health and contentment. It is a great deal for a poor man to have something which he can call his own; something on which he can bestow labour, and from which he can, in consequence, extract enjoyment. The absolute necessities of life are few, and derived directly from the soil; the labouring man, therefore, who has a house and a few roods of land, is certain of a home and food; he increases the interest of his home by a wife; and parental care and solicitude, with connubial and filial attachment, fill up the measure of his happiness. These are the essential purposes and enjoyments of life, which nature intended for all men; which the poor man can enjoy as well as the rich; and for which no other enjoyment, either of the rich or the poor, the wise or the learned, can entirely compensate. In no part of Europe have we seen, or thought we have seen, these enjoyments so generally diffused as in the countries we have recently passed through, and more especially Wurtemberg. We entered on these countries, expecting to find the people not much better off than in France: but we could not resist the conviction produced by constant observation, and the result of various inquiry, that comfort and happiness exist to a much greater degree among the labouring classes of society in the south of Germany, than they do in Britain. The people, at first sight, have a milder and more civilized aspect. The dress of the country labourers, male and female, does not consist of such fine materials as in England; but one part of the dress is of a quality consistent with the others, and the whole is in a superior style, compared with the dress of the other classes of society. There is no such thing, in this part of Germany, as a man or woman in rags, or with a coat or gown of the best quality, and the hat or stockings in tatters, as is frequently the case, not only among labourers, but even among mechanics, in England. In short, the dress in Germany is in much better keeping. Both men and women of the labouring class here are more intelligent in their aspect, much more civil and polite on a first acquaintance, and much better furnished with conversation than the British labourers. What struck us particularly were, the great rarity of exceptions to this general description, the general uniformity of manner and character throughout the whole country, and the total absence of public beggars. On inquiry, we found that there were few or no poor supported publicly, though every parish is obliged to support its poor when unable to work; and also, that there were few people in prison, either for debt or for crime of any kind.

"This state of things more particularly applies to Wurtemberg: and the causes, we think, may be very easily traced. The first and principal cause is a law respecting schools, which has existed, more or less, in the states of the south of Germany for above a century, but which has been greatly improved within the last thirty years. By this law, parents are compelled to send their children to school, from the age of six to fourteen years, where they must be taught reading, writing, and arithmetic, but where they may acquire as much additional instruction in other branches as their parents choose to pay for. To many of the schools of Bavaria large gardens are attached, in which the boys are taught the principal operations of agriculture and gardening in their hours of play; and, in all the schools of the three states, the girls, in addition to the same instruction as the boys, are taught knitting, sewing, embroidery, &c. It is the duty of the police and priest (which may be considered equivalent to our parish vestries) of each commune or parish, to see that the law is duly executed, the children sent regularly, and instructed daily. If the parents are partially or wholly unable to pay for their children, the commune makes up the deficiency. Religion is taught by the priest of the village or hamlet: and where, as is frequently the case in Wurtemberg, there are two or three religions in one parish, each child is taught by the priest of its parents; all of which priests are, from their office, members of the committee or vestry of the commune. The priest or priests of the parish have the regular inspection of the schoolmaster, and are required by the government to see that he does his duty; while each priest, at the same time, sees that the children of his flock attend regularly. After the child has been the appointed number of years at school, it receives from the schoolmaster, and the priest of the religion to which it belongs, a certificate, without which it cannot procure employment. To employ any person under twenty-one, without such a certificate, is illegal, and punished by a fixed fine, as is almost every other offence in this part of Germany; and the fines are never remitted, which makes punishment always certain. The schoolmaster is paid much in the same way as in Scotland; by a house, a garden, and sometimes a field, and by a small salary from the parish; and by fixed rates for the children.

"A second law, which is coeval with the school-law, *renders it illegal for any young man to marry before he is twenty-five, or any young woman before she is eighteen*; and a young man, at whatever age he wishes to marry, must shew to the police and the priest of the commune where he resides, that *he is able, and has the prospect, to provide for a wife and family.*

"There are minor causes, but these two laws, and the general possession of land both by labourers and tradesmen, are the chief. Amongst the minor causes are the general simplicity of their forms of religion, and universal toleration; even the Catholic faith in Wurtemberg is unattended with the ceremony and spectacle with which it is exhibited in various parts of Germany and France. The equal footing on which the different religions are placed, is also favourable to liberality of sentiment and good neighbourhood. That particular mildness of feature and character, so different from what is met with in the labouring classes in England, is no doubt partly owing to the greater proportion of vegetables and fruits which enter into the general diet of the population; the almost total abstinence from strong liquors or spirits, the general drink being wine; and, perhaps, to the almost unremitted smoking of tobacco from morning to night."—*Magazine of Natural History.*

No. IX.—Death.

Text, p. 58.

The fact of a decrease in the mortality of England is strikingly supported by the following extract from the Scotsman of 16th April 1828. It is well known that this paper is edited by Mr Charles Maclaren, a gentleman whose extensive information, and scrupulous regard to accuracy and truth, stamp the highest value on his statements of fact; and whose profound and comprehensive intellect warrants a well-grounded reliance on his philosophical conclusions.

"Diminished Mortality in England.—The diminution of the annual mortality in England amidst an alleged increase of crime, misery, and pauperism, is an extraordinary and startling fact, which merits a more careful investigation than it has received. We have not time to go deeply into the subject; but we shall offer a remark or two on the question, how the apparent annual mortality is affected by the introduction of the cow-pox, and the stationary or progressive state of the population. In 1780, according to Mr Rickman, the annual deaths were 1 in 40, or *one-fortieth* part of the population died every year; in 1821, the proportion was 1 in 58. It follows, that, out of any given number of persons, 1000 or 10,000, scarcely more than two deaths take place now for three that took place in 1780, or the mortality has diminished 45 per cent. The parochial registers of burials in England, from which

this statement is derived, are known to be incorrect; but as they continue to be kept without alteration in the same way, the errors of one year are justly conceived to balance those of another, and they thus afford *comparative* results, upon which considerable reliance may be placed.

"A community is made up of persons of many various ages, among whom the law of mortality is very different. Thus, according to the Swedish tables, the deaths among children from the moment of birth up to 10 years of age, are 1 in 22 per annum; from 10 to 20, the deaths are only 1 in 185. Among the old, again, mortality is of course great. From 70 to 80, the deaths are 1 in 9; from 80 to 90 they are 1 in 4. Now, a community like that of New York or Ohio, where marriages are made early and the births are numerous, necessarily contains a large proportion of young persons, among whom the proportional mortality is low, and a small proportion of the old, who die off rapidly. A community in which the births are numerous, is like a regiment receiving a vast number of young and healthy recruits, and in which, of course, as a whole, the annual deaths will be few compared with those in another regiment chiefly filled with veterans, though among the persons at any particular age, such as 20, 40, or 50, the mortality will be as great in the one regiment as in the other. It may thus happen, that the annual mortality among 1000 persons in Ohio may be considerably less than in France, while the *Expectation of Life*, or the chance which an individual has to reach to a certain age, may be no greater in the former country than in the latter; and hence we see that a diminution in the rate of mortality is not a certain proof of an increase in the value of life, or an improvement in the condition of the people.

"But the effect produced by an increased number of births is less than might be imagined, owing to the very great mortality among infants in the first year of their age. Not having time for the calculations necessary to get at the precise result, which are pretty complex, we avail ourselves of some statements given by Mr Milne in his work on Annuities. Taking the Swedish tables as a basis, and supposing the law of mortality to remain the same for each period of life, he has compared the proportional number of deaths in a population which is stationary, and in one which increases 15 per cent. in 20 years. The result is, that when the mortality in the stationary society is *one* in 36.13, that in the progressive society is one in 37.33, a difference equal to 3⅓ per cent. Now, the population of England and Wales increased 34.3 per cent. in the 20 years ending in 1821, but in the interval from 1811 to 1821, the rate was equivalent to 39¼ per cent. upon 20 years; and the apparent diminution of mortality arising from this circumstance must of course have been about 8½ per cent. We are assuming, however, that the population was absolutely stationary at 1780, which was not the case. According to Mr Milne (p. 437), the average annual increase in the five years ending 1784, was 1 in 55; in the ten years ending 1821, according to the census, it was 1 in 60. Deducting, then, the proportional part corresponding to the former, which is 3¼, there remains 5¼. If Mr Milne's Tables, therefore, are correct, *we may infer that the progressive state of the population causes a diminution of 5¼ per cent. in the annual mortality*—a diminution which is only *apparent*, because it arises entirely from the great proportion of births, and is not accompanied with any real increase in the value of human life.

"A much greater change—not apparent but real—was produced by the introduction of vaccination in 1798. It was computed, that, in 1795, when the population of the British Isles was 15,000,000, the deaths produced by the small-pox amounted to 36,000, or nearly 11 per cent. of the whole annual mortality. (See article *Vaccination* in the Supplement to Encyclopædia Brittannica, p. 713.) Now, since not more than one case in 330 terminates fatally under the cow-pox system, either directly by the primary infection, or from the other diseases supervening; the whole of the young persons destroyed by the small-pox might be considered as saved, were vaccination universal, and always properly performed. This is not precisely the case, but one or one and a half per cent. will cover the deficiencies; and we may therefore conclude, that *vaccination has diminished the annual mortality fully nine per cent.* After we had arrived at this conclusion by the process described, we found it confirmed by the authority of Mr Milne, who estimates, in a note to one of his tables, that the mortality of 1 in 40 would be diminished to 1 in 43–45, by exterminating the small-pox. Now this is almost precisely 9 per cent.

"We stated, that the diminution of the annual mortality between 1790 and 1821 was 45 per cent., according to Mr Rickman. If we deduct from this 9 per cent. for the effect of vaccination, and 5 per cent. as only apparent, resulting from the increasing proportion of births—31 per cent. remains, *which, we apprehend, can only be accounted for by an improvement in the habits, morals, and physical condition of the people.* Independently, then, of the two causes alluded to, the value of human life since 1780 has increased in a ratio which would diminish the annual mortality from 1 in 40 to 1 in 52½—a fact which is indisputably of great importance, and worth volumes of declamation in illustrating the true situation of the labouring classes. We have founded our conclusion on data derived entirely from English returns; but there is no doubt that it applies equally to Scotland. It is consoling to find, from this very unexceptionable species of evidence, that though there is much privation and suffering in the country, the situation of the people has been, on the whole, progressively improving during the last forty years. But how much greater would the advance have been, had they been less taxed, and better treated! and how much room is there still for future amelioration, by spreading instruction, amending our laws, lessening the temptations to crime, and improving the means of correction and reform! In the mean time, it ought to be some encouragement to philanthropy to learn that it has not to struggle against invincible obstacles, and that even when the prospect was least cheering to the eye, its efforts were silently benefiting society."

Extract from Edinburgh Advertiser, 13th January 1829: "The following comparative table of the average duration of life at Geneva, during the last 260 years, is very remarkable. The growing improvement affords a striking proof of the benefits resulting from the progress of civilization and the useful arts.

	Average duration. Years.	Months.
From 1560 to 1600, . .	18	5
1604 to 1700, . .	23	5
1701 to 1760, . .	32	
1761 to 1800, . .	33	7
1801 to 1814, . .	38	6
1815 to 1826, . .	38	10"

It has been mentioned to me, that the late Dr Monro, in his anatomical lectures, stated, that, as far as he could observe, the human body, as a machine, was perfect—that it bore within itself no marks by which we could possibly predict its decay—that it was apparently calculated to go on for ever—and that we learned only by experience that it would not do so; and some persons have conceived this to be an authority against the doctrine maintained in Chap. III. Sect. 2, that death is apparently inherent in organization. In answer, I beg to observe, that if we were to look at the sun only for one moment of time, say at noon, no circumstance in its appearance would indicate that it had ever risen, or that it would ever set; but if we had traced its progress from the horizon to the meridian, and down again

till the long shadows of evening prevailed, we should have ample grounds for inferring, that, if the same causes that had produced these changes continued to operate, it would undoubtedly at length disappear. In the same way, if we were to confine our observations on the human body to a mere point of time, it is certain that, from the appearances of that moment, we could not infer that it had grown up by gradual increase, or that it would decay; but this is the case only because our faculties are not fitted to penetrate into the essential nature and dependences of things. Any man who had seen the body decrease in old age, could, without hesitation, predicate, that, if the same causes which had produced that effect went on operating, dissolution would at last inevitably occur; and, if his Causality were well developed, he would not hesitate to say that a *cause* of the decrease and dissolution must exist, although he could not tell by examining the body what it was. By analysing alcohol, no person could predicate, independently of experience, that it would produce intoxication; and, nevertheless, there must be a cause in the constitution of the alcohol, in that of the body, and in the relationship between them, why it produces this effect. The notion, therefore, of Dr Monro, does not prove that death is not an essential law of organization, but only that the human faculties are not able, by dissection, to discover that the cause of it is inherent in the bodily constitution itself. It does not follow, however, that this inference may not be legitimately drawn from phenomena collected from the whole period of corporeal existence.

No. X.—Infringement of Moral Laws.

Text, p. 64.

The deterioration of the operative classes of Britain, which I attribute to excessive labour, joined with great alternations of high and low wages, and occasionally with absolute idleness and want, is illustrated by the following extract from a Report on Emigration, by a Committee of the House of Commons:—

"Joseph Foster, a weaver, and one of the deputies of an emigration society in Glasgow, states that the labour is all paid by the piece; the hours of working are various, sometimes eighteen or nineteen out of twenty-four, and even all night once or twice a-week; and that the wages made by such labour, after deducting the necessary expenses, will not amount to more than 4s. 6d. to 7s. per week, some kinds of work paying better than others. When he commenced as a weaver, from 1800 to 1805, the same amount of labour that now yields 4s. 6d. or 5s. would have yielded 20s. There are about 11,000 hand-looms going in Glasgow and its suburbs, some of which are worked by boys and girls, and he estimates the average net earnings of each hand-weaver at 5s. 6d. The principal subsistence of the weavers is oatmeal and potatoes, with occasionally some salt herrings.

"Major Thomas Moodie, who had made careful inquiries into the state of the poor at Manchester, states, that the calico and other light plain work at Bolton and Blackburn yields the weaver from 4s. to 5s. per week, by fourteen hours of daily labour. In the power-loom work, one man attends two looms, and earns from 7s. 6d. to 14s. per week, according to the fineness of the work. He understood that, during the last ten years, weavers' wages had fallen on an average about 15s. per week.

"Mr Thomas Hutton, manufacturer, Carlisle, states, that there are in Carlisle and its neighbourhood about 5500 families, or from 18,000 to 20,000 persons dependent on weaving. They are all hand-weavers, and are now in a very depressed state, in consequence of the increase of power-loom and factory weaving in Manchester and elsewhere.* Taking fifteen of his men, he finds that five of them, who are employed on the best work, had earned 5s. 6d. per week for the preceding month, deducting the necessary expenses of loom-rent, candles, tackling, &c.; the next five, who are upon work of the second quality, earned 3s. 11d.; and the third five earned 3s. 7½d. per week. They work from fourteen to sixteen hours a-day, and live chiefly on potatoes, butter-milk, and herrings.

"Mr W. H. Hyett, Secretary to the Charity Committee in London, gives a detailed statement, to show, that, in the Hundred of Blackburn, comprising a population of 150,000 persons, 90,000 were out of employment in 1826! In April last, when he gave his evidence before the Committee, these persons had generally found work again, but at very low wages. They were labouring from twelve to fourteen hours a-day, and gaining from 4s. to 5s. 6d. per week.

"*Extract from Lord Advocate Sir William Rae's Speech in the House of Commons, 11th March 1828, on the additional Circuit Court of Glasgow.*

"The Lord Advocate, in rising to move for leave to bring in a bill to 'authorize an additional Court of Justiciary to be held at Glasgow, and to facilitate criminal trial in Scotland,' said, he did not anticipate any opposition to the motion. A great deal had been said of the progress of crime in this country, but he was sorry to say crime in Scotland had kept pace with that increase. A return had been made of the number of criminal commitments in each year, so far back as the year 1805. In that year the number of criminal commitments for all Scotland amounted only to 85. In 1809, it had risen to between 200 and 300; in 1819–20, it had increased to 400; and, by the last return, it appeared, that, in 1827, 661 persons had been committed for trial. He was inclined to think that the great increase of crime, particularly in the west of Scotland, was attributable, in no small degree, to the number of Irish who daily and weekly arrived there. He did not mean to say that the Irish themselves were in the habit of committing more crime than their neighbours; but he was of opinion that their numbers tended to reduce the price of labour, and that an increase of crime was the consequence. Another cause was the great disregard manifested by parents for the moral education of their children. Formerly, the people of Scotland were remarkable for the paternal care which they took of their offspring. That had ceased in many instances to be the case. Not only were parents found who did not pay attention to the welfare of their children, but who were actually parties to their criminal pursuits, and participated in the fruits of their unlawful proceedings. When crime was thus on the increase, it was necessary to take measures for its speedy punishment. The great city of Glasgow, which contained 150,000 inhabitants, and to which his proposed measure was meant chiefly to apply, stood greatly in need of some additional jurisdiction. This would appear evident, when it was considered that the court met there for the trial of capital offences, had also to act in the districts of Renfrew, Lanark, and Dumbarton. In 1812, the whole number of criminals tried in Glasgow was only 31; in 1820, it was 83; in 1823, it was 85; and in 1827, 211.—The learned lord concluded by moving for leave to bring in a bill to authorize an additional circuit court of justiciary to be held at Glasgow, and to facilitate criminal trial in Scotland."

* In what is called factory-weaving, an improved species of hand-loom is employed, in which the dressing and preparation of the web is effected by machinery, and the weaver merely sits and drives the shuttle.

Dedicated, by permission, to the King of the Belgians.

THE

PRINCIPLES OF PHYSIOLOGY

APPLIED TO THE

PRESERVATION OF HEALTH,

AND TO THE IMPROVEMENT OF

PHYSICAL AND MENTAL EDUCATION.

BY

ANDREW COMBE, M.D.

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"Nor is it left *arbitrary*, at the will and pleasure of every man, to do as he *list*; after the dictates of a depraved *humour* and extravagant *phancy* to live at what rate he pleaseth: but every one is bound to observe the *Injunctions* and *Law of Nature*, upon the penalty of forfeiting their *health*, *strength*, and *liberty* —the true and long enjoyment of themselves."—MAYNWAYRINGE.

WITH FIFTEEN WOODCUTS.

TWELFTH EDITION,
FOURTH IMPRESSION.

EDINBURGH:
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AND ALL BOOKSELLERS.

1847.

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CONTENTS.

WOODCUTS.

PREFACE TO THE PEOPLE'S EDITION.

When the present work was first published in 1834, it was warmly recommended to general attention by the Quarterly Journal of Education, on the ground that the physiological exposition embodied in its pages applied "most admirably to persons of all conditions, and to every variety of situation," and was thus calculated to benefit "the whole community." Such was unquestionably the aim with which the volume was written; and the favourable reception which it has met with, shews that the Reviewer's estimate of its utility has, to some extent at least, been borne out by public opinion.

With the view of removing as much as possible a chief obstacle to the work obtaining a circulation somewhat proportioned to the extent of the want it was designed to supply, it has hitherto been published in the form of a neat closely printed volume, at about half the cost of most books, or one-fourth of that of an ordinary novel, containing an equal quantity of letter-press. The result has been such as not only to confirm, in the strongest manner, the high estimate I had formed of the importance of physiology, but to demonstrate the readiness of the public to welcome a plain exposition of its nature and applications; for already, in the course of nine years, sixteen thousand copies have been exhausted in this country alone. But great beyond expectation as this success has been, and widely as the work has, in consequence, become diffused, there is reason to believe that it still remains almost inaccessible to thousands in the humbler walks of life, who, correctly appreciating the value of physiology, desire to avail themselves of its aid in the improved management of themselves and their families. Under this conviction I began, about five years ago, to prepare a still cheaper edition for publication; but obstacles, arising partly from infirm health and partly from personal considerations which it is unnecessary to detail, came in the way, and it is only now that their partial removal has allowed me to fulfil my intention, and to offer the present, or "People's Edition," with all the improvements I have been able to effect on it, at one-third of the original cost of the work.

That, in this form, the work will prove an acceptable and useful guide to many among the industrious classes of society, seems to me not improbable, from the fact that, in the United States of America, with a smaller population than our own, upwards of 30,000 copies of a very imperfect edition, published without my sanction, and at the higher price of 75 cents, or three shillings, were exhausted within the first six years. The very extent of such a sale appears to warrant the inference, that a large proportion of the purchasers must have been among the working classes; while the steady demand which still exists for two improved and neat editions, more recently published in that country, affords a presumption that the interest felt in the book has not been the result of a temporary fit of enthusiasm, but has proceeded from a sense of the inherent importance of the subject of which it treats.

In a general as well as a personal point of view, the favour with which the work has been received has been very gratifying, because it affords an instructive example how rapidly the public mind can advance in the appreciation of useful truths even in the face of strong and long-cherished prejudices. Ten years ago, the proposition that physiology should constitute a part of general education, was received by most persons with ridicule or doubt, and by very many with absolute disgust. Of late, on the contrary, opinion has been almost unanimous in its favour, and allusions to the doctrines and usefulness of physiology meet us on every side. In accordance with this, its laws are now frequently referred to by men of philosophic minds, as the standards by which every proposition for the physical, social, or moral improvement of man ought to be tested. This happy change is likely to be progressive, because it has arisen from the gradual diffusion of sounder ideas, and from the preference instinctively felt for useful truths, when once clearly presented to the understanding.

That, progress is really making in a right direction, may further be inferred from the numerous examples every day presenting themselves, of the successful application of physiological principle to the promotion of human improvement. Among many others, I may refer to the pains taken and the expense incurred by Government in the proper ventilation, lighting, and heating of the new Houses of Parliament, and many of the public Offices and Hospitals; to the recent official investigation into the means required for promoting health in large towns; to the attention now devoted to secure an improved construction of houses, a better supply of water, more thorough draining, and a more adequate supply of the necessaries and comforts of life, as well as a proper system of education and moral training, for the labouring poor; and lastly, to the special provision so carefully

and intelligently made in the army and navy, for the health, morality, and comfort of the men. All these and many other examples afford striking proofs of the extent to which a perception of the influence of the laws of physiology is beginning to pervade the more enlightened portion of the community; and warrant the hope that a much higher degree of improvement may yet be reached by the wider diffusion and application of physiological knowledge than is at present generally expected. To effect this, however, not only parents and the teachers of the young, but the young themselves, of all ranks and both sexes, must be made familiar, at an early age, with the nature of their own organization, and *trained by example*, as well as by precept, to the practical observance of the laws by which their functions are regulated.

It is with a strong wish to contribute all in my power to this most desirable end, that I am anxious to place this volume within the reach of every class, and especially of the many parents and teachers, both male and female, who have never enjoyed an opportunity of acquiring correct information regarding the physical and mental constitution of man, and who, with the very best intentions, and the strongest desire to discharge their duty, often fall involuntarily into error from the want of it. Even with every aid, the task of the educator is not less arduous than important; and if his success does not always correspond to the zeal, talent, and industry which he brings to its performance, the cause is to be looked for in the prevailing ignorance of the nature of man, far more than in any deficiency peculiar to the individual. Every experienced medical man must be familiar with cases where efforts which, under the guidance of physiological knowledge, would have secured the richest harvest of results, have either been expended in vain, or even been productive of direct, and sometimes permanent, injury to the pupil. To parents and teachers, then, this volume is offered, in the hope that it may afford them both aid and comfort. That it is far from sufficient to satisfy all their wants, no one is better aware than its author; but it may nevertheless, in the absence of a better, help to guide them in a right direction, and enable them to pursue their important labours with increased credit and success. But it is right to warn them beforehand, that the benefit to be derived from the following pages must depend mainly on the spirit in which they are perused. The subjects treated of embrace so many important facts and principles of action, which are comparatively new to the general reader, that it is only by their careful and frequent study that he can become sufficiently familiar with them to avail himself of the applications of which they are capable, to the purposes of self-education and improvement, and to the preservation or recovery of health. To read merely as one reads a novel or a newspaper, can be productive of but little solid or permanent advantage; and therefore, while I value highly the grateful tribute implied in *endeavouring to act* (it may be, in silence) upon the principles I have unfolded, I feel indifferent to even the most eloquent and laboured eulogium, when it is not accompanied by any practical results. I am the more anxious to enforce this view, because many will, I believe, read with increased interest and advantage after their attention has been thus earnestly directed in the very outset to the practical character and aim of the work.

EDINBURGH, 25 RUTLAND STREET,
November 1843.

NOTE.—Since the date of the above Preface, three impressions, amounting in all to eleven thousand copies, of the People's Edition have been sold, and already a fourth impression is required. This success is in every way gratifying, and shews that, in my hope of a favourable reception for the work in its present form, I was not misled by partiality for a favourite subject. I have only to add, that, with a view to carry out still farther the objects mentioned in the Preface, People's Editions of my works on *Digestion and Diet*, and on *The Management of Infancy*, have also been published in a still more convenient form, and been received with a degree of favour which not only amply rewards me for all the pains bestowed on their preparation, but proves the deep interest which such subjects are calculated to excite in the public mind, when their importance is once fairly understood.

EDINBURGH, 1*st August* 1847.

THE

PRINCIPLES OF PHYSIOLOGY

APPLIED TO THE IMPROVEMENT OF

PHYSICAL, INTELLECTUAL, AND MORAL EDUCATION

CHAPTER I.

INTRODUCTORY REMARKS.

Objects of the present volume.—Functions to be treated of.—Digestion considered in a separate work.—Guiding principle laid down, and its importance shewn.—Evils of ignorance.—Objections to physiological knowledge answered.—Testimonies to its practical usefulness.

THE object of the present volume is to lay before the public a plain and intelligible description of the structure and uses of some of the more important organs of the human body, and to shew how information of this kind may be usefully applied both to the preservation of health, and to the improvement of physical, intellectual, and moral education. In selecting the functions to be treated of, I have preferred to examine those which, while they are the most influential in their operation on the general system, are, at the same time, the most easily understood, and the most directly under our own control. On the present occasion, however, I have, on due consideration, omitted all mention of the digestive organs, although both grounds of preference apply to them in an eminent degree. To have treated of them in a manner proportioned to their extensive influence in the animal economy, would have involved an amount of detail incompatible with the limits of a volume in which other important subjects necessarily fall to be discussed; while to have passed them over altogether would have been to leave unfulfilled one of the principal purposes for which I took up my pen. The only remaining alternative was, to treat of them in a separate volume of the same plain and practical character as the present. I have accordingly done so; and, judging from the success which has attended that work,* I infer that I have neither greatly erred in the resolution which I have adopted, nor miscalculated the value of the information which it was my object to disseminate.

In soliciting attention, as I have done in the following pages, to the manifold applications which may be made of the principles of physiology to the prevention of suffering, and the furtherance of human improvement, it has been my constant endeavour to exhibit the relation subsisting between the rules of conduct which I have occasion to recommend, and the particular laws of the organization according to which their influence is exerted, that the recommendation itself may rest, as far as possible, on the foundation of nature, and not on the doubtful authority of any individual. Many of the valuable treatises which have already appeared on the subjects of health and of education, seem to me to have failed in making an adequate impression on the public mind, chiefly from this basis not having been brought sufficiently into view; and thus not only have the evils arising from defective education been unjustly and invidiously charged against education itself, but the most opposite methods have been advocated and practised with equal earnestness and plausibility, where a direct reference to the laws of the organization would at once have revealed the source of the contradiction and afforded a protection against its occurrence.

It has been objected, that to teach any one how to take care of his own health is sure to do harm, by making him constantly think of this and the other precaution, to the utter sacrifice of every noble and generous feeling, and to the certain production of hypochondriacal peevishness and discontent. The result, however, is exactly the reverse; and it would be a singular anomaly in the constitution of the moral world were it otherwise. He who is instructed in, and familiar with, grammar and orthography, writes and spells so easily and accurately as scarcely to be conscious of attending to the rules by which he is guided; while he, on the contrary, who is not instructed in either, and knows not how to arrange his sentences, toils at the task, and sighs at every line. The same principle holds in regard to health. He who is acquainted with the general constitution of the human body, and with the laws which regulate its action, sees at once his true position when exposed to the causes of disease, decides what ought to be done, and thereafter feels himself at liberty to devote his undivided attention to the calls of higher duties. But it is far otherwise with the person who is destitute of this information. Uncertain of the nature and extent of the danger, he knows not to which hand to turn for safety, and either lives in the fear of mortal disease, or, in his ignorance, resorts to irrational and hurtful precautions, to the certain neglect of those which he ought to use. It is ignorance, therefore, and not knowledge, which renders an individual full of fancies and apprehensions, and robs him of his usefulness. It would be a stigma on the Creator's wisdom if true knowledge weakened the understanding and led to injurious results. And, accordingly, the genuine hypochondriac, whose blind credulity leads him to the implicit adoption of every monstrous specific, is not the person who has gained wholesome knowledge by patient study in the field of nature; but he, and he alone, who has derived his notions of the human constitution, and of the laws of nature, from the obscure recesses of his own unenlightened imagination.

Those who have had the most extensive opportunities of forming an opinion on this subject from experience, bear unequivocal testimony to the advantages which knowledge confers in saving health and life, time, and anxiety. Thus, Dr Beddoes, in alluding to the delicate constitutions of females of the higher ranks in this country, remarks, that he cannot "conceive how they can be rendered more hardy or *less nervous*, if that term is preferred, otherwise than by being seasonably taught the *principles* of self-management;" and adds, that he specifies "the principles," because "little good can be expected unless we proceed as in other instances where we exhibit to sense that connection between cause and ef-

* Already nearly *six thousand* copies of this work have been sold. It is entitled, The Physiology of Digestion, considered with reference to the Principles of Dietetics, 1 vol. post 8vo, with twelve illustrative woodcuts.

fect which constitutes the order of nature" (p. 26). In like manner, Dr Davies, of the East India Company's Depot at Chatham, distinctly states, that the man of mature age, who has been some years at a trade before enlisting, and who has consequently gained some knowledge of his own constitution, always makes the most valuable soldier, because "he not only conforms with more ease to the system of diet and restraint necessary to subordination, but, having more experience, he is *more observant of health, learns sooner how to take care of himself, to avoid or diminish causes of disease, and, when ill, he gives more aid in bringing about a state of convalescence.*" Dr Davies adds afterwards, that this "*knowing how to manage* is an *invaluable qualification* to a soldier embarking for service in a tropical climate;" and if it is invaluable to the soldier, it is assuredly not less safe and advantageous to the civilian.

If, indeed, ignorance were itself a preventive of the danger, or could provide a remedy when it approached, then it might well be said that "ignorance is bliss;" but as it gives only the kind of security which shutting the eyes affords against the dangers of a precipice, and consequently leaves its victim doubly exposed, it is high time to renounce its friendship and protection, and to seek those of a more powerful and beneficent ally. If ignorance could divest us even of the sense of anxiety attending the apprehension of evil, the consequent tranquillity of mind, deceptive though it were, would be at least some compensation for submitting to its rule. But, unhappily, so far from ignorance of the nature and extent of the threatening danger saving us from gloomy anticipations, the fact is notoriously the reverse; for the darkest picture ever drawn is assuredly that delineated by an ill-directed imagination. Every medical man can testify that, natural character and other circumstances being alike, those whose knowledge is the most limited are the fullest of whims and fancies, the most alarmed at every trifling ailment, the most credulous respecting the efficacy of every senseless and preposterous remedy, the most impatient of restraint, and the most discontented at suffering. There are some, no doubt, whose constitutional sensibility prevents them ever controlling their feelings, or being guided by the dictates of reason; but such persons are comparatively few in number, and even they become more tractable as well as more comfortable in spirit, when their minds are enlightened, and their true situation is distinctly understood.

If any of my readers be still doubtful of the propriety or safety of communicating physiological knowledge to the public at large, and think that ignorance is in all circumstances to be preferred, I would beg to ask him whether it was knowledge or ignorance which induced the poorer classes in every country of Asia and of Europe to attempt to protect themselves from cholera, by committing outrages on the medical attendants of the sick, under the plea of their having poisoned the public fountains? And whether it was ignorance or knowledge which prompted the more rational part of the community to seek safety in increased attention to proper food, warmth, cleanliness, and clothing? In both classes, the desire of safety and the sense of danger were the same, but the modes resorted to by each were as different in kind as in result: the efficiency of the one having formed a glaring contrast to the failure of the other.

In thus strongly advocating the benefits to be obtained by the wide diffusion of a general knowledge of the laws of health, I must, however, express my belief that the study of *diseases*, and their modes of cure, by unprofessional persons is not only unprofitable, but often deeply injurious—just because such persons cannot possibly possess the collateral knowledge required to form a correct judgment of all the attending circumstances, and are therefore extremely liable to fall into error, where every error is attended with risk. Let us suppose, for example, what I have seen and what has often happened, that a person of an apprehensive disposition, who has been occasionally subject to palpitation, takes up a medical treatise, and there finds that palpitation is a symptom commonly present where the heart is diseased. It is almost certain that such a person will, in his ignorance, make no farther distinction, but hurry at once to the conclusion that his own heart is affected, and that he must speedily die. The notion being once implanted in his mind, he will become anxious and watchful of every sensation, deny himself necessary exercise from fear of over-exertion, and necessary food from fear of a bloodvessel giving way, and in no long time will fall into a state of weakness and disease which will confirm every one of his apprehensions. But had this individual, instead of acting on his own *imperfect* knowledge, consulted his medical adviser, whose business it is to make himself acquainted with the *whole* of the case, he would have discovered immediately that the dreaded source of all this suffering was originally a simple fit of indigestion, which nature would have cured in three days, had not the machine been so perversely deranged by the very want of exercise and food, in which the patient was ignorantly seeking for safety. Even here, be it observed, the danger arises from the *incompleteness* of the knowledge possessed; and I would condemn the perusal of medical books only because the general reader cannot, except by going through a course of professional study, become qualified to make a proper use of their contents. And accordingly it is well known that few students escape fits of hypochondriacal apprehension when they first seriously enter on the study of diseases; and that they become free from them almost in proportion as their knowledge advances. It is then a most fallacious mode of arguing to contend that, because an imperfect acquaintance with disease is hurtful, a knowledge of the conditions and laws of health must, therefore, be also prejudicial.

CHAPTER II.

NATURE AND USES OF PHYSIOLOGY.

Physiology, Vegetable, Comparative, and Human.—Animate and Inanimate Bodies.—Objects of Physiology.—Usefulness of Physiological knowledge.—Illustrations.—Physiology ought to be a branch of general education.—Much suffering arises from its omission.—Proofs and examples of this in infancy, in general society, on ship-board, in factories, and in Parliament.—Leonard Horner's evidence.—Medical men blameable for the omission—dangerous fallacies arising out of it.—Physiological knowledge necessary for understanding the causes and cure of disease.—The author's case a good example of its utility in promoting recovery.—Slow origin of chronic diseases in continued neglect of the organic laws—their cure by continued obedience to them.—Practical uses of physiology overlooked even in medical education—great injury thence arising.—Causes of this oversight.—Quaint description of health and its value.—Physiology the basis of all educational measures, and therefore indispensable to teachers and parents.

PHYSIOLOGY, from φυσις, *nature*, and λογος, *discourse*, signifies literally a discourse about natural powers, but, as now used, it applies exclusively to the doctrine of the uses or functions of the different constituent parts of beings endowed with the principle of life. As applied to the vegetable kingdom, it is called *Vegetable* Physiology; to the lower animals, *Comparative* Physiology; and to man, *Human* Physiology. In all of these instances, however, the objects of physiology are the same, viz. to unfold the mechanism and laws by which the various functions which characterize living bodies are carried on, and to explain the manner in which each species is fitted for the particular sphere of action in which the Creator intended it to exist.

The grand mark of distinction between animate and inanimate bodies, is to be found in the different rela-

tions in which they stand to the ordinary laws of the material world. Inanimate or inorganized bodies, such as a mineral or a metal, have no internal power of action, and of themselves can effect no change. Possessed of certain fixed and invariable properties, they stand uniformly in the same relation to each other, and act invariably according to the same general laws, so that what is once ascertained of them can be predicted with certainty to hold true for ever after; and therefore, in conducting our investigations, we know that the same effects will always follow the same causes with mathematical precision. But when the same elementary material becomes part of a living body, this rule no longer holds; the laws of chemical and physical action are greatly modified, or for a time counteracted. The now organized matter, having entered into new relations with other organized matter, henceforth obeys the laws of vegetable or animal life, and is not again subjected to those of purely chemical action, till it is either eliminated from the body, or till life is extinct; and, in point of fact, the putrefaction which instantly follows the extinction of the vital principle is neither more nor less than the ordinary laws of inanimate matter resuming their dominion when no longer opposed by a higher power.

An example or two will render the difference more apparent. All bodies gravitate towards the earth, according to a constant and well-known law. But animals are able to resist this law, so far as to preserve an attitude at variance with its tendency, or even to rise, like the eagle, many thousand feet in the air in opposition to their natural weight; but on the extinction of life they lose this power, and again become subject to the full influence of gravitation. In the same way many animals preserve an elevated and steady temperature, whether exposed to severe cold or to excessive heat; but, when life ceases, rapidly assume that of the objects by which they are surrounded. A human being may, for instance, be exposed to the intensest cold of the Polar regions without having his own internal temperature reduced by a single degree, so long as life endures; but, from the moment when life ceases, the heat which is lost is no longer replaced, and consequently his body becomes in a short time frozen and stiff like the other inanimate masses by which it is surrounded.

Here, then, is a grand boundary-line dividing the organized from the inorganized, the animate from the inanimate body. Chemistry and natural philosophy investigate the laws and conditions which regulate the action and movements of inanimate or inorganized objects; but, from what we have seen of the power of the vital principle in modifying these, it will be manifest that, however extensive and accurate our knowledge of the properties of the elementary materials of living bodies, considered separately, may be, we can thence infer nothing in regard to the qualities of the animal compound when endowed with life, but must resort to observation and study for the discovery of the conditions by which life is characterized, and under which it is carried on.

Physiology, or the history of the functions which characterize *living* beings, is thus a subject of peculiar interest; and human physiology, or that which is about to engage our attention, is as important in its practical consequences as it is attractive to rational curiosity. In its widest sense it comprehends an exposition of the functions of the various organs of which the human frame is composed; of the mechanism by which these are carried on; of their relations to each other; of the means of improving their development and action; of the purposes to which they ought severally to be directed; and of the manner in which exercise ought to be conducted, so as to secure for the organ the best health, and for the function the highest efficiency. A true system of physiology comes thus to be the proper basis, not only of a sound physical, but of a sound moral and intellectual education, and of a rational hygiène; or, in other words, it is the basis of every thing having for its object the physical and mental health and moral improvement of man: for so long as life lasts, the mental and moral powers with which he is endowed manifest themselves through the medium of organization, and no plan which he can devise for their cultivation, that is not in harmony with the laws which regulate that organization, can possibly be successful.

But, besides the power of resisting the operation of the ordinary chemical and physical laws, living bodies are distinguished by other properties peculiar to themselves. Unlike inorganized matter, which exists in the same form from the beginning, bodies endowed with the principle of life derive their origin from previously existing living bodies of the same nature as themselves; and they in their turn give birth to others, and in this way the succession is kept up. Unlike the inert material which retains its properties unaltered throughout endless ages, the living body is constantly undergoing changes from the first to the last moment of its existence; and these are exemplified, on the large scale, in the great stages of youth, maturity, old age, and death. Unlike inorganized matter, which neither grows nor decays, living bodies require a constant supply of nourishment to admit of their growth in youth, and to replace the worn-out particles which are regularly thrown off at every period of life; and unlike inanimate objects, the properties of which never alter, living bodies cease at last to exist, and their component elements, deprived of the principle of life, again become wholly subject to the ordinary laws of matter, and are speedily decomposed and scattered about, as if life had never been. The above properties, it may be observed, are common to vegetable and animal life; but animals possess others peculiar to themselves. Among the most remarkable of these are sensation, thought, voluntary motion, and the faculty of communicating to each other their thoughts and feelings through the medium of natural or artificial language. These are grand marks of distinction, and, considered in a general point of view, amply suffice to divide the two great classes of animated beings; for, while some animals exhibit individual powers in higher perfection, man stands far their superior, not only in combining in his own person all the senses and faculties which they possess, but in being endowed with moral and intellectual powers which are denied to them, and which at once place him at the head of the living creation, and constitute him a moral, religious, intelligent, and responsible being.

So numerous and important are the various organs of which the human frame is composed, and so closely are they linked with each other in their action, that, in treating of them, it is difficult, or rather impossible, to follow any arrangement which shall not involve considerable repetition, or which shall admit of every statement being at first fully understood. On the present occasion, however, a systematic mode of proceeding is not essential, my object being merely to communicate a general knowledge of some of the more important functions, partly with a view to the direct practical purposes to which such information may be applied, and partly for the sake of rousing public attention to the necessity of including this branch of science in every plan of what is called a liberal education.

Let it not be said that knowledge of this description is superfluous to the unprofessional reader; for society groans under the load of suffering inflicted by causes susceptible of removal, but left in operation in consequence of the prevailing ignorance of our own structure, and of the relations of the different parts of the system to each other and to external objects. Whether we consider the pressing evils to which many of the working classes are habitually exposed in the exercise of their various trades, without any attempt being made to ap-

ply the resources of knowledge to their relief or protection; or whether we contemplate the thousand forms in which the seeds of disease are allowed to be scattered about, especially in our larger towns, when even a small amount of physiological knowledge among the public would almost ensure their speedy removal, we cannot but feel greatly surprised that so little should have been done, during so long a time, to dissipate that ignorance from which, not the poor alone, but the noble and the wealthy, have often extensively suffered. In this respect, professional men have, I fear, been much to blame. They alone were the possessors of the knowledge required, and they alone could fully appreciate its value; and yet they have rarely made any effort either to diffuse it more widely or to rouse attention to its importance. The consequence has been, that every medical man must have felt and lamented, even while he was in some degree blamable for, the ignorance so generally prevalent in regard to the simplest functions of the animal system, and its necessary consequence—the absence of the judicious co-operation of friends in the care and cure of the sick; and that in the sufferings of even his own family and friends he must often have been punished for the physiological ignorance which he allowed to prevail around him.

It is from the same ignorance of the commonest facts in the constitution of the human body, and of the influence of external conditions upon its various functions, that we meet with so many men—among our legislators, for instance—of much good sense and information in every other respect, who not only subject themselves unwittingly to the active causes of disease, but give their sanction to laws and practices destructive equally to life and morality, and which, if they saw them in their true light, they would shrink from countenancing in the slightest degree. As one striking example, I may refer to a law which exists, or lately existed, in France, by which infants must be taken within a very short time after being born to the office of the *Maire*, if it is wished to have their births registered. But there is another law, written by the finger of the Creator on the very constitution of the infant being, with which this enactment is directly at variance; and, in consequence of this higher law, the infant is found to be incapable of bearing exposure to a low temperature without injury. The result is, that in winter, especially in places where the *Maire* resides at a distance, and where, consequently, the exposure is increased, a greater mortality takes place than is observed among infants placed under more favourable circumstances. Had the nature of the living functions been generally understood by the framers of such a law, it is obvious that it could never have been enacted; for to have done so knowingly would have been in substance to legalize infanticide.

In the preceding editions of this work I mentioned another instructive instance of the dangers arising from thus excluding even the simplest notions of physiology from common education. It was that of the death of two young men on board of the Magnus Troil in Leith harbour, in March 1833, arising from suffocation. They had gone to bed in the cabin as usual, but had shut the door so closely on account of the cold, that they were found in the morning the one dead and the other dying from mere want of air. Since that time, I have read in the newspapers of the day, accounts of six accidents precisely similar in every particular. The two last, in which two fine young men also perished, happened in the cabin of the sloop Mary Hardie, lying in Greenock harbour, in November 1840, from which it is manifest that such occurrences are by no means unfrequent. And yet it is quite clear that, had these unfortunate victims been made acquainted at school, even in a very general way, with the nature of the atmosphere, and with the relation of its elements to the function of respiration, they would have seen too clearly the danger of shutting themselves up in such a confined space, ever to have risked their lives in the way they did. A constant supply of pure air is indispensable to the formation of proper blood in the lungs, and consequently to the preservation of life and the wellbeing of the whole body; but formerly, when this condition was as little known or regarded as it was by these seamen, many persons were shut up together in small ill-ventilated rooms in schools, jails, and hospitals, and the natural result was a degree of mortality from fevers and other diseases, which, now that the laws of respiration are better known and more attended to, is never heard of.

For additional evidence of the evils arising to society from the neglect of physiological knowledge as a constituent part of a good education, I might refer to the lamentable ignorance displayed in Parliament, even by very intelligent and well-educated men, during the frequent discussions on the regulation of infant labour in factories and mills. But as I shall have occasion to touch upon this subject more than once in the subsequent chapters, I shall now only remark, that, previous to 1833, the law authorized the working of children between the years of eight and sixteen, in the close-heated atmosphere of a cotton-mill, for twelve hours a-day; and that as a great boon, by the Factories' Regulation Bill passed in that year, no children are now employed under nine years of age, while between that and fourteen the period of daily labour is not to exceed eight hours. Had our legislators been instructed in anatomy and physiology so far as to obtain even the most general notion of the constitution of the human body, and had they been aware of the intimate dependence of the mind on the condition of the bodily organization, they would at once have perceived the destructive tendency of the former system of labour and confinement, and the utter impossibility of combining with it that moral and intellectual cultivation which is so imperatively required. Instead of objecting to the limitation when it was proposed, they would have looked forward with dread to the physical and moral degradation which the system then in operation was fast effecting in the multitudes under its influence; and their only doubt would have been, whether even *eight* hours' labour in a close atmosphere was not too much for undeveloped children, and was not incompatible with that efficient moral and general training in the domestic circle, which is indispensable to the development of our best feelings, and, consequently, to the formation of peaceful, moral, and intelligent citizens. The evidence in the printed Parliamentary report is said to have been partially got up; but granting that it was so, it nevertheless contains a multitude of facts so entirely in accordance with the soundest and best understood principles in physiology, and which no counter-evidence can rebut, that one can only lament the ignorance which prevented many able and benevolent but prejudiced men from perceiving its true character, and yielding so far to the imperious dictates of nature and of duty as to legislate at once and effectively for the protection of the young. That there were great difficulties in the way of every alteration is quite true; but surely no question of mere gain to any or to every class ought to be allowed to stand *for ever* in the way, when the lives and happiness of multitudes of our fellow-creatures, and the tranquillity and real prosperity of the country, are at stake. Unless we *begin* somewhere, how can any improvement ever be accomplished?

Since the preceding remarks were first published in the earlier editions of the present work, I have been delighted to find from Mr Leonard Horner's recently published pamphlet,* that all the ominous predictions of ruin and misery made by many of the manufacturers, when contending against any legislative interference for the purpose of limiting the working hours of the children, have been entirely falsified, and that, after a seven years' trial, most of them are now satisfied that the law

* On the Employment of Children in Factories and other works. Longman and Co., 1840.

has been *beneficial even to themselves*. Thus it will always be when we enter upon a right course.

It would be easy to multiply to an indefinite extent similar examples of hurtful ignorance among both public bodies and private individuals; but as many of them will be mentioned incidentally when treating of the special functions of the animal economy, it is unnecessary to dwell farther upon them at present.

We are constantly meeting with anomalies in practical life, in the case of individuals little accustomed, when in health, to observe or to reflect on the influence of external circumstances and modes of living in disturbing the actions of the various animal functions, but at the same time easily and deeply impressed by all *extraordinary* occurrences affecting them. Thus, when any one is taken ill, his relatives or friends become extremely anxious to have his room properly ventilated; his body-clothes frequently changed and carefully aired; his food properly regulated in quantity and quality; his skin cleaned and refreshed; his mind amused and tranquillized; his sleep sound and undisturbed; and his body duly exercised;—and they state as the reason for all this care, and most justly, that pure air, cleanliness, attention to diet, cheerfulness, regular exercise, and sound sleep, are all highly conducive to health. And yet such is the inconsistency attendant on ignorance, that the patient is no sooner restored, than both he and his guardians are often found to become as careless and indifferent in regard to all the laws of health, as if these were entirely without influence, and their future breach or observance could in no way affect him! Just as if it were not better, by a rational exercise of judgment, to preserve health when we have it, than first to lose it, and then pay the penalty in suffering and danger, as an indispensable preliminary to its subsequent restoration!

One cause of such anomalous conduct is the dangerous and prevalent fallacy of supposing that, because glaring mischief does not *instantly* follow every breach of an organic law, no harm has been done. Thus, what is more common than to hear a dyspeptic invalid, who seeks to gratify his palate, affirm, that vegetables, for example, or pastry, or puddings, do not disagree with him, as he ate them on such a day and felt no inconvenience from them? and the same in regard to late hours, heated rooms, insufficient clothing, and all other sources of bad health, every one of which will, in like manner, be defended by some patient or other, on the ground that he experienced no injury from them on a *certain specified occasion*; while all, when the rule is not directly applied to themselves, will readily admit that, in the case of others, such things are, and *must be*, very hurtful.

Happy would it often be for suffering man could he see beforehand the modicum of punishment which his multiplied aberrations from the laws of physiology are sure to bring upon him. But as, in the great majority of instances, the breach of the law is limited in extent, and becomes serious only by the frequency of its repetition; so is the punishment gradual in its infliction, and slow in manifesting its accumulated effect; and this very gradation, and the distance of time at which the full effect is produced, are the reasons why man in his ignorance so often fails to trace the connection between his conduct in life and his broken health. But the connection subsists although he does not regard it, and the accumulated consequences come upon him when he least expects them.

Thus, pure air is essential to the full enjoyment of health, and reason shews that every degree of vitiation must necessarily be *proportionally* hurtful, till we arrive at that degree at which, from its excess, the continuance of life becomes impossible. When we state this fact to a delicately constituted female, who is fond of frequenting heated rooms, or crowded parties, theatres, or churches, and call her attention to the hurtful consequences which she must inflict on herself by inhaling the vitiated air of such assemblies, her answer invariably is, that the closeness and heat are very disagreeable, but that they rarely injure *her*:—By which she can only mean, that a single exposure to them does not always cause an illness serious enough to send her to bed, or excite acute pain; although both results are admitted sometimes to have followed. An intelligent observer, however, has no difficulty in perceiving that they *do* hurt her, and that although the effect of each exposure to their influence is so gradual as not to arrest attention, it is not the less progressive and influential in producing and maintaining that general delicacy of health by which she is characterized and from which no medical treatment can relieve her so long as its causes are left in active operation.

The debility so generally complained of in spring by invalids and persons of a delicate constitution, and which renders that season of the year so formidable in prospect and in reality so fatal, seems, in numerous instances, to result more from the accumulated effects of neglect during the preceding winter months, than from any thing directly inherent in the season itself. At the commencement of winter, such persons feel comparatively strong from the beneficial exposure to the open air, light, and exercise, which they enjoyed during the summer and autumnal months. But, in proportion as they are deprived of these advantages by the advance of winter, and are subjected to the evil consequences of confinement, deficient exercise, cold damp air, and deprivation of the stimulus of light, the strength of the constitution becomes impaired, and debility and relaxation begin to be felt, and make progress from day to day, till, on the arrival of spring, they have reached their maximum, and then either give rise to positive disease, or again gradually disappear on the return of the invigorating influence of longer and warmer days. Where, however, pulmonary disease or any unusual susceptibility pre-exists, this principle will not apply: for in such cases, the east winds prevalent in spring are directly injurious.

If the above view be correct, it is obvious that, in most cases, the hurtful cause is not, as is commonly supposed, so much any positive quality of the season, as the accumulated mass of the winter influences then reaching their maximum; and this is not perceived, only because the effect from day to day, although perfectly real, is too small to attract notice, while the aggregate result of the many days composing winter is striking enough. The fact that those who deny themselves the delight of late parties and crowded rooms, and are sufficiently robust to undergo the necessary exposure in winter, suffer much less in spring, seems to corroborate the above explanation.

Of the truth and practical value of the above doctrines, the author may be allowed to quote his own case, as an instructive example. In the autumn of 1831, he went to Italy in consequence of pulmonary disease; which, in January and February 1832, reduced him to such a state of debility as to leave no hope of his surviving the spring. Aware that his only chance lay in assisting nature to the utmost extent by placing every function in the circumstances best fitted for its healthy performance, he acted habitually on the principle of yielding the strictest obedience to the physiological laws and rendering every other object secondary to this. He did so, in the full assurance that, whether recovery followed or not, this was, at all events, the most certain way to secure the greatest bodily ease and the most perfect mental tranquillity compatible with his situation. The result was in the highest degree satisfactory. From being obliged to pause twice in getting out of bed, a slow but progressive improvement took place, and by long and steady perseverance continued till, at the end of two or three months, he was able to drive out and walk a little every day. From month to month thereafter, the amendment was so gradual as to be scarcely perceptible

but, at the end of a longer period, the difference was striking enough. Thus encouraged, the author continued true to his own principles, and in resisting every temptation to which improving health exposed him; and the ultimate result has been that every successive year from 1832 up to the present time, 1841, has, with one or two exceptions, found him more healthy and vigorous than before, and that many of his professional friends, who long regarded his partial convalescence as destined to be of very brief duration, cannot yet refrain from an expression of surprise on observing it to be still perceptibly advancing at the end of ten years.

The author now publishes this example, both because, as an illustration of the advantages of acting in accordance with the laws of our nature, it is as instructive as any with which he is acquainted, and because it strikingly shews the gradual accumulation of almost imperceptible influences operating surely though slowly in restoring him to a degree of health and enjoyment which has richly repaid him for all its attendant privations. Had he not been fully aware of the gravity of his own situation, and, from previous knowledge of the admirable adaptation of the physiological laws to carry on the machinery of life, disposed to place implicit reliance on the superior advantages of fulfilling them as the direct dictates of Divine Wisdom, he never would have been able to persevere in the course chalked out for him, with that ready and long enduring regularity and cheerfulness which have contributed so much to their successful fulfilment and results. And, therefore, he feels himself entitled to call upon those who, impatient at the slowness of their progress, are apt after a time to disregard all restrictions, to take a sounder view of their true position, to make themselves acquainted with the real dictates of the organic laws, and, having done so, to yield them full, implicit, and persevering obedience, in the certain assurance that they will reap their reward in renewed health, if recovery be still possible; and if not, that they will thereby obtain more peace of mind and bodily ease than by any other means which they can use.

From the preceding explanation of the slow but gradually increasing effect of both noxious and healthful influences on the human body, it is obvious that while we cannot infer from a single application of a remedy or single fulfilment of a physiological law being unproductive of an instantly perceptible result, that it is therefore of no use; neither ought we to infer that because a *single* excess of any kind does not produce a *direct* attack of disease, it is therefore necessarily harmless; for it is only when the noxious agent is very powerful indeed that its deleterious influence on the system becomes instantly sensible. In the great majority of situations to which man is exposed in social life, it is *the continued or the reiterated application of less powerful causes* which gradually, and often imperceptibly, unless to the vigilant eye, effects the change, and ruins the constitution before danger is dreamt of; and hence the great mass of human ailments is of slow growth, and slow progress, and admits only of a slow cure. Whereas those which are suddenly induced by violent causes, are urgent in their nature and rapid in their course. And yet so little are we accustomed to trace diseased action to its true causes, and to distinguish between the essential and the accidental in the list of consequences, that, as already observed, if no glaring mischief has followed any particular practice, within at most twenty-four hours, nine out of ten individuals will be found to have come to the conclusion that it is perfectly harmless, even where it is capable of demonstration that the reverse is the fact.

The benevolence and wisdom of this arrangement are very conspicuous. There are many casual influences from the agency of which man will never be able entirely to protect himself. If they are speedily withdrawn from him, the slight disorder which they produce quickly ceases, and health remains essentially undisturbed. But, if they be left in operation for a considerable length of time, the derangement which they excite gradually and slowly increases, till at last a state of disease becomes established, which requires an equally long or longer period, and a steady observance of the laws of health, for its removal.

Such is the history of the rise and progress of most of the ailments which afflict the human family, and the source of the grand distinction between *acute* and *chronic* diseases. We are apt to wonder that a severe disease like inflammation should run its course in a few days, while dyspeptic and nervous ailments require months for their cure. But our wonder is diminished when we attend to the fact, that the one generally dates its rise from a strong cause applied within perhaps a few hours or a few days; while the others are the slow and gradual results of months or years of previous anxiety or neglect of dietetic rules and exercise, during which the ailment was maturing unnoticed and unsuspected. Had the real state of the matter been early perceived, and the causes been removed, the dyspeptic and the nervous invalids would have regained health and serenity in proportionally little time, and with proportionally little suffering. In such cases, Nature kindly allows some latitude of action free of serious penalty, as if on purpose to protect us from being hurt by such occasional exposure as we are necessarily subjected to by the ordinary vicissitudes of life; but it is always on condition of returning to obedience the moment the necessity is over. If we presume on the indulgence being permanent, the evil accumulates, and health is destroyed; but if we return in time to the right path, little inconvenience results. Where, however, the injurious influences are of a more energetic kind, equal latitude of exposure is obviously incompatible with safety. Were they not to enforce immediate notice, our corporeal organs might be irrecoverably altered by disease before we took the alarm, and it is therefore the purest benevolence to attach immediate suffering to them, in order to ensure that instant attention which alone can stay the rapidity of their progress.

In chronic or slowly arising diseases, then, the separation of the effect from its cause is only apparent and not real, and in practice it is essential to keep this in mind. A fit of insanity, for example, is often said to have come on *without any cause*, when, on minuter examination, causes can be easily traced operating through many previous months, only not of so violent a nature as to have at once upset reason, and the same will be found to hold in almost all those slow and insidious illnesses which so often baffle our best efforts; and although at present we cannot always discover their true origin, it is clear that we shall ultimately succeed much better if we believe them to have causes which *may* be found out, than if we regard them as mysteries which no study or attention can ever explain.

It is this apparent but unreal separation of the effect from its cause which has given rise to the variety of opinions entertained in regard to the qualities of the same agents, and which has, perhaps, tended more than any thing else to discourage rational regard to the means of preserving health; and yet this very variety is a proof at once of the absence of sound views of our own nature, and of the urgent necessity of possessing them. In society, accordingly, nothing is more common than to hear the most opposite opinions expressed in regard to the evils or advantages of particular kinds of clothing, food, and exercise. One person will affirm, with perfect sincerity, that flannel is pernicious, because it irritates the skin, and uniformly causes an eruption over the whole body; and that linen or cotton is an excellent article of dress, because it produces no such consequences. Another will tell us, with equal truth, that flannel is a capital thing, because it is pleasant to the feeling, and affords protection from cold and rheumatism, which linen does not. One will affirm that a long walk or violent muscular exercise is an excellent tonic, because it gives a keen

appetite, and a vivacity and alertness which are delightful. But another will declare that a long walk or severe exercise is exceedingly injurious and debilitating, because it destroys his appetite, and unfits him for exertion of mind or body, and always gives him headach. One will, in like manner, praise vegetables as the best diet, and another animal food as infinitely superior, and so on through the whole range of the physical objects which act upon the human frame; and the natural consequence of these apparent anomalies and contradictions is, that, when in health, we come practically to look upon the effects of air, food, exercise, and dress, as very much matters of chance, subject to no fixed rule, and therefore little worth attending to, except when carried to palpable extremes, or in the cure of disease.

In this way, man, instead of being able to protect his children by the results of his own experience in his journey through life, goes on from generation to generation, groping a little, then seeing a little, and then groping again, till he arrives, often prematurely, at the end of his existence, when he stumbles into his grave, leaving his posterity to pass unaided through the same series of experiments, and arrive at the same termination, as himself.

This unnatural result must arise either from the laws which regulate the animal functions and the operations of external objects being variable and ever changing, or from the conditions of the living body on which they act being different in different persons, or in the same person at different ages or seasons; and it is not difficult to determine to which of these it is to be ascribed. It cannot be the first, for the laws of nature are invariable and unbending. The food which to-day nourishes and sustains the body, and which to-morrow, when sickness is present, raises the pulse and excites the heart to febrile action, has not altered its qualities or changed its relation to the healthy body. It is the state of the body that has changed, and caused the apparent discrepancy of effect. In judging, therefore, of the propriety, advantages, or evils of exercise, food, and clothing, we must take into consideration not only the kind of exercise, the kind of food, and the kind of clothing, but also the age, health, and kind of constitution of the individual who uses them, and adapt each to the degree in which it is required; and then we may rest assured that many of our difficulties will vanish, and certainty and consistency come proportionally into view.

Were the intelligent classes of society better acquainted with the functions of the human body, and the laws by which they are regulated, many of these anomalies in practice would disappear; the sources of much suffering would be dried up, and the happiness of the community at large be essentially promoted. Medical men would no longer be consulted so exclusively for the *cure* of disease, but would also be called upon to advise regarding the best means of strengthening the constitution, from an early period, against any accidental or hereditary susceptibility which might be ascertained to exist. More attention would be paid to the *preservation* of health than is at present practicable, and the medical man would then be able to advise with increased effect, because he would be proportionally well understood, and his counsel, in so far at least as it was based on accurate observation and a right application of principles, would be perceived to be, not a mere human opinion, but in reality an exposition of the will and intentions of a beneficent Creator, and would therefore be felt as carrying with it an authority to which, as the mere dictum of a fallible fellow-creature, it can never be considered as entitled.

It is true that as yet medicine has been turned to little account in the way of directly promoting the physical and mental welfare of man. But the day is perhaps not far distant, when, in consequence of the improvements both in professional and in general education now in progress, a degree of interest will become attached to this application of its doctrines far surpassing what those who have not reflected on the subject will be able to imagine as justly belonging to it, but by no means exceeding that which it truly deserves. In allusion to these remarks it may be not uninstructive to notice, that, in the case of the lower animals, the necessity of modifying the method of cultivation according to the peculiarities of constitution which they present, has been long perceived and consistently acted on, and with such success as to afford us good reason for applying the same rule to our own species, and for considering every mode of education as erroneous and inefficient, which is not in harmony with the higher nature of man. The extent, indeed, to which, by following this plan, we can carry our influence over the lower animals, and secure the development and efficiency of almost every organ and quality which we desiderate, has often been the theme of admiration and surprise; and there can scarcely be a doubt that were the same principle followed in the cultivation of the physical, moral, and intellectual powers of man, and were no rule received which is not in accordance with the laws of his constitution, a much higher degree of success would reward our exertions than has ever yet been experienced.

The little regard which has hitherto been paid to the laws of the human constitution, as the true basis on which our attempts to improve the condition of man ought to rest, will be obvious from the fact, that notwithstanding the direct uses to which a knowledge of the conditions which regulate the healthy action of the bodily organs may be applied, in the prevention, detection, and treatment of disease, there is scarcely a medical school in this country in which any special provision is made for teaching it; the pupil being left to elaborate it for himself from amidst information communicated to him for other purposes. It is, therefore, only too true that "*preventive medicine*, the destined guardian of infancy, youth, manhood, and old age, adapted to the interior of families, has yet no existence."* In some of the foreign universities, indeed, chairs have been instituted for diffusing instruction of this description; and, in France, a Journal of Hygiène has existed for several years. But, in this country, with the exception of the London University, which, since the publication of the former editions of this work, has done itself honour by being the first institution in Britain to require an acquaintance with Hygiène from intending candidates for its diploma, the subject has never been treated with any thing like the regard which it assuredly deserves. In one point of view, indeed, the omission is not so extraordinary as it may at first sight appear. The prominent aim of medicine being to discriminate and to cure *disease*, both the teacher and the student naturally fix upon that as their chief object; and are consequently apt to overlook the indirect but substantial aid which an acquaintance with the laws of health is calculated to afford in restoring the sick, as well as in preserving the healthy from disease.

It is true that many medical men, sooner or later, work out this knowledge for themselves: but I have no hesitation in saying, that these are exceptions to the general rule, and that the greater number pass through life without a conception of its value in the prevention and cure of disease. Even those who ultimately become familiar with the subject almost always attain their knowledge only after having suffered from the want of it, and rarely master it so completely as they would have done had it been made a part of their elementary education, to which they saw others attach importance. In my own instance, it was only after having entered upon practice that I had first occasion to feel and to observe the evils arising from the ignorance which prevails in society in regard to it. Impressed afterwards more

* Lecture Introductory to a course of popular instruction on the constitution and management of the human body, by Dr Thomas Beddoes. 1797, p. 58.

deeply than ever with the interest and utility of the study, I contributed two or three articles on the subject to one of our periodical journals, and resolved to make them the basis of a more detailed and connected exposition, as soon as my own views should be matured by sufficient experience and reflection. This I have now attempted; not, I need scarcely add, with the view of making every man his own physician, or of recommending the general perusal of professional treatises—for both practices induce many more ailments than they cure; but simply with the hope that the method which I have followed, of connecting physiological details with practical applications, may be found useful and interesting to both the medical and the general reader.

The practical neglect of physiological knowledge in the training and education of the young, and especially of the professional student, seems to me to have arisen, to a great extent, from the unnatural separation of the different branches of medical science from each other by their cultivators and teachers, and the exclusive devotion of each to his own favourite department. The Anatomist, for example, teaches structure, and structure only, and refers to the Physiologist for an account of the uses to which it is subservient; and the Physiologist, on the other hand, expounds functions, but scarcely touches upon the instruments by which they are executed. The consequence is, that the student often becomes disgusted with what he considers dry anatomical details, when perhaps nothing would interest him more deeply were the purposes which the structure fulfils in the animal economy taught to him at the same time. Many, in like manner, fail to take any pleasure in the study of physiology, who would be truly delighted to hear the truths of which it treats expounded in connection with peculiarities of organization, and with more frequent reference to their practical applications. The Anatomist and Physiologist err, in short, in limiting themselves too exclusively to their own particular pursuits, and devoting too little attention to the relations which these bear to each other and to the great unit,—the living being, of which they form a part. So far, indeed, has this separation been carried, and so injurious is the habit thence arising of contemplating objects under the narrowest point of view, that I have known a very able teacher of physiology, in his public lectures, ridicule the very notion of laying down general rules for the preservation of health, and imagine that he set the matter entirely at rest by the simple assertion that *variety* is advantageous, and affirming that, therefore, *uniformity of obedience to any rules must be prejudicial*,—as if it were not of the very essence of general laws to be modified in their operation and results by the circumstances under which they act; and as if, because of such modifications, their influence might with safety be entirely neglected.*

The result of this erroneous system is, as already hinted, that the young practitioner is educated without having made himself sufficiently familiar with the conditions on which the *healthy* action of the animal economy depends, or having even rightly appreciated the importance of such knowledge; and that, consequently, in common with his patient, he not only neglects the important agency of hygienic influences in the cure of disease, but sometimes unwittingly allows the operation of morbid causes to go on without interference, where, by a timely warning on his part, serious illness might have been averted; or unconsciously permits the gradual ripening of hereditary tendencies into active disease, which rational precautions, early resorted to, might have kept in subjection throughout a long period of existence.

Some practitioners, I am aware, object to unprofessional persons attempting to make themselves acquainted with the structure or functions of the human body, and, in practice, think it best never to give any explanation to the patient of the principles on which it is proposed to conduct the treatment. But, generally speaking, it will be found that the cheerful co-operation of the patient is never so effectually secured as by addressing his understanding, and giving him an intelligible interest in what is proposed for his relief. In acute diseases, of course, explanation of any kind is often precluded. Here the professional man must act, and act with decision. But the great majority of ailments are of a chronic character, in the cure of which the steady co-operation of the patient is almost indispensable. And even when the malady is acute, the patient will submit to severe measures much more readily when ordered by an adviser who has been in the habit of addressing his reason when opportunity occurred, than when prescribed by one who has always followed the system of dictation.

So far from the rational care of health being justly chargeable with the imputation of selfishness, so often ignorantly thrown out against it, there is nothing which tends so much to relieve society from the burden of miseries not its own, as each individual taking such care of his constitution as shall enable him to cope successfully with the duties and difficulties of the situation in which he is placed. No man is so thoroughly selfish as he who, in the ardent pursuit of pleasure or of profit, heedlessly exposes his life to the hazard of a die, regardless of the suffering which he may entail upon those who depend on him for support. In the abstract, we all admit that the enjoyment of health is the first of earthly blessings, and that without it all others may be lavished in vain; and yet it has been quaintly asked, "Who is he that values *health* at the *rate* it is *worth?* Not *he* that hath it; he reckons it among the *common ordinary* enjoyments, and takes as *little notice* of it, or *less* regards it, than his long-*worn clothes:* perhaps more *careful of* his *garments*, remembering their *price;* but thinks his *health* costs him *nothing*, and coming to him at so easy a *rate*, values it accordingly, and hath little *regard* to keep it: is never truly sensible of what he *enjoyed* until he finds the *want* of it by *sickness;* then *health*, above *all things*, is earnestly desired and wished for."

In proportion, however, as we consider the matter with that attention which its importance really deserves, we shall become anxious rather to take care of health, when we have it, than first to lose it, and then exert ourselves to recover it. Such was evidently the feeling which elicited the following remarks from the same clear-sighted author.

"You that have health," says he, "and know not how to *prize* it, I'll tell you what it is, that you may love it better, put a higher *value* upon it, and endeavour to *preserve* it with a more *serious*, *stricter* observance and tuition.

"*Health* is *that* which makes your *meat* and *drink* both *savoury* and *pleasant*, else Nature's injunction of *eating* and *drinking* were a hard task and slavish custom.

"*Health* is *that* which makes your bed *easy* and your *sleep refreshing;* that revives your *strength* with the rising sun, and makes you *cheerful* at the light of another *day;* 'tis that which fills up the hollow and uneven places of your carcass, and makes your body *plump* and *comely;* 'tis that which *dresseth* you up in Nature's *richest attire*, and *adorns* your face with her *choicest* colours.

"'Tis *that* which makes *exercise* a *sport*, and walking abroad the enjoyment of your *liberty*.

"'Tis *that* which makes *fertile* and increaseth the natural *endowments* of your mind, and preserves them *long* from *decay*, makes your *wit* acute, and your *memory retentive*.

"'Tis *that* which supports the *fragility* of a corruptible body, and *preserves* the *verdure*, *vigour*, and *beauty* of youth.

"'Tis *that* which makes the *soul* take delight in her *mansion*, sporting herself at the casements of your eyes.

* The lecturer above alluded to afterwards changed his opinion so far as, not only to deliver a course of popular lectures on Physiology, but to publish in favour of its being considered an indispensable branch of general education.

"'Tis *that* which makes *pleasure* to be *pleasure*, and delights delightful, without which you can solace yourself in nothing of *terrene* felicities or enjoyments."

But "now take a view of yourself when *health* has turned its back upon you, and deserts your *company*; see then how the *scene* is changed, how you are robbed and spoiled of all your comforts and *enjoyments*.

"Sleep that was stretched out from *evening* to the *fair bright day*, is now broken into pieces, and *subdivided*, not worth the accounting; the *night* that before seemed *short* is now too *long*, and the downy bed presseth hard against the bones.

"*Exercise* is now *toyling*, and *walking abroad* the carrying of a *burthen*.

"The *eye* that flasht as lightning is now like the *opacous* body of a thick cloud; that rolled from *east* to *west*, swifter than a *celestial orb*, is now tired and weary with standing still;—that penetrated the *centre* of another *microcosm*, hath lost its planetary influence, and is become obtuse and dull," &c.

If such, then, be a true picture of the opposite conditions of health and disease, what stronger inducements can any one require to give him an interest in the "study and observance of Nature's institutions," seeing that they are the only means by which "the beloved ends and wished-for enjoyments" can be attained, and that we "may as likely keep or acquire *riches* by *prodigality*, as preserve *health* and obtain *long life* by *intemperance*, inordinate passions, a noxious air, and such like injurious customs, ways, and manner of living?"*

But it is not merely in preserving health and improving the physical condition of mankind, that physiology is calculated to prove eminently useful. It applies with at least equal force, and with still higher results, to the cultivation of the moral and intellectual nature of man, and in fact constitutes the only basis on which education can securely rest; and until this important truth be perceived and acted upon to its full extent, education will fall short in its beneficial results. So long as life continues, from the moment of birth to the hour of dissolution, the mind acts only through the medium of the living organization, and is directly influenced by every change in its state. In infancy, its powers are mobile and feeble, because the brain is as yet imperfectly developed and organized. In youth, its powers increase in readiness and vigour; because their material instruments have advanced so far towards maturity. In old age they again become feeble and wavering, from the gradual decay of the organization. In disease they are in like manner exalted or impaired by the excitement or oppression of the brain. Under the influence of wine they are roused to energetic activity, while under that of opium they become buried in sleep. At home and at school, the intellect and feelings are equally dependent on the brain for their power of working, and there, as on every other occasion and at every instant of life, they act always in obedience to, and in accordance with, the physiological laws of the constitution. It is clear, therefore, that if the teacher remain unacquainted with the connexion subsisting between the mind and body, and with the chief circumstances by which the action of the brain is influenced, he cannot regulate his treatment of the different mental faculties with any certainty or precision, so as to be sure of producing the result at which he aims; and, in many circumstances, it is just as likely that he may do precisely the reverse. This, indeed, too often happens, and I believe there is scarcely a school in the kingdom in which some part or other of the educational and general training is not at variance with the organic laws, and, therefore, productive of mischievous results, which might be at once obviated if the teachers possessed even a moderate acquaintance with physiology, and were willing to direct their conduct by its dictates.

* Mayuwaringe on the Method and Means of Health, 1683.

In forming a proper estimate of the utility of physiology in the conducting of moral and intellectual as well as physical education, we must never lose sight of the fact that it is the organization with which mind is connected during life which requires to be exercised and trained, and on which the good effects of education are produced. In teaching the art of riding, fencing, skating, or dancing, we admit at once, that to ensure success regard must be had to the muscular constitution of the individual, and to the laws of muscular exercise. But it is not sufficiently considered that, in cultivating the intellectual and moral faculties, similar regard must be had to the nervous and cerebral constitution of the pupil, and to their laws of exercise. Why does the mind *weary* after being long intent upon any object of pursuit? Just because the brain, by means of which the mind acts, has become exhausted by over-exercise, in the same way as the muscles after too long a walk. Why, when the mind is weary of one subject, can it turn to another, from mathematics to music for example, with alacrity and pleasure? Because the wearied faculties and their organs are left in repose, and a different set have come into play which had not previously been in activity; just in the same way as a tailor may be very weary of his day's work, and yet be delighted to enjoy himself at a dance, because in the latter the weary muscles of the arm are left unemployed, and those of the legs and trunk, which were panting for exercise, are now gratified in their turn. To discover, therefore, the proper laws of mental and moral training, we must always have regard to the laws by which the action of the brain and nervous system is regulated; and as it is the special province of physiology to investigate and expound these laws, it follows that to the educationist, whether parent or teacher, a knowledge of physiology is indispensable to success.

Such accordingly is the case; but as I shall touch upon this subject at greater length when I come to treat of the functions of the brain, I need not dwell longer upon it at present. I have said enough to satisfy the candid reader that physiology cannot be neglected with impunity by those who either direct or conduct the education of the young.

CHAPTER III.

STRUCTURE AND FUNCTIONS OF THE SKIN.

The Skin—composed of three layers.—The Cuticle—its structure and uses.—The Mucous Coat—the seat of Colour.—The True Skin—its structure—the seat of perspiration—its nature—consequences of suppressed perspiration.—Sympathy between the Skin and other organs.—The Skin a regulator of Animal Heat—the seat of absorption.—Touch and Sensation.—Connection between the Skin and Nervous System.

In selecting the subjects of the following essays, I shall, as already stated, be guided partly by the intrinsic importance of the functions of which they treat to the wellbeing of the animal economy; and partly by the comparative ignorance which prevails in regard to them. As uniting both conditions in a very high degree, I shall commence with an explanation of the structure and functions of the skin.

The skin is that membranous covering which is spread over the whole surface of the body, and which serves to bind together, and to protect from injury, the subjacent and more delicate textures. In different animals, and at different parts of the body, it assumes different appearances. It is smooth, soft, and delicate in youth, and in females; firmer and more resisting in middle age and in males; flabby and wrinkled in old age, and after disease; puckered or disposed in folds in places that admit of extensive flexion, as over the finger-joints, and in the palm of the hand; and thick and horny where it is sub-

jected to the influence of pressure, as in the soles of the feet.

The structure of the skin, like that of every other part of the animal frame, displays the most striking proofs of the transcendent wisdom and beneficence of its great Creator. Though simple in appearance and in design, it is a compound of many elements, and the seat of as great a variety of functions. In a general sense, it may be described as composed of three layers of membrane, viz., the thin *scarf-skin* or *cuticle*, the *mucous coat* immediately beneath, and the thick *true skin*, as it is called, which is the most internal of all and directly envelopes the body. In a purely scientific treatise it would be necessary to enter upon a minute examination of the structure and origin of these different constituent parts. But in a work like the present, intended chiefly for the unprofessional reader and for practical purposes, it will be more interesting and instructive to confine ourselves to such a general view of the nature and functions of the skin as can be easily understood by every intelligent person, and made available in the ordinary management of ourselves and families. For this reason, instead of beginning with the consideration of the internal layer or true skin, as a scientific anatomist would do, I shall adopt the more usual method of commencing with the cuticle.

The *cuticle*, *epidermis* (from ἐπι upon, and δέρμα the skin) or *scarf-skin*, is the outermost of the three layers of which the skin is composed, and is that which is raised in blisters. To the naked eye, it appears to be a thin continuous membrane, destitute of organization and without either bloodvessels or nerves. When cut or abraded it neither bleeds nor feels pain. From these peculiarities it has generally been regarded as altogether without life, and by many as merely an exhalation of albuminous mucus resembling a coating of varnish. On more careful examination, however, by the aid of a powerful magnifier, it is discovered to possess a uniform structure, and vessels have not only been detected in it, but are said to have been successfully injected, and to be very manifest in some preparations in the Museum of St Thomas's Hospital, which leave no doubt that these vessels belong to the sanguiferous system.* Breschet, accordingly, in his late interesting researches into the structure of the skin, expresses the opinion, that the epidermis is not an inorganic matter or a mucus expelled mechanically, but, "on the contrary, a tissue of a rather complicated organization, connected with the important functions of exhalation and absorption, by the faculty which it possesses of giving passage to, or allowing itself to be penetrated by, liquids." Breschet adds, however, that he considers its life as merely vegetative; and that it becomes coloured, exhales, and absorbs in the same manner as vegetables, its want of nerves rendering it insensible.†

The epidermis is at first secreted in a fluid state on the surface of the true skin, and in successive layers, the innermost and the most fluid of which constitutes the *mucous coat*, as it is called, and the outermost and driest the *cuticle* or external epidermis. This fluid mucus becomes organized after its secretion, and the cuticle, properly so called, is found to consist of very minute scales of an irregular trapezoidal shape, which overlap each other, are more or less striated, white and transparent, and placed upon a very thin network tissue (*un canevas ardolaire très mince*). When, by any change of position, the skin is folded upon itself, these scales overlap more and more in the same way as the scales of a serpent's skin; and, on the other hand, when the skin is unusually extended, they become separated from each other and connected only by the fine intervening membrane.

It has long been a matter of dispute whether the cuticle is perforated by pores or not. The fact of its giving passage outwards to the perspiration, and also inwards to substances rubbed upon its external surface, seemed to indicate the affirmative; but, as the pores could not be distinctly recognised by the eye, there always remained some doubt as to the fact. Blumenbach, Rudolphi, and Meckel still deny their existence, and consider them as unnecessary. But Breschet has shewn that there really are distinct canals or vessels for excreting the perspiration, and that these vessels open upon the surface of the epidermis by a very oblique orifice almost parallel to the plane of the skin. This orifice, he says, is shut by the one side of the duct being pressed against the other, and when sweat is flowing it is easy to observe a slight rising of the epidermis just before the small drop is about to exude. (P. 27.) Practically speaking, the question is not one of much moment, provided it be remembered that its texture, whether perforated or not, is such as to admit of *exhalation* and *absorption* taking place, or, in other words, of fluids and other bodies passing *out* and *in* through its substance.

The structure of the cuticle is, in other respects also, in admirable harmony with its uses. Placed as an insensible intermedium between external objects and the delicate nervous expansion on the surface of the subjacent true skin, it serves as a physical defence against friction; and while, by impeding evaporation, it preserves the true skin in that soft and moist state which is essential to its utility, it also, by impeding, but not absolutely preventing, absorption, enables man to expose himself without injury to the action of numerous agents, which, but for its protection, would immediately be imbibed, and cause the speedy destruction of health and life. This is remarkably exemplified in several trades, where the workman is unavoidably exposed to an atmosphere loaded with metallic and poisonous vapours, or obliged to handle poisonous substances; and where, without the obstruction of the cuticle, the evils to which he is subjected would be aggravated a hundred-fold. Being destitute of nerves, the cuticle is not hurt by the direct contact of external bodies, and being very thin, it blunts without impairing the distinctness of the impression made on the nerves of sensation. The necessity of this latter provision becomes very obvious when the cuticle is abraded or removed by vesication. The surface below is then found to be too tender and irritable for the exercise of touch, and conveys to the mind scarcely any other sensation than that of pain.

For the same reason, those parts of the skin which are most exposed to pressure and friction, such as the palms of the hands and soles of the feet, are provided with a thicker cuticle to defend them from injury. The greater thickness of the cuticle in such situations is manifestly the intentional work of the Creator, for it is perceptible even at birth, before use can have exercised any influence. Indeed, were the tender skin not so protected, every violent contraction of the hand upon a rough and hard surface, and every step made on uneven ground, would cause pain, and disable us for exertion.

By another beneficent provision, calculated to afford increased protection according to the necessities of the individual, it happens that, when a part is much used, the cuticle covering it becomes thicker and thicker within certain limits, till in extreme cases it becomes as thick, hard, and resisting as horn. It is this thickening of the epidermis on the lady's finger that alone enables her to wield with impunity that important instrument the needle. And it is the same thickening that fits the blacksmith and the mason, the stone-breaker and the boatman, to ply their trades, without that painful blistering which the young apprentice or unaccustomed labourer so regularly undergoes, and which must have continued to recur for ever, had the cuticle been organized with bloodvessels and nerves, or not subjected

* British and Foreign Medical Review, vol. ii. p. 443.

† Nouvelles Recherches sur la Structure de la Peau. Par M. G. Breschet, D. M., &c. Paris, 1835.

to this law of becoming thicker wherever increased protection is required.

Another modification of the cuticle to suit a modification of circumstances, is that observed in the nails. These belong to the cuticle, and separate with it; and, like it, they have no visible bloodvessels or nerves, and may be cut or bruised without pain. When the hand or foot is macerated in water, the nails and the cuticle shew their identity of organization, by separating together from the dermis or true skin below. The nails, like the cuticle, serve chiefly to protect the subjacent parts from injury; and accordingly, in those lower animals whose manner of life subjects their feet to continual pressure, and requires no nice exercise of touch, Nature has provided horny and resisting hoofs for their protection, instead of merely a thickened epidermis.

To produce thickening of the cuticle, exercise must be gradual, and not too severe. If, for example, a person takes a very long walk, rows a boat, or makes use of a heavy hammer, for a few hours, without having been accustomed to such an effort, there is no time for the cuticle to thicken, and defend itself from the unusual friction. The parts below, being inadequately protected, become irritated and inflamed, and throw out a quantity of watery fluid or *serum* on their surface, which raises up the cuticle in blisters, and by making it painful to continue the pressure, obliges the person to desist from an exercise which, if continued, would evidently soon alter the structure of the sentient nervous filaments, and for ever unfit them for their proper uses: So that even in this result, beneficence and wisdom are prominently displayed.

Immediately beneath the scarf-skin, and between it and the true skin, is the next layer, called the *mucous coat, rete mucosum*, or *mucous network*, which is remarkable chiefly as being the seat of the colouring matter of the skin. It is seen with difficulty on dissection, except in Negroes, in whom it is thick. It is exceedingly attenuated in Albinos, and is in fact thick in proportion to the depth of colour. When first secreted, it is destitute of bloodvessels and nerves, but, like the cuticle, is permeable by other bodies. The colouring matter is said to be the same as that of the blood; Davy and Blumenbach, however, regard it as carbon.

For all practical purposes, the mucous coat may be viewed generally as merely a thin soft covering, placed between the outer and the inner skin, to protect the nerves and vessels of the latter, and give them their requisite softness and pliancy. Breschet considers it as originally a fluid mucus, similar both in its nature and mode of production to that which is secreted on the surface of the other mucous membranes; but soon after its secretion it becomes united with a colouring matter secreted by a distinct apparatus; and from this union the different colours of hair, horns, plumage, and scales, result. The mucous matter is itself secreted by glandular bodies situate near the inner surface of the skin, and seen at *c* in the woodcut on page 12, representing the structure of the skin as it appears under a powerful magnifier. This mucus is conveyed towards the surface of the true skin by the ducts or vessels seen to proceed upwards from the rounded glands at *c*. Breschet is of opinion, as already mentioned, that the epidermis is formed by the gradual drying, in successive layers, of this fluid mucus, and that the cuticle, and what is called the mucous coat, are merely the outer and drier, and the inner and moister, parts of the same thing, and he consequently includes both under the name of epidermis. The inner and more fluid layer is mixed with the colouring matter already referred to, and which is secreted by a glandular-looking apparatus, situate near the surface of the true skin, and seen in the woodcut at *f*, running along horizontally under the base of the *papillæ* or eminences *h*, on the outer surface of the skin. The mucous coat thus formed being of a dark colour in the Negro, has been supposed to diminish the heating influence of the sun's rays in tropical climates by the higher radiating power which is possessed by a black than by a light surface; but there is reason to doubt the soundness of the theory at least, for black is well known to excel in *absorbing* or taking in, as well as in radiating or giving out, heat; and late experiments on the coast of Africa seem to shew, that the temperature of the Negro is actually about two degrees higher than that of the European under the same circumstances.

The mucous coat is the seat of the beautiful and variegated colouring observed in the skins of many fishes and other animals, in which it has often a high and almost metallic splendour.

The third or inmost layer, called the *true skin, cutis, dermis*, or *corion*, is by far the most important of the three, both in structure and functions, and indeed constitutes the chief thickness of the skin. In the woodcut this is manifest enough from the dermis occupying all below the level of *g*, while the very small portion above it includes all the layers of the epidermis, or, in other words, both the epidermis and mucous coat. In structure, the dermis is a dense, firm, and resistant tissue, possessed of great extensibility and elasticity, and of a colour more or less red in proportion to the quantity of blood it receives and contains. Its looser internal surface, which is united to the cellular membrane in which the fat is deposited, presents a great number of cells or cavities, easily seen on the inner surface of the skins of animals, which penetrate obliquely into the substance, and towards the external surface of the skin, and also contain fatty matter. These *areolæ* or cells are larger on some parts of the body than on others; they are very small on the back of the hand and foot, the forehead, and other places where fat is never deposited, and the skin is very thin; while they are large in the palm of the hand and sole of the foot, where the skin is consequently thicker and fat abounds. These cells are traversed by innumerable bloodvessels and filaments of nerves, *a b* in the woodcut, which pass through to be ramified on the substance or outer surface of the skin, where they shew themselves in the form of numerous small papillæ or points, *h*, which are very visible on the surface of the tongue, and on the fingers and palm of the hand. These papillæ constitute the true organs of sensation, and are therefore most thickly planted where the sense of touch is most acute.

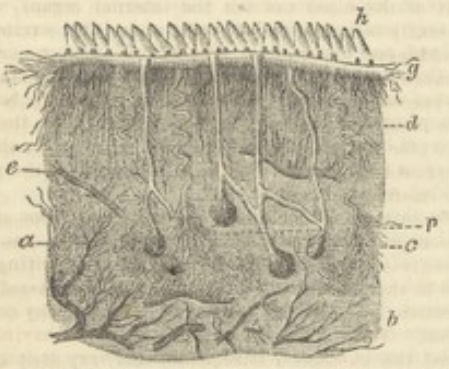
The dermis, indeed, is so abundantly supplied with blood and nervous power, that, for practical purposes, it may almost be regarded as composed of vessels and nerves alone; and it is important to notice this fact. The universal and equal redness of the skin in blushing is itself a proof of great vascularity; but a still stronger consists in our being unable to direct the point of the finest needle into any spot without puncturing a vessel and drawing blood. The same test proves the equal abundance of nervous filaments in the skin, for not a point can be punctured without transfixing a nerve and causing pain; and it is well known that, in surgical operations and accidental wounds, the chief pain is always in the skin, because it is profusely supplied with nerves on purpose to serve as an instrument of sensation.

Such are the appearances presented by the dermis on a superficial examination. When subjected, however, to a minuter scrutiny under the microscope, its organization is discovered to be at once complex and delicate in the highest degree. Instead of being merely a network of bloodvessels and nerves upon a ground of membrane, it is found to consist of a variety of distinct parts, each performing a distinct function. By virtue of its firm and elastic texture, it is well adapted for the protection of the parts beneath; while, by means of its innumerable secreting glands and excretory ducts, it is admirably suited for its office of *exhalant* of waste matter from the system; by means of another set of vessels it is enabled to act as an *inhalant* or *absorbent*; and lastly, by

means of the nervous papillæ on its surface, it is not less admirably qualified to act as the principal *organ of sensation and touch*.

As a protector of the parts below, the dermis acts chiefly mechanically, so that we need not dwell upon this part of its uses, but proceed first to consider it as an organ of *secretion* and *exhalation*.

For a long time the *perspiration* or sweat was considered simply as an exudation of the more watery portion of the blood from the very minute ramifications of the bloodvessels; and hence the fact of the skin being extremely vascular was supposed to be a perfectly sufficient explanation of the origin and very large quantity of matter thus thrown out of the system. This, however, is a very incorrect view of the subject. The sweat is not a mere watery exudation, but a distinct secretion effected by glands, or small bodies of a glandular nature, expressly provided for the purpose. According to Breschet, to whose investigations we are much indebted for a more accurate knowledge of the structure of the skin, these bodies are situate in great numbers in the substance of the dermis, and consist of what, for want of a better name, he calls a glandular *parenchyma* (from a Greek word signifying *to strain through*). On referring to the annexed woodcut, representing a highly magnified view of the component parts of the skin—its glands, ducts, bloodvessels, and nerves, we perceive, indistinctly, a small oval-shaped glandular body at *p*, with a spiral line proceeding from its upper part. The first of these is the *sweat-secreting* gland, and the latter is the *duct*, seen also at *d*, along the sinu-



osities of which the sweat is conveyed till it reaches the surface, and escapes by open mouths between the papillæ in the form of an invisible vapour. Several other glands and spiral ducts may be also seen; but in nature they are, of course, neither so distinct nor so far apart as they appear in the woodcut. In reality they are small in size and almost crowded together through the whole substance of the skin; and hence when the body is overheated by exercise, the sweat literally flows from every pore, because every pore is simply the outlet of a corresponding duct; and their very minuteness and number have been the causes why their existence and uses were not sooner discovered.

Viewed as an exhalant the skin cannot fail to be regarded with great interest, from the constant influence which it exercises over the welfare of the animal economy. But few have any just notion of the actual extent and importance of the exhalation, such as we shall now attempt to exhibit it.

During the whole period of life, the bodily organization is in a state of constant decay and renovation, and when any suspension of, or derangement in, the due balance between these processes occurs the health immediately suffers, and fatal consequences are often the result. The skin, the kidneys, the bowels, and the lungs, constitute the channels or outlets by which the waste matter is removed, and of these, the excretion, or throwing out, by the skin is by far the most abundant. In the ordinary healthy state of the body, no exhalation is *seen*, but the skin is *felt* to be soft and slightly moist. If, however, a cool and well-dried mirror is brought nearly into contact with its surface, a damp moisture is speedily observed to gather upon it, shewing that in reality an exhalation of vapour is constantly going on. The same fact is shewn by the speedy impregnation of flannels or other clothes in contact with the skin, indicated by the peculiar dampness and smell which it imparts to them. Being invisible to the eye and impalpable to the touch, this, the usual form of exhalation, is called the *insensible perspiration*, to distinguish it from that more copious and fluid secretion which is produced under severe exercise or the influence of great heat, and which, being both visible and tangible, is known as the *sensible perspiration* or *sweat*.

The obvious importance of the cutaneous exhalation to the welfare of the system at large, has led to many attempts to form an accurate estimate of its amount, but so many difficulties have stood in the way of obtaining precise results, and the difference in different constitutions, and even in the same person at different times, is so great, that we must be satisfied with an approximation to the truth. Among the first inquirers whose accuracy can be in any degree relied on, Sanctorius deserves to be honourably mentioned. With a zeal and perseverance worthy of greater success, he carefully weighed himself, his food, and his excretions, in a balance, every day for thirty years, and came to the conclusion that *five* out of every eight pounds of substance taken into the system pass out of it again by the skin, leaving only three to pass off by the bowels, the lungs, and the kidneys. The celebrated Lavoisier and M. Seguin afterwards entered on the same field of inquiry, and with more satisfactory results, as they were the first to distinguish between the cutaneous and pulmonary exhalations. M. Seguin shut himself up in a bag of glazed taffetas, which was tied over his head and provided with a hole, the edges of which were glued to his lips with a mixture of turpentine and pitch, so that the pulmonary exhalation might be thrown outwards and the cutaneous alone be retained in the bag. He first weighed himself and the bag in a very nice balance, at the beginning of the experiment; then at the end of it, when he had become lighter in proportion to the quantity of exhalation thrown out by the breathing; and lastly, he weighed himself out of the bag, to ascertain how much weight he had lost in all; and by subtracting the loss occasioned by the lungs, the remainder of course exhibited the amount carried off by the skin. He attended minutely also to the collateral circumstances of diet, temperature, &c.; and allowance being made for these, the results at which he arrived were the following:—

The *largest* quantity of insensible perspiration from the lungs and skin together, amounted to thirty-two grains per minute; three ounces and a quarter per hour; or *five pounds per day*. Of this, the cutaneous constituted three-fourths or sixty ounces in twenty-four hours. The *smallest* quantity observed amounted to eleven grains per minute, or one pound eleven and a half ounces in twenty-four hours, of which the skin furnished about twenty ounces. The *medium* or average amount was eighteen grains a minute, of which eleven were from the skin, making the cutaneous perspiration in twenty-four hours about *thirty-three ounces*. When the extent of surface which the skin presents, calculated at 2500 square inches, is considered, these results do not seem extravagant. But even admitting that there may be some unperceived source of fallacy in the experiments, and that the quantity is not so great as is here stated, still, after making every allowance, enough remains to demonstrate that exhalation is a very important function of the skin. And although the precise amount may be disputed, it is quite certain that the cutaneous exhalation is more abundant than the united

excretions of both bowels and kidneys, and that, according as the weather becomes warmer or colder, the skin and kidneys alternate in the proportions of work which they severally perform; most passing off by the skin in warm weather, and by the kidneys in cold. The quantity exhaled increases after meals, during sleep, in dry warm weather, and by friction or whatever stimulates the skin; and diminishes when digestion is impaired, and in a moist atmosphere.

What we have considered relates only to the *insensible* perspiration. That which is caused by great heat or severe exercise is evolved in much greater quantity; and by accumulating at the surface, it becomes visible, and forms sweat. In this way a robust man, engaged in hard labour and exposed to intense heat, may lose *five* pounds' weight in the course of an hour, and this loss happen even twice a-day for a length of time.* When, on the other hand, the surface of the body is chilled by cold during inactivity, the bloodvessels of the skin become contracted in their diameter, and hinder the free entrance of the red particles of the blood, which are therefore of necessity collected and retained in greater quantity in the internal organs, where the heat varies very little. The skin consequently becomes pale, and its papillæ contract, forming by their erection what is called the goose's skin. In this state it becomes less fit for its uses; the sense of touch can no longer nicely discriminate the qualities of bodies, and a cut or bruise may be received with comparatively little pain. From the oppression of too much blood, the internal parts, on the other hand, work heavily: the mental organs are weakened, sleepiness is induced, respiration is oppressed, the circulation languishes, and digestion ceases; and if the cold be very intense, the vital functions are at last extinguished without pain, and without a struggle. This is a picture of the extreme degree; but the same causes which, in an aggravated form, occasion death, produce, when applied in a minor degree, effects equally certain, although not equally marked or rapid in their appearance.

Taking even the lowest estimate of LAVOISIER, we find the skin endowed with the important charge of removing from the system about twenty ounces of waste matter every twenty-four hours; and when we consider that the quantity is not only great, but sent forth in so divided a state as to be invisible to the eye, and that the whole of it is indirectly given out by the very minute ramifications of the bloodvessels which supply the secreting organs of the skin, we perceive at once why these vessels are so extremely numerous that a pin's point cannot touch any spot without piercing them. We see also an ample reason why, independently of the debilitating impression made through the medium of the nervous system, checked perspiration should prove so detrimental to health,—because, for every twenty-four hours during which such a state continues, we must either have a large amount of useless and now poisonous matter accumulating in the body, or have some of the other organs of excretion greatly overtasked to get rid of it by other means; which obviously cannot happen without disturbing their regularity and wellbeing. People know the fact, and wonder that it should be so, that cold applied to the skin, when the body is inactive, or continued exposure in a cold day, often produces a bowel-complaint, a severe cold in the chest, or inflammation of some internal organ: But were they taught, as they ought to be, the structure and uses of their own bodies, they would rather wonder that it did not always produce one of these effects.

In tracing the connexion between suppressed perspiration and the production of individual diseases, we shall find that those organs which possess some similarity of function sympathize most closely with each other. Thus the skin, the bowels, the lungs, the liver, and the kidneys, sympathize readily, because they have all the common office of throwing waste matter out of the system, each in a way peculiar to its own structure; so that if the exhalation from the skin, for example, be stopped by long exposure to cold, the large quantity of waste matter which it was charged to throw out, and which in itself is hurtful to the system, will most probably be thrown upon one or other of the above-named organs, whose function will consequently become excited; and if any of them, from constitutional or accidental causes, be already weaker than the rest, as often happens, its health will naturally be the first to suffer. In this way, the bowels become irritated in one individual, and occasion bowel complaints; while in another it is the kidneys, and in a third the lungs, which become affected. When, on the other hand, all these organs are in a state of vigorous health, a temporary increase of function takes place in them, and relieves the system, without leading to any local disorder; and the skin itself speedily resumes its activity, and restores the balance among them.

One of the most obvious illustrations of this reciprocity of action is afforded by any convivial company seated in a warm room in a cold evening. The heat of the room, the food and wine, and the excitement of the moment, stimulate the skin, cause an afflux of blood to the surface, and increase in a high degree the flow of the insensible perspiration; which thus, while the heat continues, carries off an undue share of the fluids of the body, and leaves the kidneys almost at rest. But the moment the company goes into the cold external air, a sudden reversal of operations takes place; the cold chills the surface, stops the perspiration, and directs the current of the blood towards the internal organs, which presently become excited—and, under this excitation, the kidneys, for example, will in a few minutes secrete as much of their peculiar fluid as they did in as many of the preceding hours. The reverse of this, again, is common in diseases obstructing the secretion from the kidneys; for the perspiration from the skin is then altered in quantity and quality, and acquires much of the peculiar smell of the urinary fluid.

Since the publication of the earlier editions of the present work, the attention of the profession has been strongly directed to the influence of cold in exciting disease in the kidneys as a consequence of suppressed perspiration, especially in persons of an unhealthy constitution. To Dr Bright belongs the honour of having detected the unsuspected frequency and very serious and often fatal nature of the disease alluded to, and now generally known under the name of *Bright's disease*, or *Granular Degeneration of the Kidneys*. In Dr Osborne's excellent little work on the subject,* it is expressly stated, that, "*on reviewing the causes of the disease in thirty-six cases, in twenty-two individuals it could be directly referred to suppressed perspiration.*" (P. 31.) Dr Osborne explains this result by saying, that "when cold is applied over the whole surface in a continuous manner for some time, and no inflammation or general fever has resulted, then an increased secretion from the kidneys is usually observed; and the necessity of frequent evacuations of the bladder during the frosts of winter, has become proverbial and is familiar to every one. When the suppression of perspiration, however, instead of being transient, is rendered permanent, then permanent irritation of the kidneys is produced, and in the great majority of cases, the result is the disease of the kidneys now before us." (P. 31.) Dr Christison, in like manner, admits the frequency of cold as the exciting cause, and makes the remarkable statement that, "*where cold was not the apparent cause, I have never met with an instance where the patient could ascribe his illness to any thing else.*"†

* Southwood Smith's Philosophy of Health, vol. ii. p. 3

* Osborne on Dropsies, 2d edition, London, 1837.

† Christison on Granular Degeneration of the Kidneys.—Edinburgh, 1840. P. 108.

The very frequent occurrence of bronchitis and diarrhœa, the former an affection of the lining membrane of the lungs, and the latter of that of the bowels, along with disease of the kidneys, affords an interesting corroboration of the remark in a preceding page, explanatory of the sympathy of the excreting organs with each other. In eighteen out of thirty-six cases, Dr Osborne found bronchitis co-existing with the affection of the kidney, and in eleven some form of intestinal disease. Dr Osborne justly considers, that "the co-existence of these affections with the disease in question is best explained by this circumstance—that *they are all the effect of the one cause, namely, suppressed perspiration.*"

When the lungs are weak, and their lining membrane is habitually relaxed, and secretes an unusual amount of *mucus* or phlegm from its surface, as often happens in persons of an indolent lymphatic constitution, the mass of blood thrown inwards upon the lungs by cold applied to the skin, increases that secretion to a high degree. Were this secretion to accumulate, it would soon fill up the air-cells of the lungs, and cause suffocation; but to obviate this danger, the Creator has so constituted the lungs, that accumulated mucus or any foreign body coming in contact with them excites the convulsive effort called coughing, by which a violent and rapid expiration takes place, with a force sufficient to hurry the mucus or other foreign body along with it; just as peas are discharged by boys with much force through short tubes by a sudden effort of blowing. Thus, especially in indolent old Indians and persons who have lived long in a warm climate, a check given to perspiration, by diminishing the quantity of blood previously circulating on the surface, naturally leads very often to increased expectoration and cough, or, in other words, to chronic catarrh.

The lungs excrete, as already noticed, and as we shall afterwards more fully see, a large proportion of waste materials from the system; and the kidneys, the liver, and the bowels, have in so far a similar office. In consequence of this alliance with the skin, these parts are more intimately connected with each other in healthy and diseased action than with other organs. But it is a general law, that whenever an organ is unusually delicate, it will be more easily affected by any cause of disease than those which are sound: so that, if the nervous system, for example, be weaker than other parts, a chill will be more likely to disturb its health than that of the lungs, which are supposed, in this instance, to be constitutionally stronger; or, if the muscular and fibrous organizations be unusually susceptible of disturbance, either from previous illness or from natural predisposition, *they* will be the first to suffer, and rheumatism will ensue; and so on. And hence the utility to the physician of an intimate acquaintance with the previous habits and constitutions of his patients, and the advantage of adapting the remedies to the nature of the cause, when it can be discovered, as well as to the disease itself. Thus, in Bright's disease, which so often proceeds from checked perspiration, Dr Osborne mentions, that whenever he succeeded in restoring perspiration over the whole surface, he never failed in removing the general dropsy by which the affection of the kidneys is accompanied. In like manner, a bowel-complaint may arise from a check to perspiration or from over-eating; but although the thing to be cured is the same, the *means* of cure ought obviously to be different. In the one instance, an emetic or laxative to carry off the offending cause, and in the other a diaphoretic to open the skin, will be the most rational and efficacious remedies. Facts like these expose well the glaring ignorance and effrontery of the quack, who affirms that his one remedy will cure every form of disease. Were the public not equally ignorant with himself, their credulity would cease to afford to his presumption the rich field in which it now revels.

The close sympathy between the skin and the stomach and bowels has often been noticed; and during epidemic influenza, it is not uncommon for persons of weak digestion to suffer as much from an affection of the stomach as others do from that of the chest. In both instances, there is the same depressing sense of debility and illness without any violent local disease by which it can be accounted for, and in both there is often the same slow recovery. It is well understood, too, that most of the obstinate eruptions which appear on the face and rest of the surface, owe their origin to disorders of the digestive organs, and are most successfully cured by treatment directed to the internal disease. Even among the lower animals, the sympathy between the two is so marked as to have arrested attention. Thus, in speaking of the horse, Delabere Blaine says, "by a well-known consent of parts between the skin and alimentary canal in general, but between the first passages and the stomach in particular, it follows, in almost every instance, that when one of these becomes affected, the other takes on a sympathetic derangement also, and the condition is then morbid throughout. From close observation and the accumulation of numerous facts, I am disposed to think, that so perfect is this sympathetic consent between these two distant parts or organs, that they change the order of attack as circumstances occur. Thus, when the skin is primarily affected, the stomach becomes secondarily so, and *vice versa*," so that "a sudden check to the natural or acquired heat of the body, particularly if aggravated by the evaporation of a perspiring state," as often brings on disease of some internal organ, as if the cause were applied directly to the organ itself.*

In noticing this connexion between the suppression of perspiration and the appearance of internal disease, I do not mean to affirm that the effect is produced by the physical transference of the suppressed exhalation to the internal organ. In many instances, the chief impression seems to be made on the nervous system; and the manner in which it gives rise to the resulting disease is often extremely obscure. Our knowledge of the animal functions is, indeed, still so imperfect, that we daily meet with many occurrences of which no explanation can be given. But it is nevertheless of high utility to make known the fact, that a connexion does exist between two orders of phenomena, as it calls attention to their more accurate observation, and leads to the adoption of useful practical rules, even when their mode of operation is not understood. Nothing, indeed, can be more delusive than the rash application of merely physical laws to the explanation of the phenomena of living beings. Vitality is a principle superior to, and continually modified by, the laws which regulate the actions of inanimate bodies; and it is only after life has become extinct that these laws regain the mastery, and lead to the rapid decomposition of the animal machine. In studying the functions of the human body, therefore, we must be careful not to hurry to conclusions before taking time to examine the influence of the vital principle in modifying the expected results.†

It is in consequence of the sympathy and reciprocity of action existing between the skin and the internal organs, that burns, and even scalds of no very great extent, prove fatal, by inducing internal, generally intestinal, inflammation. By disordering or disorganizing a large nervous and exhaling surface, an extensive burn causes not only a violent nervous commotion, but a continued partial suspension of an important excretion; and, when death ensues at some distance of time, it is

* Blaine's Outlines of the Veterinary Art, 3d edition, p. 65.

† The reader will find some excellent practical remarks on the sympathy between the skin and the thoracic and abdominal viscera, in Dr James Johnson's "Treatise on Derangements of the Liver, Internal Organs, and Nervous System," published some years ago. They deserve every attention on the part of the profession, as shewing how affections of different organs influence each other.

almost always in consequence of inflammation being excited in the bowels or sympathizing organ. So intimate, indeed, is this connexion, that some surgeons of great experience, such as the late Baron DUPUYTREN, of the Hôtel Dieu, while they point to internal inflammation as in such cases the general cause of death, doubt if recovery ever takes place, when more than one-eighth of the surface of the body is severely burnt. And whether this estimate be correct or not, the facts from which it is drawn clearly demonstrate the importance of the relation subsisting betwixt the skin and the other excreting organs.

In some constitutions, a singular enough sympathy exists between the skin and the bowels. Dr A. T. THOMSON, in his work on Materia Medica (p. 42), mentions that he is acquainted with a clergyman who cannot bear the skin to be sponged with vinegar and water, or any diluted acid, without suffering spasm and violent griping of the bowels. The reverse operation of this sympathy is exemplified in the frequent production of nettle-rash and other eruptions on the skin, by shell-fish and other substances taken into the stomach. Dr Thomson tells us, that the late Dr Gregory could not eat the smallest portion of the white of an egg, without experiencing an attack of an eruption like nettle-rash. According to the same author, even strawberries have been known to cause fainting, followed by a petechial efflorescence of the skin.

We have seen that the insensible perspiration removes from the system, without trouble and without consciousness, a large quantity of useless materials, and at the same time keeps the skin soft and moist, and thereby fits it for the performance of its functions as the organ of an external sense. In addition to these purposes, the Creator has, in his omniscience and foresight, and with that regard to simplicity of means which betokens a profoundness of thought inconceivable to us, superadded another, scarcely less important, and which is in some degree implied in the former; I mean *the proper regulation of the bodily heat*. It is well known that, in the polar regions and in the torrid zone, under every variety of circumstances, the human body retains nearly the same temperature, however different may be that of the air by which it is surrounded. This is a property peculiar to life; and, in consequence of it, even vegetables have a power of modifying their own temperature, though in a much more limited degree. Without this power of adaptation, it is obvious that man must have been chained for life to the climate which gave him birth, and even then have suffered constantly from the change of seasons; whereas, by possessing it, he can retain life in a temperature sufficiently cold to freeze mercury, and is able for a time to sustain, unharmed, a heat more than sufficient to boil water, or even to bake meat. Witness the wintering of Captains Parry and Ross and their companions in the Polar Regions; and the experiments of Blagden, Sir Joseph Banks, and others, who remained for many minutes in a room heated to 260°, or about 50° above the temperature of boiling water. The chief agents in this wonderful adaptation of man to his external situation, are undoubtedly the skin and the lungs, in both of which the power is intimately connected with the condition of their respective exhalations. But it is of the skin alone, as an agent in reducing animal heat, that we are at present to speak.

The sources of animal heat are not yet demonstrably ascertained; but that it is constantly generated and constantly expended, has been long known; and if any considerable disproportion occurs between these processes, it is at the immediate risk of health. During repose, or passive exercise, such as riding in a carriage or sailing, and in a temperate atmosphere, no more heat is produced than is readily carried off by the insensible perspiration from the lungs and skin, and by the contact of the colder air; but during active exercise, when the amount of heat generated is increased, an increased expenditure becomes immediately necessary: this is effected by the skin and lungs being excited to higher action; by the latter sending out the respired air loaded with vapour, and the former exhaling its fluid so rapidly as to form sweat. Accordingly, we find that, in cold countries, and in frosty weather, the exhalation from the skin is reduced to a very moderate amount, the superabundant heat being rapidly carried off by contact with a cooler air; and that, in warm climates, where the heat is not carried off in this way, the surface is constantly bedewed with perspiration, and a corresponding appetite exists for liquids by which the perspiration may be kept up to a sufficient degree. Every one must have experienced the grateful effects of this provision, in passing from the dry, restless, and burning heat, like that of fever, to the soft and pleasant coolness which follows the breaking out of the sweat.

Attention to the order of events affords the requisite knowledge of the means employed for carrying off the increased heat which is produced when a person is exposed to a warm air and powerful sun, or engaged in severe exercise. At first, the body is felt to be actually warmer, the skin becomes dry and hot, and the unpleasant sensation of heat is soon at its maximum. By-and-by, a slight moisture is perceived on the surface, followed by an immediate increase of comfort. In a short time afterwards, this moisture passes into free and copious perspiration; and if the heat or exertion be still kept up, the sweat becomes profuse and drops from the body or wets the clothes which envelope it. A decrease of animal heat unavoidably accompanies this, because, independently of any vital action contributing to this effect, as is most probable, the mere physical evaporation of so much fluid is itself sufficient to carry off a large quantity of caloric. The curious experiments of Edwards tend to shew that evaporation is really the only means required for reducing animal heat to its proper degree; but the results obtained by him require to be confirmed, and the experiments varied and carried farther, before the inquiry can be considered as completed. The sagacity of Franklin led him to the first discovery of the use of perspiration in reducing the heat of the body, and to point out the analogy subsisting between this process and that of the evaporation of water from a rough porous surface, so constantly resorted to in the East and West Indies, and other warm countries, as an efficacious means of reducing the temperature of the air in rooms, and of wine and other drinks, much below that of the surrounding atmosphere. The quantity of fluid evaporated from the skin during profuse sweat, so far exceeds that given out during the highest insensible perspiration, that, as already seen on page 13, five pounds in weight have been lost by this means in a single hour—an amount evidently sufficient to carry off the largest quantity of superfluous animal heat which can ever be present. In the performance of this function, the skin is, indeed, assisted by the exhalation from the lungs; but as both act on the same principle, the explanation is not affected by this circumstance.

In very warm weather, the dog is always seen with the tongue lolling out of his mouth, and copiously covered with frothy secretion. This is merely another modification of the means used for reducing animal heat. The dog perspires very little from its skin, and the copious exhalation from the mouth is the expedient resorted to by Nature for supplying its place.

Bearing in mind the preceding explanation of the functions of the skin, the reader will peruse with interest the following remarks from Dr Thomson's work formerly quoted. "Dr Davy, in his Travels in Ceylon, states, from his personal observation, that on first landing in a tropical climate, the standard heat of the body of a European is raised two or three degrees, and febrile symptoms occur, which require temperance, the avoiding every cause of excitement of the vascular sys-

tem, and the use of aperient medicines. All authors, and indeed every observing person who has visited the torrid zone, agree that with the languor and exhaustion resulting from the high temperature of the atmosphere, there is a greatly increased mobility of the nervous system. *The action of the cutaneous vessels amounts to disease*, and produces that eczematous or vesicular eruption of the skin, known by the name of prickly heat, which occurs in Europeans who visit the West Indies on their first landing. On the other hand, this function of the skin is so much weakened, almost paralyzed, when the climate from which a person is passing is dry and bracing, and that into which he has passed is humid and relaxing, that congestions of blood take place in the larger vessels, the body becomes susceptible of the least impression of marshy exhalations, and agues and similar diseases are produced."*

We shall now be able to understand why in summer we suffer most from heat in what is called moist close weather, when no air is stirring; and why warm climates that are at the same time moist, are proverbially the most unwholesome. The chief reason is the diminished evaporation from the skin, which such a condition of the atmosphere produces, partially shutting up the natural outlet of the superfluous heat of the body; and as it at the same time checks the exit of the waste matter which ought to be thrown out, and which is known to be as injurious to the system as an active poison taken into the body from without, the hurtful consequences of such weather and climates, and the fevers, dysenteries, and colds, to which they give rise, are partly accounted for. A moist state of the atmosphere also stimulates *absorption*, and hence, if noxious effluvia are at the time floating in the air, they are more easily received into the system. It is on this account that night air is so unwholesome, particularly in malaria districts, which are loaded with moisture and miasma or marsh poison; for, when the air is dry as well as hot, free evaporation takes place, and absorption is almost null, so that little or no inconvenience is felt, and health often remains uninjured. Delaroche has established this point conclusively by experiment. He exposed animals to a very high temperature in a dry air, and found them to sustain no mischief; but when he exposed them in an atmosphere saturated with moisture, to a heat only a few degrees above that of their own bodies, and greatly lower than in the former instance, they very soon died. Here we see also the reason why, in ague and other fevers, the suffering, restlessness, and excitement of the hot stage can never be abated till the sweat begins to flow, after which they rapidly subside; and why the remedies which, when given in the hot stage, added to the excitement and distress, may now be productive of the best effects.

The function next to be noticed, viz. *Absorption*, is in some measure the opposite of the last. By its instrumentality, substances placed in contact with the skin are taken up and carried into the general circulation, either to be appropriated to some new purpose, or to be afterwards thrown out of the body.

Absorption or *inhalation*, being a distinct function of the skin, is carried on by vessels appropriated to the purpose, and thence named *absorbents* or *inhalants*, and closely resembling, if they are not identical with, what in other parts are called *lymphatic* vessels. Breschet says, that they are situate in that part of the mucous coat which forms the outer layer of the skin, namely, the epidermis, and that they may be seen commencing on its outer surface in rounded extremities in the form of a *cul-de-sac* without any orifice. He acknowledges, at the same time, that it is so difficult to distinguish their true origin, that he has described rather what seemed to him to exist, than what he was certain of really existing; but in the more internal layers of the mucous coat, the absorbents, he says, are easily seen by the aid of a magnifying glass. In the skin itself the absorbents are so small and numerous that, when injected with mercury, the surface is said, by Dr Gordon, to resemble a sheet of silver. In health they are too small to admit the red globules of the blood, and hence, from their contents being nearly transparent, they are sometimes named *lymphatics*.

Of the reality of absorption from the surface of the skin, we have a familiar example in the process of vaccination as a protection from smallpox. A small quantity of cowpox matter is inserted under the cuticle on the surface of the true skin, and there left. In a short time it is acted upon, and taken into the system by the absorbent vessels. In like manner, mercurial preparations rubbed on the skin for the cure of liver-complaint are absorbed, and affect the constitution precisely as when received into the stomach. Many even of the common laxatives, such as rhubarb and croton oil, have of late been successfully administered in the same way, and the rapid absorption of poison from bites of rabid animals and wounds in dissection through the same channel, is familiar to every one. It is from the active principle of the Spanish flies used in blisters being taken up by the cutaneous absorbents, that irritation of the kidneys and urinary organs so often attends the employment of that remedy.

Some ascribe great importance, and others very little, to cutaneous absorption. In some diseases, such as diabetes, in which, occasionally for weeks in succession, the urinary discharge exceeds, by many ounces daily, the whole quantity of food and drink, without the body losing proportionally in weight, we can account for the system being sustained only by supposing moisture to be extensively absorbed from the air by the skin and lungs, in the same way as the carbonic acid of the air is absorbed by the leaves of plants, and constitutes their principal nourishment. Of late, indeed, it has been proved by actual experiment, that additional weight is often acquired in the course of even a few hours, where nothing whatever of either a solid or fluid nature has been taken. The fact of the skin possessing an active absorbing power in common with the lining membrane of the lungs cannot, therefore, be called in question; and hence, although the ancients may have gone too far in believing that, when food could not be retained in the stomach, a person might be nourished by placing him in a bath of strong soup or milk, they were nevertheless correct in principle; and their only error was in regarding the absorbing power as greater in extent and more indiscriminating in nature than it really is. Some, indeed, deny that any absorption would take place at all, because it is doubtful whether, as a general fact, the body gains in weight by immersion in a warm bath. But the inference is not well founded, for thirst is well known to be relieved in this way; which can only happen from the absorption of fluid. Weight, however, *is* also occasionally gained; and even when it is not, as much water must have been absorbed during immersion as would make up the loss sustained by perspiration, which is believed to go on more rapidly in warm water than in the open air.

That animals absorb copiously when immersed in water, has been amply proved by Dr Edwards and other physiologists. Dr Edwards selected lizards as the subjects of experiment, because he regarded their scaly skins as unfavourable for absorption. After reducing the bulk of a lizard by several days' exposure to a dry air, he immersed its tail and hind legs in water, and found that absorption took place to such an extent as to restore the original plumpness of *all* parts of the body. The same result attended a variety of other trials, so that the fact does not admit of doubt. In man, absorption from the surface is greatly retarded by the intervention of the cuticle; and it is universally admitted that when this obstacle is removed, the process goes on

* Thomson's Materia Medica, p. 66

with great vigour. Thus arsenic applied to cancerous sores, and strong solutions of opium to extensive burns in children, have been absorbed in quantities sufficient to poison the patients. Colic in its severest forms has followed similar external applications of the salts of lead. Mercury, also, in the form of fumigation, has often been used where rapid action was required, because in the state of vapour it is very speedily taken up by the cutaneous absorbents.

It is quite certain, then, that the skin does absorb. The only doubt is as to what extent the cuticle operates in preventing or modifying that action. When friction accompanies the external application, the cuticle, as we see exemplified in the use of mercurial and other liniments, is not an efficient obstacle. But when friction is not resorted to, and the substance applied is of a mild unirritating nature, such as oil, it may remain in contact with the skin for a long time, without being taken into the system in appreciable quantities. If, however, it is irritating, like Spanish flies, absorption speedily begins, and is carried on through the cuticle, as is proved by the effects produced on the urinary organs.

When the perspiration is brought to the surface of the skin, and confined there either by injudicious clothing or by want of cleanliness, there is much reason to suppose that its residual parts are again absorbed, and act on the system as a poison of greater or less power, according to its quantity and degree of concentration, thereby producing fever, inflammation, and even death itself; for it is established by observation, that concentrated animal effluvia form a very energetic poison. The fatal consequences which have repeatedly followed the use of a close waterproof dress by sportsmen and others, and the heat and uneasy restlessness which speedily ensue where proper ventilation is thus prevented, seem explicable on some such principle.

It is believed by many that marsh miasmata and other poisons are absorbed by the skin as well as by the lungs, and Bichat considered the fact as established in regard to the effluvia of dissecting-rooms. There are many reasons for concurring in this belief. The plague, for instance, is much more readily communicated by contact than by any other means, and this can happen only through the medium of absorption. Besides, it is observed that those who work with oil and other greasy substances which obstruct the pores of the skin, often escape the contagion when all around them suffer. Flannel and warm clothing, in like manner, which have been proved to be extremely useful in preserving those who are unavoidably exposed to the action of malaria and of epidemic influences, manifestly act chiefly by protecting the skin. A late writer on the Malaria of Rome strongly advocates this opinion, and expresses his conviction that the ancient Romans suffered less from it, chiefly because they were always enveloped in warm woollen dresses. This opinion, he says, is justified by the observation, that since the period at which the use of woollen clothing came again into vogue, intermittent fevers have very sensibly diminished in Rome. Even in the warmest weather, the shepherds are now clothed in sheep-skins. Brocchi, who experimented extensively on the subject, obtained a quantity of putrid matter from the unwholesome air, and came to the conclusion, that it penetrated by the pores of the skin rather than by the lungs. Brocchi ascribes the immunity of the sheep and cattle, which pasture night and day in the Campagna, to the protection afforded them by their wool.* These remarks deserve the serious attention of observers,—particularly as, according to Patissier, similar means have been found effectual in preserving the health of labourers digging and excavating drains and canals in marshy grounds, where, previously to the employment of these precautions, the mortality from fever was very considerable.

* Edin. Phil. Journ. January 1833.

It is a general law, that every organ acts with increased energy when excited by its own stimulus; and the application of this law to the different functions of the skin may help to remove some of our difficulties. The skin exhales most in a warm dry atmosphere, because the latter dissolves and carries off the secretion as fast as it is produced; and the same condition is unfavourable to absorption, because nothing is present upon which the absorbents of the skin can act. In a moist atmosphere, on the other hand, the absorbents meet with their appropriate stimulus, and act powerfully; while exhalation is greatly diminished, because the air can no longer carry off the perspiration so freely. Apparently from this extensive absorption we find the inhabitants of marshy and humid districts remarkable for the predominance of the lymphatic system, as has long been remarked of the Dutch; and, as malaria prevails chiefly in situations and seasons in which the air is loaded with moisture, and is most energetic at periods when absorption is most active and moisture is at its maximum, the probability of its being received into the system chiefly by cutaneous absorption is greatly increased, and the propriety of endeavouring to protect ourselves from its influence by warm woollen clothing becomes more striking. In the army and navy, accordingly, where practical experience is most followed, the utmost attention is now paid to enforcing the use of flannel and sufficient clothing as a protection against fever, dysentery, and other diseases, particularly in unhealthy climates. In the prevention of cholera, flannel was decidedly useful.

From the above exposition of the laws of absorption, and from the facts referred to at page 16, may it not be feasibly inferred, that the efficacy of great heat in preventing contagion from the plague, is partly owing to the consequent dryness of the atmosphere no longer presenting the requisite stimulus to the absorbents, but, on the contrary, powerfully exciting the action of the exhalants? Damp directly stimulates the absorbents, and hence may arise its hurtfulness as a vehicle. The system, too, it is well known, is peculiarly susceptible of infection when the stomach has been for some time empty, as before breakfast. May not this be accounted for by the then greater activity of absorption?*

From grouping all the constituent parts of the skin into one whole, and perceiving so many operations connected with that tegument, some may be apt to suppose it an exception to a principle already hinted at, that no single part can execute more than a single direct function. In reality, however, it is only by taking the guidance of this principle that we can extricate ourselves from the apparent confusion. We have already seen that exhalation and absorption are each connected with distinct textures in the skin. On farther examination, we shall find the office of Touch and Sensation intrusted exclusively to another constituent part, *the nervous*: for, in serving as the instrument of feeling, the skin acts in no other way than by affording a suitable surface for the distribution and protection of the nerves which receive and transmit to the brain and mind the impressions made on them by external bodies. In this respect the skin resembles the other organs of sense, in all of which the nerve is the true instrument of the sense; the eye, the ear, the nose, and the skin, being simply structures fitted to bring the nerve into relation with the qualities of colour, sound, smell, roughness, and smoothness, by which they are respectively affected;—and they differ from each other, because sound differs from colour, colour from smell, and smell from roughness or smoothness; and because sound or colour can be

* In Dr Madden's work on Cutaneous Absorption, and also in two excellent articles on the Skin in Nos. IV. and XII. of the British and Foreign Medical Review, the reader will find additional information concerning the structure and functions of the skin, and especially on the subject of its absorbing power.

taken cognizance of by its own nerve, only when the latter is provided with an apparatus fit to be acted upon by the vibrations of the air, or by the rays of light. In every instance, it is the external object acting upon a *nerve* which gives rise to the impression received from the organs of sense.

The skin being the seat, and the nerve the immediate instrument, of sensation or sensibility, it becomes an object of interest to ascertain in what manner the nerve is distributed over the skin so as to enable it to come into contact with external bodies without the risk of sustaining injury from their roughness or hardness. On this point we shall find much information in the work of Breschet already referred to.

On examining the woodcut on page 12, a great number of pointed or conical eminences, *h*, will be seen to cover the surface of the skin. These are called, from their shape, *papillæ*, or little paps, and very often, from their structure, *nervous papillæ*. These papillæ consist of minute nervous ramifications, separated from each other by the space which gives passage to the perspiratory pores. Their shape is that of a small cone with its base resting on the dermis, and its apex terminating in an obtuse point. Every nervous branch entering a papilla penetrates into the epidermis like a sword into its scabbard, so that the depressions on the internal surface of the epidermis represent exactly the number and disposition of the papillæ. On entering the papillæ, the nerves lose their common investing membrane or sheath (neurilema), and are then protected by a covering from the epidermis itself. By this arrangement, the tactile extremity of the nerve which enters into the papillæ, is allowed to come into more direct contact with the qualities of the external objects which it is intended to recognise, and thus to appreciate them more correctly. In this way, touch is exercised by thousands of these little organs, all placed side by side, as it were, and communicating together by means of the nervous network spread over the whole surface of the body from one papilla to another; and the proof that the nerve really penetrates into the papilla is, that although the epidermis may be removed with impunity, acute pain is felt the moment the papilla itself is injured. Even the mere contact of the air causes pain when the protecting epidermis is removed.

Small as the individual papillæ are, and still smaller as are the nervous ramifications which constitute their chief bulk, each of them receives into its centre a minute branch of a bloodvessel as the condition of its life and action. When the surface of the body is warm, and its circulation active, touch and sensation are acute, because their nerves then receive abundance of stimulating blood. But when the surface is chilled by cold, and the circulation through the skin is almost null, sensation becomes so blunt that wounds may be inflicted without exciting pain; because then the nervous papillæ, being imperfectly supplied with blood, can no longer act with readiness or vigour.

Such being the structure of the skin, it follows that every part of it, however remote, must be provided with filaments from the nerves of sensation, that we may become immediately sensible of the presence and action of external bodies. If any part were destitute of this property, its texture and vitality might be destroyed without our being conscious of the fact; whereas, in consequence of this provision of sensitive nerves, no object can touch the skin without our being instantly made aware of its presence and properties. A case described by Dr Yelloly, in the third volume of the Medico-Chirurgical Transactions, illustrates in a striking manner the great utility of these nerves in warning us of danger. "The patient's hands," says Dr Yelloly, "up to the wrists, and the feet half-way up the legs, are perfectly insensible to any species of injury, as cutting, pinching, scratching, or burning. . . *He accidentally put one of his feet, some time ago, into boiling water, but was no otherwise aware of the high temperature than by finding the whole surface a complete blister on removing it.*"

While, however, sensation is common to the whole surface of the body, there are parts of the skin more immediately destined by Nature for the exercise of Touch, and for the better appreciation of all the qualities of which it is cognizant. Such are the hands and tongue in man, the proboscis in the elephant, the tail in some of the monkey tribes, and the tentacula in fishes. Now, in accordance with the explanation given of the dependence of sensation upon nervous endowment, it is remarkable that all the parts destined for this special exercise of Touch, receive the most abundant supply of sensitive nerves. Thus the nerves going to the hand and arm, the most perfect instruments of Touch and Sensation in man, are at their dorsal roots five times larger than those which are destined for its motion; and, in like manner, the nerve supplying the tactile extremity of the proboscis of the elephant, exceeds in size the united volume of all its muscular nerves. On the other hand, in animals covered with hair or feathers, whose Touch and Sensation are comparatively defective, the muscular nerves far exceed in size those of Sensation; and wherever Nature has endowed any particular part with high sensitive powers, she is invariably found to have distributed to that part, and to it alone, a proportionally higher nervous endowment. In man, accordingly, innumerable nervous papillæ, destined for the exercise of Touch, may be distinctly seen in parallel irregular rows on the fingers and palm of the hand, and every body knows how acute the sense is in these parts. In fishes, on the other hand, no nervous papillæ can be detected on the surface of the skin; but many of them have tentacula or projections generally about the mouth, for the special purpose of exercising Touch, and these are always plentifully supplied with branches from the fifth pair of nerves.

The nervous tissue of the skin is thus not only an important instrument for receiving and conveying to the mind accurate impressions in regard to the properties of external objects, but it is even essential to our continued existence. The pain which is caused by injuries is no doubt very disagreeable, but in its uses it is a positive blessing, in warning us against the danger, and even certain destruction, which would speedily overtake us if we had no such monitor at hand. If we had no nerves on the surface to communicate to us a lively impression of cold, we might inadvertently remain inactive in a temperature which would not only suspend perspiration, but benumb the powers of life; or we might, as we have already seen, approach so near the fire or boiling fluids, as to have the organization destroyed before we knew: Whereas, by the kind interposition of the nerves, we cannot, when perspiring freely, be exposed to the cold air without an unpleasant sensation being experienced, impelling us to attend to our safety, and to keep up our heat either by additional clothing or by active exercise. When both the nervous and the vascular parts of the skin are in healthy action, a pleasant soft warmth is felt over the body, which is in itself a delight, and which gives to the mind a lightness and hilarity, or pleasant consciousness of active existence, the very opposite of the low and languid depression which so generally accompanies continued defective action in the skin, and which forms a marked feature in many nervous affections.

For the due exercise of Sensation, the nerves must be in a proper state of health. If, for example, the cuticle protecting the nervous papillæ be abraded, or removed by vesication, the naked nerves are too powerfully stimulated by the contact of external bodies, and, instead of receiving and transmitting the usual impressions of heat, cold, and configuration, they communicate scarcely any feeling except that of pain; while, if the cuticle become thickened by hard labour, the impression made on the nerves is proportionally lessened, and little information is conveyed by them to the mind.

I have already remarked that a due supply of arterial blood is another requisite for the action of the nerves of sensation, and that if they be deprived of this, as by exposing the body to a degree of cold sufficient to drive the blood from the surface, the nerves become almost insensible, and severe wounds may be received in this state without the individual being conscious of the accident, or feeling the slightest pain. For the same reason, severe cold, after a certain time, ceases to be painful, and death ensues like deep sleep and without suffering. But when a frozen limb is thawed, and the returning circulation begins to set the nerves in action, suffering forthwith commences, and the over-action is in danger of leading to inflammation. The same phenomena, in an inferior degree, must be familiar to every one, in the prickling and tingling so commonly complained of on heating cold hands or feet too rapidly at a good fire,—symptoms which arise from the return of the blood stimulating the nerves to undue action.

It is the nervous tissue of the skin which takes cognizance of the temperature of the bodies by which we are surrounded, and imparts to the mind the sensation of warmth and coldness. In the healthy state, the sensation is a correct index of the real temperature; but in disease, we often complain of cold and shivering when the skin is positively warmer than natural. In this way, people whose digestion is weak and circulation feeble complain habitually of cold, and of cold feet, where others, differently constituted, experience no such sensations. Exercise dissipates this feeling and increases heat, by exciting the circulation of the blood, throwing more of it to the surface, and thereby increasing the action of the cutaneous vessels and nerves.

Some mental emotions operate upon the skin, and impair its functions much in the same way as cold. Grief, fear, and the depressing passions, by diminishing the afflux of arterial blood, render the skin pale, and at the same time diminish perspiration and nervous action; while rage and other violent passions, by augmenting the afflux of blood, elevate the temperature of the surface, and give rise to the red flush, fulness, and tension so characteristic of excitement. Sometimes, indeed, the effect of mental emotions on the skin is so great as to induce disease. In speaking of impetigo, Dr Bateman alludes to two gentlemen in whom the eruption arose from "great alarm and agitation of mind;" and adds, that he "witnessed some time ago the extraordinary influence of mental alarm on the cutaneous circulation, in a poor woman who became a patient of the Public Dispensary. A sudden universal anasarca (dropsy under the skin) followed, *in one night*, the shock occasioned by the loss of a small sum of money, which was all she possessed."* Facts like these establish a connection between the brain and nervous system and the skin, which it is important not to overlook.

The reverse influence which the condition of the nervous matter distributed over the surface of the body exerts on the rest of the system is also well known, and is exemplified in the effects of exposure to intense cold. The first sensation of chill excited in the nerves of the skin is quickly succeeded by that of numbness and insensibility; and if the exposure be continued, the impression is speedily communicated to the brain, and confusion of mind, followed ultimately by the extinction of life, comes on. When, on the other hand, as in tropical climates, the surface is relaxed by excessive heat, the brain speedily participates in the relaxation, and the mind is unfitted for sustained or vigorous action.

Invalids and literary men often suffer severely from excess of action in the brain, and deficiency of activity in the nerves of the skin and remoter organs. The nervous stimulus, which is essential to digestion and to the health and warmth of the skin, cannot be provided when the brain is too exclusively exercised in thinking or feeling; and from the want of this stimulus the tone of the digestive and cutaneous organs is greatly reduced; the surface of the body becomes cold, shrunk, and uncomfortable, and the individual is subject to annoyance and painful sensations from trifles which formerly gave pleasure. Bad digestion and deficient warmth of surface are thus proverbially complained of among literary and sedentary persons, and can be removed only by exciting the nervous and vascular functions of the skin, and diminishing those of the brain.

Such are the direct and important uses of the skin. But, in addition to the parts already noticed, there are several others which, in a purely scientific treatise, would require to be described at some length. But as they have very little influence in a practical point of view, and moreover would not be easily understood, I shall content myself with a simple allusion to two of them.

We have already seen that what are called the mucous coat and the epidermis are merely different states of an originally fluid mucus, secreted in the substance of the dermis, and mixed, on reaching its surface, with a peculiar colouring matter. This mucus, according to Breschet, is secreted by a particular apparatus composed of a principal organ, analogous to a gland, seen at *c* in the woodcut on page 12, and situate at the bottom or near the inner surface of the dermis, and of an excretory duct, seen arising from the top of the gland *c*, which traverses the dermis and pours out the mucus upon its external surface. This excretory duct differs from that by which the sweat is excreted in not being spiral, and in the woodcut the two kinds of glands and ducts may be easily distinguished from each other.

The only other structure requiring to be mentioned in connection with the skin, is that by which the colouring matter is produced. Breschet describes it as composed of a glandular parenchyma situate a little below the papillæ, seen at *g* in the woodcut like a rounded line or cord running along their base, and presenting innumerable little threads projecting from its upper edge towards the papillæ. These threads are the ducts by which the colouring principle is poured out upon the surface of the dermis, there to become mixed with the soft and diffluent mucus, and to impart that colour by which the skin is distinguished in different individuals and races. From this view, it will be observed that the dermis or true skin is itself without colour, and that the latter, properly speaking, resides in the mucous coat. The red suffusion of the skin in blushing, however, does not arise from this cause, but from the unusual afflux of blood distending the innumerable minute vessels which form a vascular net-work on the surface of the dermis, and which are essential to the due performance of its functions as the seat of perspiration and of sensation.

Besides the parts just described, there are also numerous small follicles or glands contained in the substance of the skin, more abundant where hairs are implanted, and in the vicinity of the orifices of natural canals than in other regions, but existing in all parts except the palms of the hands and soles of the feet. They are about the size of a millet-seed, and the skin which contains them is thin, reflected on itself, and very vascular. Their cavities are filled with an oily humour, and each opens by an orifice at the external surface of the skin. It is this oily matter which prevents water from penetrating easily and relaxing the cuticle, and the absence of which, when it has been removed by the soda used in washing clothes, allows the skin of the hands and fingers to assume that wrinkled and shrivelled appearance common among washerwomen.

* Bateman on Cutaneous Diseases, p. 150.

CHAPTER IV.

CONDITIONS OF HEALTH OF THE SKIN, AND ITS INFLUENCE ON THE GENERAL SYSTEM.

Conditions of health of the skin.—Free circulation in its vessels, and free exhalation from its surface the chief requisites.—Cold unfavourable to both.—Mortality in infancy from cold.—Exercise indispensable—attention to clothing is important.—Bad health in youth from inadequate clothing and cold rooms, especially in schools—coldness of feet and its consequences, causes and means of prevention—mischief from abuse of warm bottles in bed—and from over-heated rooms causing increased susceptibility of cold—cautions on this subject.—Excess of clothing equally injurious.—Dress not to be tight.—Influence of cold and wet feet.—Qualities requisite in clothing.—Flannel combines most of them.—Practical proofs of the utility of flannel as a preservative of health—in warm as well as in cold climates—cautions to be observed in laying aside clothing.—Clothing to be carefully exposed to the air.—The frequent removal of impurities from the clothes and surface essential to the health of the skin.—Hence the utility of frequent changes—and of ablution and bathing.—Washing-establishments for the poor recommended—their advantage and economy shewn in Liverpool.—Necessity of removing impurities from the skin—hence usefulness of tepid and warm bath, shower-bath, and daily ablution—cold bathing and sponging with water and vinegar or salt.—Preservative and soothing influence of warm bath as a domestic comfort.—Strongly recommended for the working-classes, and much used on the continent—fear of cold after it unfounded—the reverse is the truth.—Vapour bath very useful.—In nervous disease and in depression, warm and vapour baths very salubrious.—Daily friction with hair-glove or flesh-brush of great value in both health and disease.—Sailing and riding useful by acting on the skin.—The author's case a good illustration of the influence of the skin on health.—Beneficial influence of solar light.—Important deficiency of it in the dwellings of the poor.—Noxious external agencies to be avoided.—Contagion by absorption.—Best means of preventing it.

From the foregoing exposition of the structure and functions of the skin, the principles on which its physiological management ought to be conducted will be sufficiently apparent; but as knowledge becomes valuable only in proportion as it is rendered subservient to the improvement and happiness of man, I shall offer no apology for now directing the attention of the reader to some of the advantages which may be derived from the practical application of the information which has just been communicated.

Assuming the natural constitution of the skin for our guide, it follows that the conditions essential to its healthy action are, *first*, that a free and equal circulation of blood shall take place over every part of its surface; *secondly*, that a free and equal perspiration shall be kept up in every part in due proportion to the circumstances in which the individual is placed; *thirdly*, that the *residuum*, or remains of the perspired matter, and all external impurities accidentally deposited on the surface of the body, shall be scrupulously and timeously removed; and, *lastly*, that the contact of noxious external agents likely to be absorbed by the skin should be carefully avoided and removed.

As the means which are most effectual in *ensuring a free and equal circulation of blood over the whole surface of the skin*, are, at the same time, more or less directly efficacious *in keeping up a due degree of perspiration, and in removing impurities* from the surface, I shall, to avoid unnecessary complication, treat of them all under the same head. Those among them which chiefly require our attention, are bodily exercise, suitable clothing, friction, and bathing.

The temperature of the skin is a pretty good test of the state of both circulation and perspiration on its surface. When the skin is comfortably warm, its depth of colour, pleasant softness, and moisture, indicate that the blood circulates freely through its minuter vessels, and that the perspiration is healthy and active. When, on the other hand, the surface is chilled and pale, we may be perfectly certain that its circulation is inactive, and perspiration deficient. Hence the proper regulation of its temperature is, in one sense, the first requisite to the preservation of its health.

When the skin is habitually cold, not only are the circulation and perspiration impeded or obstructed, and the injurious waste matter thus retained within the system; but the great mass of blood is thrown in undue proportion upon the internal organs, and, by over-distending their bloodvessels, tends directly to impair their health, and induce serious and often fatal disease.

The most frequent causes of this injurious coldness of the surface, are bodily inactivity, or a want of active exercise in the open air, want of sufficient clothing, and sitting in cold rooms. When a person sits all day at a desk or in a drawing-room, especially in winter, coldness of the feet and a chilly dry paleness of the skin are almost sure to be produced. But on going into the open air and taking active and invigorating exercise, the chill soon begins to disappear, the complexion deepens, and a genial heat and moisture of the skin succeed; and these results become habitual if the exercise be repeated with sufficient regularity and frequency. Exercise, then, is an indispensable requisite to the health of the skin; but as I shall have occasion to treat of it very fully in a subsequent chapter I shall not enter farther upon its consideration here.

The influence of *unsuitable or inadequate clothing* in impairing, and of *suitable clothing* in protecting and restoring, the functions of the skin, is very visible at all ages, in all ranks of society, and in all seasons. In infancy, and especially among the poor, want of proper clothing and the consequent exposure to cold are frequent causes of death, and still more frequent causes of sickness. From the recent *Reports of the Registrar-General of Births, Deaths, and Marriages in England* for 1838–9, it appears that one-third of all the deaths registered, or 342 per 1000, occur under two years of age. On inquiry, it is found that the proportion of such deaths among the poor is far greater than among the middle and richer classes. A very influential, although by no means the only, cause in producing this excess among the poor, is the inadequate protection afforded to the new-born infant against the effects of the sudden transition which it makes in passing from a high and almost unvarying temperature in the mother's womb, to one greatly inferior and constantly liable to change. At birth the skin is delicate, extremely vascular, and highly susceptible of impressions, so much so that cases have occurred in which a leech-bite has caused a fatal hæmorrhage. The circulation is, in fact, cutaneous; for the lungs, the stomach, the liver, and the kidneys, are as yet newly brought into activity, and feeble in their functions. If the infant then be rashly exposed to a cold atmosphere, the mass of blood previously circulating on the surface of the body is immediately driven inwards by the contraction of the cutaneous vessels, and, by over-stimulating the internal organs, gives rise to fever, bowel-complaints, inflammation, croup, or convulsions, which sooner or later extinguish life. Hence warm and light clothing is indispensable in infancy, and especially during the winter and spring months; and if, under the absurd expectation of hardening the constitution, the infant be daily plunged into cold water at that tender age, or rashly exposed to the open air during very cold weather, or to currents from doors or windows, the consequences can scarcely be otherwise than injurious.

In my recently published *Treatise on the Physiological and Moral Management of Infancy*, I have entered into some details in proof of the great influence of cold on infant mortality, and particularly of that arising from a law now or lately prevalent in France, which

requires newly-born children to be carried to the office of the *Maire* to be registered, a custom which Dr Edwards has shewn to be productive of a rate of mortality proportioned to the coldness of the season and climate, and to the distance which the infant is carried from the parent's house. What more striking proof than this can be required of the evils arising from the ignorance of legislators in regard to the constitution of the human body? No man who understood physiology could ever have sanctioned a law, the practical effect of which is to consign annually so many victims to an untimely grave.

Many parents, however, from over-anxiety to avoid one form of evil, run blindfold into another scarcely less pernicious, and not only envelope infants in innumerable folds of warm clothing, but keep them confined to very hot and close rooms. It would be well for them to recollect, when they do so, that extremes are always hurtful, and that the constitution may be enfeebled, and disease induced by too much heat and clothing, and too close an atmosphere, as effectually as by cold and currents of air. The skin, thus opened and relaxed, perspires too easily, and is readily affected by the slightest variations of temperature; whence arise colds and other ailments, which it is their chief intention to guard against; and the internal organs, being at the same time deprived of their fair proportion of blood, become enfeebled and afford inadequate nourishment and support to the rest of the body

But it is not in infancy alone that sickness and mortality are produced from the imperfect regulation of the temperature of the skin. In youth, and especially during the debility arising from rapid growth, the proper regulation of the clothing demands more attention than is generally bestowed on it. Many young persons of both sexes are in the habit of going about in winter and in cold weather with a dress light and airy enough for a northern summer, and they think it manly and becoming to do so; but those who are not very strongly constituted suffer a severe penalty for their folly. The necessary effect of deficient circulation and vitality on the skin, is, as we formerly said, to throw a disproportionate mass of blood inwards; and when this condition exists, insufficient clothing perpetuates the evil, until internal disease is generated, and health irrecoverably lost. Insufficient clothing not only exposes the wearer to all the risk of sudden changes of temperature, but it is still more dangerous (because in a degree less marked, and therefore less apt to excite attention till the evil be incurred) in that form which, while it is warm enough to guard the body against extreme cold, is inadequate to preserving the skin at its natural heat. Many youths, particularly females, and those whose occupations are sedentary, pass days, and weeks, and months, without ever experiencing the pleasant glow and warmth of a healthy skin, and are habitually complaining of chillness of the surface, cold feet, and other symptoms of deficient cutaneous circulation. Their suffering, unfortunately, does not stop here, for the unequal distribution of the blood oppresses the internal organs, and too often, by insensible degrees, lays the foundation of tubercles in the lungs, and other maladies, which shew themselves only when arrived at an incurable stage. Young persons of a consumptive habit will generally be found to complain of this increased sensibility to cold, even before they become subject to those slight catarrhal attacks which are so often the immediate precursors, or rather the first stages, of pulmonary consumption. All who value health, and have common sense and resolution, will therefore take warning from signs like these, and never rest till equilibrium of action be restored. For this purpose, warm clothing, exercise in the open air, and regular daily friction with a hair-glove or flesh-brush, are excellently adapted, and should be diligently pursued.

It is true that in youth the skin is more vigorous in constitution than it was in infancy; and that the several animal functions being now more equally balanced, the system is less susceptible of disorder from external causes, and can endure with impunity changes of temperature which at either an earlier or more advanced age would have proved highly injurious. It is true, also, that the activity and restless energy of youth tend to keep up a free and equal circulation even in the remotest parts of the body, and that this free circulation tends in its turn to maintain an equality of temperature in them all. *Cold* bathing and lighter clothing, therefore, may now be resorted to with a rational prospect of advantage, provided they be properly regulated and duly proportioned to the state of the individual. But *when, from a weak constitution or unusual susceptibility, the skin is not endowed with sufficient vitality to originate the necessary reaction which alone renders these safe and proper,—when they produce an abiding sense of chillness, however slight in degree,—we may rest assured that mischief will inevitably follow at a greater or shorter distance of time, and we should at once modify or discontinue them.*

In ordinary, and especially in boarding schools, great mischief is often inflicted on the young from inattention to this guiding principle. I have known many instances in which delicate young girls have suffered seriously and permanently from being confined to cold rooms in winter, with little or no fire, and with nothing beyond their ordinary in-door clothing, and, at the same time, on account of the weather, not allowed any active exercise in the open air by which their natural heat could be increased. The consequence has been a state of habitual suffering during many months of the year, a lowered tone of health, a retarded development of the constitution, a cold paleness of the surface and extremities, often accompanied by chilblains, and a spiritless languor of mind, which forms a striking contrast to the natural vivacity of youth. These evils, too, it is well to remark, are not inflicted from design, or even from carelessness. In most instances they spring from ignorance alone, and from a wish to harden the constitution, which they are in reality calculated to destroy. In boarding-schools for boys, I have known the same pernicious principles acted upon, and with lamentable consequences; but in them the evil is, to some extent, counteracted by the restlessness and craving for active exercise in the open air, which at that age can scarcely be repressed under any system of prohibitive discipline. A moderate acquaintance with physiology on the part of teachers would save them from this destructive error.

Habitual coldness of the feet is another source of suffering and bad health, both in schools and in general society; and in both it arises chiefly from inactivity or indolence. Sedentary females, literary men, clerks, &c., almost invariably suffer from this cause; and, in schools, even the young suffer from not being allowed sufficient exercise in active sports to circulate their blood. The formal boarding-school walk of half an hour or an hour *on fine days*, is a mere dull shadow of what exercise ought to be in youth, and is of no avail in infusing warmth and vigour into chilblained hands and feet. But of this I shall have occasion to speak again in a subsequent chapter. In the mean time, I shall only caution the reader as to the use, or rather abuse, of warm-water bottles now so commonly resorted to, to impart heat to the feet when in bed. Like all other substitutes for the operations of Nature, warm bottles fail in the purpose for which they are used, and tend to aggravate the evil. Instead of promoting a healthier circulation through the vessels of the feet, they weaken by relaxing them, and leave them less able than before to generate *natural heat*. Every body admits that a warm foot-bath used every evening is relaxing and hurtful. But in reality a hot-water bottle in contact with the feet for hours every night acts on precisely the same principle, and proves scarcely less injurious. By the irregularity of circulation which it brings about, it

induces flushing and headach, while it does not correct the cause of the coldness of the feet. In females, accordingly, it often produces a local weakness and discharge altogether incompatible with health. To remove such coldness, exercise, friction, and proper attention to diet and to the bowels, are the most effectual means; and, in addition to these, the use of the cold salt-water foot-bath, for two or three minutes at a time, once or even twice a-day, will be very serviceable by invigorating the circulation, and exciting a healthy reaction similar to the glow which comes on after sea-bathing. The only legitimate use of hot-water bottles is to air or moderately warm the sheets, by placing two or three of them in different parts of the bed late in the afternoon, and having them removed at least an hour or so before going to bed. But even this indulgence should be resorted to only in aid of better means, and when there is positive necessity for external warmth. The plan of going to sleep with the feet in contact with a warm bottle is a very bad one, and ought never to be adopted as a habit.

The inactivity implied in a sedentary mode of life leads to another abuse, against which every thinking person ought to guard. I allude to the overheating of sitting and bedrooms by large fires or stoves. External heat thus applied invariably diminishes the heat-producing power of the animal system, and renders it, as a necessary consequence, more and more dependent on external warmth at the expense of increasing debility and susceptibility of cold. Many persons, when cautioned on this subject, triumphantly point to a thermometer in the same room as indicating a temperature of perhaps only 65°. But this is a fallacious test. There is a great difference between an equable temperature of 65° diffused *through the whole air* as in summer, and a corresponding temperature *in a part of any room, the air of which is rapidly and constantly changing.* To raise the thermometer of such a room to 65° in winter, at 10 or 15 feet distance from the fire, we must have a heat of perhaps 75° nearer the fire, and a large quantity of heat must be given out by radiation, and directly absorbed by the body. In a room warmed by a large fire, too, there is constantly a strong current of air rushing towards the chimney, to which we have no parallel in the equal temperature of a summer-day. But the air thus entering the room from without is necessarily colder by very many degrees than the air contained in it; so that, to keep the thermometer steadily at 65°, we must keep up a fire large enough to *instantly* warm that large mass of cold air. To succeed in this, however, the fire must be such as to throw out a quantity of heat by radiation and contact far beyond what is present in the same quantity of air at the same apparent heat in summer, and by this radiated heat, the body is scorched and relaxed. Whereas in summer, the walls, the furniture, and the air of the room being all at an equilibrium of heat, no such current or rapid loss is going on. The consequence is, that let any one in winter come from the open air into a room of a temperature of 65° at ten feet from the fire, and he will instantly exclaim, How overheated the room is; although those who are accustomed to it may affirm the contrary, and point, as a proof, to the thermometer. This sensation of overheating is not the result of the mere transition; for no length of time will make the warmth agreeable to a healthy person of active habits; and, practically, those who indulge in the warmth certainly suffer all the evils arising from overheated rooms. I have so often noticed this that I can speak on the subject with confidence. For invalids confined to the house it is a matter of much importance, and, as a general rule, I should consider a thermometrical temperature of 55° in winter in a bedroom or sitting-room, where there is a current of air, as fully equal to a steady temperature of 65° in summer, and consequently quite as high as ought ever to be indulged in.

For a similar reason, while sufficiency of clothing is attended to, excessive wrapping up must be as carefully avoided. Great differences in the power of generating heat and resisting cold exist in different individuals, and it would be absurd to apply the same rules to those who never feel cold, as to those who are peculiarly sensitive. The former may be benefited by cold bathing and degrees of exposure which would be fatal to the latter. The rule is, therefore, not to dress in an invariable way in all cases, but to put on clothing in kind and quantity *sufficient in the individual case to protect the body effectually from an abiding sensation of cold, however slight.* Warmth, however, ought not to be sought for in clothing alone. The Creator has made exercise essential as a means; and if we neglect this, and seek it in clothing alone, we act at the risk, or rather with the certainty, of weakening the body, relaxing the surface, and rendering the system extremely susceptible of injury from the slightest accidental exposures, or variations of temperature and moisture. Many good constitutions are thus ruined, and many nervous and pulmonary complaints brought on, to embitter existence, and to reduce the sufferer to the level of a hot-house plant.

Female dress errs in one important particular, even when unexceptionable in material and quantity. From the tightness with which it is made to fit on the upper part of the body, not only is the insensible perspiration injudiciously and hurtfully confined, but that free play between the dress and the skin, which is so beneficial in gently stimulating the latter by friction at every movement of the body, is altogether prevented, and the action of the cutaneous nerves and vessels, and consequently the heat generated, rendered less than that which would result from the same dress more loosely worn. Every part and every function are thus linked so closely with the rest, that we can neither act wrong as regards one organ without all suffering, nor act rightly without all sharing in the benefit.

We can now appreciate the manner in which wet and cold feet are so prolific of internal disease, and the cruelty of fitting up schools and similar places without making adequate provision for the welfare of their young occupants. The circumstances in which wet and cold feet are most apt to cause disease, are those where the person remains inactive, and where, consequently, there is nothing to counterbalance the unequal flow of blood which then takes place towards the internal parts; for it is well known that a person in ordinary health may walk about or work in the open air with wet feet for hours together without injury, provided he put on dry stockings and shoes immediately on coming home. It is therefore not the mere state of wetness that causes the evil, but the check to perspiration and the unequal distribution of blood to which the accompanying coldness gives rise. I am acquainted with an instance in which a robust and healthy tradesman, by incautiously standing in the sea, when in a state of profuse perspiration, for five minutes, in repairing a steam-boat, brought on severe constitutional disturbance, followed by pulmonary disease, which confined him to the house during the whole of *four* winters. Twenty-three years have now elapsed since the cause was applied; but although his health is gradually improving, he still suffers from cough and breathlessness, and is very susceptible of cold and illness from every trifling exposure. This person instantly shifted himself on coming out of the water, which at the time he had been led to believe was a sufficient precaution. But had he known something of his bodily constitution, he would have seen the danger before he exposed himself to it, and would have escaped the heavy penalty which his ignorance brought upon him.

The preceding observations refer chiefly to the quantity and fitting of the clothing; but the quality or material of which it is composed is also a consideration of much importance.

The principal requisites in clothing are, that it shall be, 1*st*, as light as possible; 2*dly*, a bad conductor of heat, so as to afford protection against sudden changes of temperature; and, *lastly*, of a sufficiently porous nature to admit of the easy passage of the insensible perspiration. Of the various kinds of clothing in common use, none presents these combined advantages in so high a degree as flannel; and consequently, as a general rule, no other material can equal it in suitableness for being worn in contact with the skin, which it is our special object to protect.

The advantages of wearing flannel next the skin have been long and familiarly known, and they are easily explicable on the principles expounded above. Being a bad conductor of heat, flannel prevents that of the animal economy from being quickly dissipated, and protects the body in a considerable degree from the injurious influence of sudden external changes. From its presenting a rough and uneven though soft surface to the skin, every movement of the body in labour or in exercise, gives, by the consequent friction, a gentle stimulus to the cutaneous vessels and nerves, which assists their action, and maintains their functions in health; and, being at the same time of a loose and porous texture, flannel is capable of both absorbing and giving passage to the cutaneous exhalations to a larger extent than any other material in common use. In some very delicate constitutions, it proves even too irritating to the skin, and in hot climates sometimes excites too great a flow of perspiration. In the former case, fine fleecy hosiery, and in the latter, cotton, will in general be easily endured, and will greatly conduce to the preservation of health. Many are in the custom of waiting till winter has fairly set in before beginning to wear flannel. This is a great error in a variable climate like ours, especially when the constitution is not robust. *It is during the sudden changes from heat to cold, which are so common in autumn, before the frame has got inured to the reduction of temperature, that protection is most wanted, and flannel is most useful, and also during the sudden transitions in spring.* Even during the summer months, the changes of temperature at different times of the day, and the degrees of activity in which we are engaged, are so very different, that flannel is scarcely less valuable as a protection than during the colder months of the year. Towards sunset the air often becomes so cold in summer after a very warm day, as to become the cause of a sudden chill to those who are not on their guard against it. This is a frequent occurrence even in the climates of France and Italy, from the moisture which is then condensed by the cooling of the air. Upon the whole, therefore, I am disposed to recommend persons of a delicate constitution not to leave off the use of flannel even in summer, but rather, if they find it too warm, to wear it over, instead of under, the shirt, as in winter. This will modify its effects, and at the same time scarcely impair its protecting power against sudden changes.

The advantages of flannel as a preservative from disease, in warm as well as in cold climates, are now so well understood, that in the army and navy its use is cogently, and with great propriety, insisted on. Sir George Ballingall, in his valuable *Lectures on Military Surgery* (p. 92), has some very judicious remarks on the influence of warm clothing in preserving the health of soldiers. After adducing the testimony of Sir James Macgrigor, to shew that in the Peninsula the best clothed regiments were generally the most healthy, Sir George mentions, that, when in India, he had himself a striking proof of the utility of flannel in checking the progress of a most aggravated form of dysentery in the second battalion of the Royals. Captain Murray, also, late of H.M.S. Valorous, told me, that he was so strongly impressed from former experience with a sense of the efficacy of the protection afforded by the constant use of flannel next the skin, that when, on his arrival in England in December 1823, after two years' service amid the icebergs on the coast of Labrador, the ship was ordered to sail immediately for the West Indies, he directed the purser to draw two extra flannel shirts and pairs of drawers for each man, and instituted a regular daily inspection to see that they were worn. These precautions were followed by the happiest results. He proceeded to his station with a crew of 150 men; visited almost every island in the West Indies, and many of the ports in the Gulf of Mexico; and, notwithstanding the sudden transition from extreme climates, returned to England without the loss of a single man, or having any sick on board on his arrival. It would be going too far to ascribe this excellent state of health solely to the use of flannel; but there can be little doubt that this was an important element in Captain Murray's success. Far, however, from trusting to it alone, Captain Murray was as careful in guarding against other sources of disease as against variations in temperature; and with this view every precaution was at the same time used, by lighting stoves between decks and scrubbing with hot sand, to ensure the most thorough dryness, and proper means were put in practice to promote cheerfulness among the men. When in command of the Recruit gun-brig, which lay about nine weeks at Vera Cruz, the same means preserved the health of his crew, when the other ships of war anchored around him lost from twenty to fifty men each.

That the superior health enjoyed by the crew of the Valorous was attributable chiefly to the means employed by their humane and intelligent commander, is shewn by the analogy of the Recruit; for although constant communication was kept up between this vessel and the ships in which sickness prevailed, and all were exposed to the same external causes of disease, yet no case of sickness occurred on board of it. Facts like these are truly instructive, by proving that man possesses much power of protecting himself from injury, when he has received the necessary instruction, and chooses to adapt his conduct to the circumstances in which he is placed.

With regard to the rest of the clothing, it is impossible to lay down any fixed rules: all that can properly be said is, that it should be light, free, and unrestrained, and in such quantity as to afford the necessary protection without relaxing the surface too much. It ought, therefore, to vary not only according to the season and the weather, but according to the active or passive state of the wearer. As active exertion is favourable to the production of animal heat, less clothing is necessary for walking than for driving or sailing. For this reason we see the labourer strip in proportion to the severity of his toil, while the passive female in a well-hung carriage lolls wrapped up in cloaks and furs. But when overheated by exercise, we should be careful not to throw aside our wrappings too suddenly after coming home. The safest way is to saunter about the room for a few minutes till the natural heat be attained, and then to throw off the superfluous covering. Many get chilled by neglecting this precaution, and blame the walking out for the cold which they caught rather after their return. In like manner, many injure themselves in severe weather by getting chilled, and trusting to subsequent exercise to restore their heat. Whereas going out already cold is the surest way to get thoroughly chilled, and to be hurt by it. Those resist external cold best who go out comfortably warm, and with an active state of the cutaneous circulation.

In aid of the third requisite of clothing—that it should be sufficiently porous to give easy passage to the insensible perspiration, and sufficiently absorbent to take up a considerable portion of moisture when sweating is induced,—it is necessary that whatever is worn should be frequently changed, aired, and washed, to free it from the impurity necessarily arising from so constant and extensive an exhalation from the skin. In the case of flannel, for example, which imbibes perspiration very readily, it is an excellent plan, instead of wearing the

same for several successive days, either to change it very frequently, or to make use of two sets of flannel, each being worn and aired by turns on every alternate day. A frequent change, however, is certainly the preferable practice. For the same reason, a practice common in Italy merits universal adoption. Instead of beds being made up in the morning the moment they are vacated, and while still saturated with the nocturnal exhalations, which, before morning, even become sensible to smell in a bed-room, the bedclothes are thrown over the backs of chairs, the mattresses shaken up, and the window thrown open for the greater part of the day, so as to secure a thorough and cleansing ventilation. This practice, so consonant to reason, imparts a freshness which is peculiarly grateful and conducive to sleep, and its real value may be inferred from the well-known fact, that the opposite practice, carried to an extreme—as in the dwellings of the poor, where three or four beds are often huddled up with all their impurities in a small room—is a fruitful source of fever and bad health, even where there is no deficiency of nourishment or of ventilation during the day. In the abodes of the poor Irish residing in Edinburgh, I have seen bedding for fourteen persons spread over one floor not exceeding twelve feet square: when morning came the beds were huddled above one another to make sitting-room during the day, and at night were again laid down, charged with accumulated exhalations. If fever were not to appear in such circumstances, it would be indeed marvellous: and we ought to learn from this, that if the extreme be so injurious, the lesser degree implied in the prevalent practice cannot be wholesome, and ought, therefore, not to be retained when it can be so easily done away with.

The exhalation from the skin is composed of a large quantity of water which passes off in the form of invisible vapour or of fluid sweat, and of various salts and animal matter, a portion of which is absorbed and retained in the texture of the clothes, and another portion of which remains adherent to the skin, and forms on it a layer of impurities. Hence the frequent removal of this residue by washing becomes an indispensable condition of health, the observance of which, particularly in early life, when waste and nutrition are both very active, prevents the appearance of the cutaneous diseases otherwise so common in infancy. Not only, therefore, is daily washing of the body required at that and indeed at every age, but frequent change of clothing is also essential; and for this reason it is much to be wished that a plan of washing the clothes of the poor at a cheap rate, similar to that so successfully in operation in Liverpool, were adopted in all our larger towns. At present, the trouble, time, and expense, imposed upon the mother of a family among the working classes in washing and drying the clothes of its individual members, are so great as to present an almost irresistible temptation to the neglect of cleanliness; and when we wonder at the dirt and disorder of a labourer's house, we are too apt to forget the disadvantages under which its inmates are placed, and the cost of toil and money at which cleanliness is obtained where there are several children to take care of, and cooking and other household operations going on at the same time. Hence, among the poorer classes in large towns, want of cleanliness prevails to a very great extent, and proves highly injurious to both health and morality. Actuated by considerations of this description, a few benevolent individuals in Liverpool combined, a few years ago, to hire and fit up a cellar in a convenient situation, with the requisite boilers, tubs, and drying stoves, where the poor might have the means of washing their bed and body clothes at an exceedingly trifling expense of both time and money; and after several years' trial the results have been most encouraging. Not only have the poor been eager to avail themselves of the privilege thus held out to them; but numerous instances have occurred in which the spread of disease was arrested, and health and character were restored, by the habits of cleanliness and self-respect thus fostered. From the very trifling expense at which this establishment is carried on, it is quite evident that a similar plan might be carried into operation in the different districts of every large town, and even in most of our country villages, with the happiest results.

But if the frequent change and washing of clothes are essential to the health of the skin by removing the saline and animal impurities deposited upon them by the perspiration, it is equally certain that frequent *bathing or washing of the skin* is not less indispensable to remove the impurities adhering to its surface, and which would otherwise tend in the long run to obstruct its pores, impede its functions, and disturb its health. It is apparently for this reason that, in the eastern and warmer countries, where perspiration is very copious, ablution and bathing have assumed the rank and importance of religious observances. Those who are in the habit of using the flesh-brush daily, are at first surprised at the quantity of white dry scurf which it brings off; and those who take a warm bath for half an hour at long intervals, cannot have failed to notice the great amount of impurities which it removes, and the grateful feeling of comfort which its use imparts. The warm, tepid, cold, or shower bath, as a means of preserving health, ought to be in as common use as a change of apparel, for it is equally a measure of necessary cleanliness. Many, no doubt, neglect this, and enjoy health notwithstanding; but many, very many, suffer from its omission, and even the former would be benefited by employing it. The perception of this truth is gradually extending, and baths are now to be found in fifty places for one in which they could be obtained twenty years ago. Even yet, however, we are far behind our Continental neighbours in this respect. They justly consider the bath as a necessary of life, while we still regard it as a luxury. I believe that I am within the truth when I say that in one hospital in Paris, a greater number of baths have been administered to the poor during the last year, than to the whole working population of Great Britain during the last ten years.

When we consider the importance of the exhaling functions performed by the skin, it seems almost incredible that ablution and bathing of every description should be so much neglected in charitable institutions, in seminaries for the young, and even by many persons who consider themselves as patterns of cleanliness. Mr Stuart, in speaking of the North Americans, remarks that "the practice of travellers washing at the doors, or in the porticos or stoops, or at the wells of taverns and hotels once a-day, is most prejudicial to health; the ablution of the body, which ought never to be neglected, *at least twice a-day* in a hot climate, being altogether inconsistent with it." "In fact," he adds, "I have found it more difficult in travelling in the United States, to procure a liberal supply of water at all times of the day and night in my bed-chamber, than to obtain any other necessary. *A supply for washing the face and hands once a-day seems all that is thought requisite.*"* But bad as this is, I fear that numbers of sensible people may be found much nearer home, who limit their ablutions to the *visible* parts of their persons, and would even express surprise if told that more than this is necessary to health. Certain it is that many never wash their bodies unless they happen to be at sea-bathing quarters in summer, or are oppressed with heat, when they will resort to bathing as a means of comfort, but without thinking at all of its efficacy *as a means of cleanliness* in preserving health. In many public charities and schools, in like manner, bathing or ablution is never thought of as a proper or practicable thing, except for the sick; and yet it is obviously of great importance to every one, especially to the

* Three Years in America, vol. ii. p. 440.

young.* These facts shew that there is quite as much truth as sarcasm in the remark of a late writer, that "we every day see whole families purged and vomited by the order of their physicians, but rarely or never do we hear of their being recommended to wash their skins."†

For *general* use, the tepid or warm bath seems to me much more suitable than the cold bath, especially in winter, and for those who are not robust and full of animal heat. Where the constitution is not sufficiently vigorous to secure reaction after the cold bath, as indicated by a warm glow over the surface, its use inevitably does harm. A vast number of persons, especially of those leading a sedentary life, are in this condition; while, on the contrary, there are few indeed who do not derive evident advantage from the regular use of the tepid bath, and still fewer who are hurt by it.

Where the health is good, and the bodily powers are sufficiently vigorous, the cold bath during summer, and the shower-bath in winter, may serve every purpose required from them. But it should never be forgotten that they are too powerful in their agency to be used with safety by *every one*, especially in cold weather. In proportion as cold bathing is influential in the restoration of health when judiciously used, it is hurtful when resorted to without discrimination; and invalids therefore ought never to have recourse to it without the sanction of their professional advisers.

Even where cold bathing is likely to be of service, when judiciously employed, much mischief often results from prolonging the immersion too long. I lately met with a case of this kind in a boy of fifteen years of age, who became nearly insensible from remaining half an hour in the sea, while bathing at Portobello. It was some days before he was sufficiently restored to be considered out of danger. In delicate subjects, injury is often caused by cold bathing, at a time when the vital powers are too languid to admit of the necessary reaction—before breakfast, for example, or after fatigue. For this reason, many persons derive much benefit from bathing early in the forenoon, who, when they bathe in the morning before taking any sustenance, do not speedily recover their natural heat and elasticity of feeling.

For those who are not robust, daily sponging of the body with cold water and vinegar, or with salt water, is the best substitute for the cold bath, both as a means of freeing the skin from its impurity and as a tonic; and it may be resorted to with safety and advantage in most states of the system; especially when care is taken to excite in the surface, by subsequent friction with the flesh-brush or hair-glove, the healthy glow of reaction. It then becomes an excellent preservative from the effects of changeable weather. When, however, a continued sensation of coldness or chill is perceptible over the body, sponging ought not to be persisted in; dry friction, aided by the tepid bath, is then greatly preferable, and often proves highly serviceable in keeping up the due action of the skin.

For habitual use, the tepid or warm bath is certainly the safest and most valuable, especially during the autumn, winter, and spring, and for invalids; and every house ought to be provided with one as an indispensable requisite for health and comfort. A temperature ranging from 85° to 90°, according to the state of the individual, is the most suitable; and the duration of the immersion may vary from fifteen minutes to an hour or more, according to circumstances. As a general rule, the water ought simply to be warm enough to feel pleasant without giving a positive sensation of heat; the degree at which this happens varies considerably according to the constitution and to the state of health at the time. Sometimes, when the generation of animal heat is great, a bath at 95° will be felt disagreeably warm and relaxing; while, at another time, when the animal heat is produced in deficient quantity, the same temperature will cause a chilly sensation. The rule, then, is to avoid equally the positive impressions of heat and of cold, and to seek the agreeable medium. A bath of the latter description is the reverse of relaxing; it gives a cheerful tone and activity to all the functions, and may be used every day, or on alternate days, for fifteen or twenty minutes, with much advantage.

A person of sound health and strength may take a bath at any time, except immediately after meals. But the *best* time for valetudinarians is in the forenoon or evening, two or three hours after a moderate meal, when the system is invigorated by food, but not oppressed by the labour of digestion. When the bath is delayed till five or six hours after eating, delicate people sometimes become faint under its operation, and, from the absence of reaction, are rather weakened by the relaxation it then induces. As a general rule, active exertion ought to be avoided for an hour or two after using the warm or tepid bath; and unless we wish to induce perspiration, it ought not to be taken immediately before going to bed; or if it is, it ought to be merely tepid, and not of too long duration.

These rules apply of course only to persons in an ordinary state of health. If organic disease, headach, feverishness, constipation, or other ailment exist, bathing ought never to be employed without medical advice. When the stomach is disordered by bile, it also generally disagrees. Under ordinary circumstances, however, and with ordinary prudence, the warm bath is not only a safe and valuable preservative of health, but an active remedy in disease. Instead of being dangerous by causing liability to cold, it is, when well managed, so much the reverse, that the author of these pages has used it much and successfully for the express purpose of diminishing such liability, both in himself and in others in whom the chest is delicate. In his own instance, in particular, he is conscious of having derived much advantage from its regular employment, especially in the colder months of the year, during which he has uniformly found himself most effectually strengthened against the impression of cold, by repeating the bath at shorter intervals than usual.‡

Considering the nature of the occupations in which most of the labouring classes are engaged, and the soothing and refreshing effects as well as the cleanliness derived from the use of the tepid bath, there cannot be a doubt that a great public benefit would be attained by providing baths for their use at a very easy rate, and encouraging them to resort to them by personal influence and frequent expositions of their advantages. In many factories where there is constantly steam or warm water running waste, baths for the workmen and their families might be fitted up at a very trifling cost, and their use do much to subdue that craving for stimulus which drives so many to the gin-shop; and also to allay that irritability of mind so apt to be induced by exces-

* While revising these pages, a friend has mentioned to me a case strikingly illustrative of the necessity of attending to the condition of the skin, and of the sympathy subsisting between it and the bowels. A lady, who is in other respects very cleanly in her habits, has never been accustomed to the use of the bath, or to general ablution of any kind, and, in consequence, the action of the skin is very imperfect. As a substitute, however, for its exhalation, she has, all her life, been affected with *bowel complaint*, which no treatment, directed to the bowels, has been able to remove. It is probable that the natural course of the exhalation could not now be restored.

† Medico-Chirurg. Rev. No. LXVI. p. 523.

‡ I am delighted to find my opinion of the value of the bath and of attention to the cutaneous functions in the prevention of pulmonary disease, and indeed the whole practical doctrines of the present chapter, corroborated by the authority of Sir James Clark, in his admirable works on Consumption and Climate—of the latter of which a much improved edition has just appeared. Both are well deserving the attention of parents and others interested in the health of the young, and especially of those who are delicately constituted.

sive labour. When the trade is dirty, a tepid bath and change of clothing on quitting it for the day would be the saving of many men who at present fall into vice by imperceptibly losing that self-respect and regard for decency of appearance which are among the strongest safeguards of character and morality; and I rejoice to think that in several manufactories the hint thrown out in the former editions of this work has been acted upon, and followed by more than the anticipated advantages. To derive full benefit from it, however, some knowledge of the animal economy must be communicated, and the desire excited among the more intelligent workmen to avail themselves of the boon. The more ignorant and the more unintellectual the individual, the less will he appreciate the offered advantage; but patient and good-humoured encouragement will soon get over all difficulties, and excite a right feeling on the subject.

In Edinburgh, a bath-establishment has of late been opened by Mr Goulding, formerly of the Infirmary, for the purpose of supplying baths at a moderate rate to the middle, and at a cheap rate to the working, classes—the cost to the latter being only sixpence. This institution is, I understand, much resorted to. In like manner, extensive baths were opened in Dublin, by the benevolent exertions of Mr Clason, where twenty tickets could be had at a shilling each, with the privilege of also giving a bath to a poor person. If the latter was taken exclusively, it could be had for either fourpence or sixpence. Mr Clason offered to establish similar baths in different parts of Dublin if the medical men would encourage them by actively recommending their use; but such was the indifference proceeding from ignorance of their advantages to persons in health that no such encouragement could be obtained. Those already in existence are, however, in constant employ; and we may hope, now that a greater interest is excited about the welfare of the working classes, that something will be done to disseminate sounder views, and to turn them to practical account in improving the condition and happiness of our less fortunate fellow-creatures.

On the Continent, the vapour and hot air baths are had recourse to both as an agreeable means of removing the impurities and exciting the action of the skin, and in the cure of disease, to a vastly greater extent than they are in this country. Their use is attended by the very best effects, particularly in chronic ailments, and where the water-bath is felt to be oppressive by its weight; and there can be no question that their action is chiefly on the skin, and through its medium on the nervous system. As a means of cleansing the skin, determining the blood to the surface, promoting cutaneous exhalation, and equalizing the circulation, they are second to no remedy now in use; and consequently, in a variety of affections which the encouragement of these processes is calculated to relieve, they may be employed with every prospect of advantage. The prevalent fear of catching cold, which deters many from using the vapour-bath, even more than from warm bathing, is founded on a false analogy between its effects and those of profuse perspiration from exercise or illness. The latter weakens the body, and, by diminishing the power of reaction, renders it susceptible of injury from sudden changes of temperature. But the effect of the vapour-bath properly administered is very different. When not too warm or too long continued, it not only removes a load of impurities beyond what was imagined to exist, but increases instead of exhausting the strength; and, by exciting the vital action of the skin, gives rise to a power of reaction which enables it to resist cold better than before. This I have heard many patients remark; and the fact is well exemplified in Russia and the north of Europe, where, in the depth of winter, it is not uncommon for the natives to rush out of a vapour-bath and roll themselves in the snow, and be refreshed by doing so; whereas were they to attempt such a practice after severe perspiration from exercise, they would inevitably suffer. It is the previous stimulus given to the skin by the vapour-bath which is the real safeguard against the coldness of the snow.

The truth of this principle is strikingly illustrated by the practice now in vogue in some parts of Germany, and particularly at Graefenberg, where it was first introduced by Dr Priessnitz, of treating diseases by first inducing severe sweating, and then administering the cold bath, not only daily, but several times a-day. The patient is first stripped naked and wrapped up rather tightly in blankets, and laid down till sweating comes on, which seldom happens in less than an hour. As soon as this commences, the window is thrown open, and he is made to drink a glassful of cold water every quarter of an hour or half hour. This increases the perspiration so much that the sweat sometimes drops from the blanket to the extent of seven pounds weight. When the sweating has continued sufficiently long he is unswathed; and, covering himself with a cloak, hurries to the cold bath, *into which he plunges bathed in perspiration*. While in the bath he is made to exercise his limbs as much as possible, in order to excite the necessary cutaneous reaction. The greater the reaction, the more favourable will be the result.

According to our ordinary notions, this practice would seem to be of the most dangerous character; but in reality it is not so; for, when judiciously managed, it is said to be both safe and advantageous. Dr Priessnitz admits, as every body does, that cold drinks, or the cold bath, *in a state of violent perspiration from exercise or the use of sudorifics*, is very dangerous; but one grand point of difference between such a state and that in which he prescribes cold bathing, is that, according to his plan, *neither the breathing nor the circulation is quickened or excited*, and both are thus ready to concur in undiminished force in the necessary reaction. But in sweating after violent exercise or sudorifics, as he justly remarks, the respiration and circulation have already been excited, and are, to a proportionate extent, exhausted, so that they are overpowered instead of being roused to reaction by the cold. Hence Dr Priessnitz affirms, and it is said with truth, that, *provided the breathing is not hurried, and the surface is not chilled by exposure to the air* before plunging into the cold bath, no risk whatever is incurred, however copious the perspiration. It is added, that if these precautions were strictly observed by ordinary bathers in summer, we should hear of fewer accidents from bathing in a state of perspiration; and the same remarks are said to apply to drinking cold water and eating ices. Active exercise, however, is most wisely and strenuously urged as a part of the treatment. But for farther particulars, I must refer the reader to an interesting account of Dr Priessnitz's method of cure in the 66th Number of the *Medico-Chirurgical Review*.

Common experience affords another illustration of the principle implied in the caution to avoid becoming chilled before going into the cold bath. If, in a cold winter day, we chance to sit for some time in a room imperfectly warmed, and feel, in consequence, a sensation of chilliness over the body, we are much more likely to catch cold on going out than if we had been sitting in a room comfortably warm. In the latter case, the cutaneous circulation and nervous action go on vigorously; heat is freely generated, and the vital action of the skin is in its full force. The change to a lower temperature, if accompanied with exercise to keep up vitality, is then felt to be bracing and stimulating rather than disagreeable. But it is widely different when the surface is already chilled before going out. The vitality of the skin being diminished, reaction cannot follow additional exposure; the circulation leaves the surface and becomes still more internal; and if weakness exist in the throat or chest, cold is the almost certain result. Many suffer from ignorance of this principle.

The vapour-bath is thus calculated to be extensively useful, both as a preservative of health and as a remedial agent. Many a cold and many a rheumatic attack, arising from checked perspiration or long exposure to the weather, might be nipped in the bud by its timely use. In chronic affections, not only of the skin itself, but of the internal organs with which the skin most closely sympathizes, as the stomach and intestines, the judicious application of the vapour-bath is productive of great relief. Even in chronic pulmonary complaints, it is, according to the Continental physicians, not only safe, but very serviceable; particularly in those affections of the mucous membrane which resemble consumption in so many of their symptoms. Like all powerful remedies, however, the vapour-bath must be administered with proper regard to the condition and circumstances of the individual; and care must be taken to have the feet sufficiently warm during its use. If, from an irregular distribution of the steam, the feet be left cold, headach and flushing are almost sure to follow. The surest precaution is to place the feet in a vessel of tepid water while using the vapour-bath.

It happens occasionally, either from some peculiarity of constitution, or from some unusual condition of the skin, indicated by great dryness and a liability to erysipelatous and scaly eruptions, that the moisture of the water or vapour-bath is at first rather prejudicial and unpleasant, and becomes grateful only in proportion as the skin regains its healthy state. In such cases the warm *air-bath* is said to be remarkably successful, and is rapidly gaining ground in the metropolis.

Although the preceding remarks apply specially to the skin considered as an *exhalant*, yet most of them are equally applicable to it when viewed as the seat of an important *nervous* function. For so intimately and beautifully are all the parts of the frame connected with each other, that what is really good for one rarely, if ever, fails to be beneficial to the rest. Thus, while exercise, adequate clothing, the bath, friction, and cleanliness, are very efficacious in promoting the insensible perspiration, removing the impurities which it leaves behind, and equalizing the circulation, they are almost equally influential in promoting the vital action of the innumerable nervous filaments ramified on the skin, and the tone of which is as essential as that of the bloodvessels to the proper discharge of the cutaneous functions. In the large and afflicting class of Nervous and Mental diseases, attention to the skin becomes therefore almost a *sine qua non* of successful treatment. As a preservative, too, it is influential. In most nervous ailments, languor and inaction of the skin shew themselves simultaneously with the earliest dawn of mental uneasiness, and often attract notice before the morbid feelings of the mind have acquired either permanence or strength. At this early period, the use of the bath will frequently prove very efficacious in restoring health.

Many imagine the tepid and warm bath to be weakening, but experience shews that they are so only when abused. When not too warm, and not prolonged beyond 20 or 30 minutes, the tepid bath may be employed daily with advantage and perfect safety by persons in health; while invalids, whose condition requires its use, are often strengthened by a much longer and equally frequent immersion. I have seen it resorted to for an hour daily, for months in succession, by nervous invalids, with much benefit to health and strength; and in France it is employed to a much greater extent. At the vast hospital of Salpétrière at Paris, and also at Charenton, M. Esquirol has, for many years, directed it to be extensively used for two, three, and even five or six hours a-day, and with excellent effect. When I visited the hospital for the insane at Charenton, and M. Esquirol's admirable private asylum at Ivry, in September 1831, that gentleman spoke to me in very strong terms of the benefits resulting from the practice, and declared that he had ever found it, when used with ordinary prudence, a safe and valuable remedy; and that, in reality, it failed to do good in some cases more from the patient remaining in it too short a time, than from its want of power to relieve.

In the Medico-Chirurgical Reviews for January and April 1833, a very interesting outline is given of an article published in the *Revue Medicale*, illustrative of the efficacy of the tepid bath and the affusion of cooler water on the head during the last few minutes of immersion, in the cure of a variety of nervous and head affections of considerable obstinacy and severity. Dr Johnson, the editor of the Review, adds his testimony to the success of the practice, and the results obtained agree entirely with my own experience; but, as these papers relate to the treatment of *disease*, it would be out of place to do more here than recommend them to the attention of the professional reader. I may mention, however, that Dr Recamier frequently orders the bath to be repeated two, three, or even four times in a day. So little reality is there in its supposed debilitating effect.

I notice these facts to shew that attention to the health of the skin is really as influential in preserving the tone of the nervous system, and in contributing to mental and bodily health and comfort, as, from the important functions which it performs, one would naturally expect it to be; and the neglect with which it has long been treated can be explained only by the ignorance which still prevails regarding its nature and uses. I must add, however, that while I attach so much importance to the use of the bath, it is not for the purpose of inducing persons in bad health to have recourse to it of their own accord. This they ought never to do, as they may chance to suffer from using it unseasonably. No rules of universal application can be laid down, and this is not the place for a professional disquisition.

Another valuable means of keeping up an equal circulation and a due degree of perspiration over the whole surface of the skin, and at the same time of aiding in the removal of the impurities which attach to it, consists in the daily and diligent *use of friction by means of a flesh-brush or horse-hair glove*,—the latter to be preferred where the skin is not too sensitive or delicate. But to derive due advantage from friction, it should be steadily continued every night and morning till a glow is excited over the whole surface, and the skin acquires a soft velvety feel. It should also be practised by the individual, and not by an assistant. It then serves partly for exercise, and, to a sedentary person, becomes its most invaluable substitute when perseveringly persisted in for months. In delicate states of the constitution, when a great susceptibility of cold exists, and in all varieties of nervous depression, with a dry cold skin, its usefulness can scarcely be overrated. But then it is one of those preservatives or remedies which require time to produce their full effects. It may be weeks before a languid or hysterical female, or hypochondriacal *litterateur*, will be aware of deriving any comfort from its use, and it is consequently sometimes difficult to induce the patient to make a proper trial of it. But I have never known any one, however sceptical at first, continue it regularly and diligently for several months without gratefully acknowledging the benefits which it conferred. I have known, indeed, some cases of severe nervous suffering of many years' standing, in which the relief afforded by friction of the skin was so marked as to elicit from the patients the earnest declaration that no motive could induce them to desist from its use. In rheumatic constitutions, it is especially beneficial, and a clear indication of its usefulness being more appreciated, is the constant announcements of "*electrical*" hair-gloves and other means of friction in the newspapers of the day.

That friction is useful also in removing impurities from the skin, will be evident to every one who chooses to apply a hair-glove to his own skin, after passing a day or two without either friction or ablution. He will then speedily find the glove become whitened from the small powdery scales which it detaches from the epidermis, and experience a very perceptible increase of comfort. From the equalizing action of friction on the circulation and nerves of the skin, it acts farther as a pleasing sedative after mental excitement or anxiety, and thus favours quiet and refreshing sleep, where otherwise none might be obtained.

But it may be said, that baths cannot be had at all times and in all places. This may be very true; but although we cannot always command them, it is right that we should know their value, and take active measures to procure them. When we fail, soap and water may still be obtained everywhere, and leave no apology for neglecting the skin; or, as already mentioned, if the constitution be delicate, water and vinegar, or water and salt, used daily, form an excellent and safe means of cleansing and gently stimulating the skin; to the invalid they are highly beneficial, when the nature of the indisposition does not render them improper. A rough and rather coarse towel is a very useful auxiliary in such ablutions. Few of those who have steadiness enough to keep up the action of the skin by the above means, and to avoid strong exciting causes, will ever suffer from colds, sore throats, or similar complaints; while, as a means of restoring health, they are often incalculably serviceable. If one-tenth of the persevering attention and labour bestowed to so much purpose in rubbing down and currying the skins of horses, were bestowed by the human race in keeping themselves in good condition, and a little attention were paid to diet and clothing,—colds, nervous diseases, and stomach-complaints would cease to form so large an item in the catalogue of human miseries. Man studies the nature of other animals, and adapts his conduct to their constitution; himself alone he continues ignorant of and neglects. He considers himself as a being of a superior order, and not subject to the laws of organization which regulate the functions of the inferior animals; but this conclusion is the result of ignorance and pride, and not a just inference from the premises on which it is ostensibly founded.

The writer of these remarks has, unfortunately for himself, had extensive experience in his own person of the connexion between the state of the skin and the general health, and especially the health of the lungs; and can therefore speak with some confidence as to the accuracy of his observations, and the benefit to be derived from attending to the condition of the skin in chronic pulmonary complaints and indigestion. Many affections of a consumptive character are preceded or begin by deficiency of vital action in the skin and extremities, and a consequent feeling of coldness in the feet and on the surface, and susceptibility of catarrhal affections from apparently inadequate causes, often long before any pressing symptom, directly connected with the lungs, occurs to attract notice. In this state, means systematically directed to restoring the cutaneous circulation will frequently be successful in warding off consumption; and, even when the disease is formed, the same means will help to prolong life and relieve suffering, while they will go far to effect a cure in those chronic affections of the bronchial membrane, which simulate consumption and are sometimes undistinguishable from it, and which, when mismanaged, are equally fatal.

The two remedies which enjoy the oldest and most general reputation in the successful treatment of pulmonary and consumptive disease and of general bad health, have this quality in common, that both owe much of their influence to their exciting the cutaneous functions, and equalizing the circulation. I allude to sailing, and riding on horseback. Many authors speak of both in the highest terms, and Sydenham is well known to have considered the latter as almost a specific. Dr Rush of Philadelphia, too, extols it with nearly equal force. Of late, a regular course of emetics has been very strongly recommended in the early stages of consumption, and apparently on good grounds. In hooping-cough, chronic catarrh, and other obstinate pulmonary affections, they have also been long in vogue, both with the vulgar and with the profession. So far as my observation goes, all of these remedial means are productive of advantage, chiefly in proportion as they determine the blood to the surface, which squeamishness, sea-sickness, and riding, all do in a powerful manner. Riding seems to have this effect, partly from the bodily exercise giving general vigour to the circulation, and partly from the continued gentle friction between the skin and the clothes stimulating the cutaneous vessels and nerves. This latter effect is of more importance than many believe. Those, accordingly, who are proof against sea-sickness derive least benefit from a voyage; while those who suffer under it long are compensated by the amelioration which it induces in the more serious malady. The writer of these remarks became ill in the month of January 1820, and soon presented many of the symptoms of pulmonary consumption. In spite of the best advice, he continued losing ground till the month of July, when he went by sea to London, on his way to the south of France; but, finding himself unable for the journey, he was obliged to return from London, also by sea. Being extremely liable to sea-sickness, he was squeamish or sick during the whole of both voyages—so much so as to be in a state of gentle perspiration for a great part of the time. After this he became sensible, for the first time, of a slight improvement in his health and strength, and of a diminution of febrile excitement. Some weeks afterwards, he embarked for the Mediterranean, and encountered a succession of storms for the first four weeks, two of which were spent in the month of November, in the Bay of Biscay, in a very heavy sea. For more than three weeks he was generally very sick, and always in a state of nausea; and during the whole time, although his bed was repeatedly partially wetted by salt water, and the weather cold, the flow of blood towards the skin was so powerful as to keep it generally warm, always moist, and often wet with perspiration, forced out by retching and nausea. The result was, that, on entering the Mediterranean at the end of a month, and there meeting fine weather, he found himself, though still more reduced in flesh and very weak, in every other respect decidedly improved; and, on his arrival in Italy, at the end of seven weeks, recovery fairly commenced, after about ten months' illness; and, by great care, it went on with little interruption. till the summer of 1821, when he returned home.

To carry on what was so well begun, riding on horseback in the country was resorted to, and that exercise was found to excite the skin so beneficially as to keep it always pleasantly warm, and generally bedewed with moisture, even to the extremities of the toes: and in proportion to this effect was the advantage derived from it in relieving the chest, increasing the strength, and improving the appetite. A second winter was spent in the south with equal benefit; and in the summer of 1822, riding was resumed at home, and the health continued to improve. The excitement given to the skin by riding was sufficient to keep the feet warm, and to prevent even considerable changes of temperature from being felt, and rain was not more regarded, although special attention was of course paid to taking off damp or wet clothes the moment the ride was at an end. Strength increased so much under this plan, combined with sponging, friction, and other means, that it was persevered in through the very severe winter of 1822–3, with the best effects. For nine years thereafter the health continued good, under the usual exposure of pro-

fessional life; but in 1831 it again gave way, and pulmonary symptoms of a suspicious character once more made their appearance. The same system was pursued, and the same results have again followed the invigoration of the cutaneous functions and of the general health by a sea-voyage, horse-back exercise, and the regular use of the bath. These, as formerly, have proved beneficial in proportion to their influence in keeping up warmth and moisture of the surface and extremities.

In thus insisting upon the advantages of maintaining the healthy action of the skin, I must not be supposed to ascribe the whole benefit to that circumstance alone. So beautifully is the animal economy constituted, that, as I have already repeatedly had occasion to observe, it is impossible to use rational means for the invigoration of one organ or function, without good being done to all; and so closely are the various parts allied to each other, that, to describe fully the functions and sympathies of any one, we would require to make the circle of the whole. From this appears the fallacy of those who select the derangements of any one organ as the origin and source of all existing diseases. Some functions are no doubt more important, and their disorders exercise a wider influence over the general health, than others; but no one who knows the structure of the human body and the relations of its parts, or has carefully observed the phenomena of disease, can be satisfied with such exclusive reasoning. The stomach, the bowels, the liver, and the nervous system, have each had their patrons, and the derangement of each has been specially held out as the grand fountain of human misery. Each doctrine, too, has been demonstrated by cases and cures to be superior to all the rest, and each has proved successful in its turn, where the others have been tried and failed. Far, however, from proving the propriety of exclusiveness in favour of any one organ, such facts, rightly considered, demonstrate the reverse, and shew that successful practice requires views and remedies founded on a careful examination of *every* function; and afford a strong presumption that the man who traces every disease to the liver, the stomach, or the nerves, will be at least as often strikingly wrong as strikingly right.

In saying, therefore, that attention to the state of the skin is influential in preserving and restoring health, I wish to represent it as an important but by no means exclusive condition, and to ascribe to the means used for invigorating its functions their due share of action upon other organs and functions. Sailing, for example, is useful in pulmonary complaints, not only because its accompanying nausea causes a healthful flow of blood from the internal parts to the surface, but because the gentle and constant exercise, occasioned by the movement of the ship, is admirably adapted to a debilitated state of the system, when other exercise cannot be taken without hurrying the breathing or inducing fatigue—and because pure, fresh, bracing air is of infinite importance in all, and especially in pulmonary, affections. Attention to the skin, therefore, must never be considered for a moment as superseding attention to the other functions. That were a pernicious mistake. It must be regarded as a part only, though an important part, of a rational and consistent treatment; and its efficacy will often depend, in no small degree, on the care which is taken to support its effects by a scrupulous attention to the necessities of the rest of the system.

I have often had occasion to remark the powerful influence which free perspiration from natural causes has in relieving acidity in the stomach and promoting digestion, and also the fact that acidity is most prevalent when the skin is most inactive, and have thereby been led to prescribe with advantage the frequent use of the tepid and vapour bath in calculous and other complaints arising from excess of acid. In accordance with the same principle, Lord Byron is found noting in his Journal (28th March 1814), that after having, when previously very unwell, "sparred with Jackson *ad sudorem*," he felt "much better in health than for many days," and remarking that "the more violent the fatigue, *the better his spirits for the rest of the day*," and this, too, at a time when he was deriving little relief from his favourite remedies, abstinence and soda-water.

These results seem to corroborate the doctrine of M. Donné, that in the healthy state an acid humour is secreted from the whole surface of the skin, while the mucus secreted from the digestive canal is every where, except in the stomach, of an alkaline nature. I have often noticed that acidity in the stomach was much relieved by free action of the skin, particularly in gouty habits, after the use of the warm bath. On the other hand, the season of the year at which I have always heard most complaints of acidity was towards the end of autumn, when the colder weather was beginning to diminish perspiration, and change the balance of the circulation. These facts, if correctly observed, go far to corroborate the accuracy of M. Donné's views. The subject, however, still remains obscure, but its importance entitles it to the most careful examination.

Among the external agents which exert a beneficial influence on the health of the skin, there is one of much importance, which, in practice, is far too much lost sight of, and which must yet be obvious to every one on a moment's reflection: I allude to *the salutary stimulus of the solar light*. Those who live in the deep valleys of mountains (as in those of the Alps), in close narrow streets where the sun never shines, in mines or dark caves, and who are rarely exposed to the light of day, present a pale relaxed sallowness of skin, which contrasts with the ruddy freshness of country people and others living much in the sun and open air. The inhabitants of towns, accordingly, may generally be known by the light colour and delicacy of skin which confinement induces. Part of the effect is owing, no doubt, to the agency of the external air, in the constitution of which the skin seems to produce changes analogous to those which take place in the lungs during respiration; but much is also attributable to deprivation of the stimulus of light. Even vegetables become pale, watery, and feeble in the dark; and, in like manner, men who work during the night and sleep during the day, never present the vigorous look of health which distinguishes well-fed day-labourers. Hence the necessity which exists, particularly in a climate favoured with so little sunshine as ours, of endeavouring always to select a good exposure to light and air for our dwellings, and of resorting to some protective legislating measures to prevent that crowding together of low damp cellars and sunless and airless rooms, into which so many thousands of the poorer classes in all our large towns are compelled to dwell, to the utter sacrifice of every comfort worth living for, and to the positive ruin of both body and mind. In several of the English manufacturing towns, and in Liverpool, the working classes live wholly either in cellars or in courts, of which there are 2400 in Liverpool alone, which seem as if constructed on purpose to admit the smallest possible portion of air and light by which human existence can be sustained. In Edinburgh and Glasgow, thousands of the poor are as badly if not worse lodged, and it is appalling to think of an amount of misery constantly existing around us in this form, sufficient to goad on the minds of its victims almost to madness when they compare their own lot with that of the richer classes who take so little heed of their suffering, and are often in fact so little aware of its existence. It is fervently to be hoped that the public mind is becoming alive to the perception of the truth, and that the efforts now making by government will prove to be only the commencement of a series of measures calculated to im-

prove and elevate the condition of the working population, and thus tend to avert the dangerous expedient to which the latter have been for some years approaching, of rising in open violence to rectify their own wrongs, and seek by force the means of happiness which they saw no chance of being able to wrest from the sympathy of their fellow-creatures.

The last means of preserving the healthy activity of the cutaneous circulation and exhalation which requires to be noticed, is that of avoiding as much as possible the contact of noxious external agents which might otherwise be absorbed by virtue of the inhaling power of the skin, and thus produce disease.

The chief sources of external agencies of this kind are impurities in the air or locality in which we live; contagious or infectious matter temporarily in contact with the skin; and, lastly, poisonous or injurious substances, such as poisonous metallic vapours to which workmen are exposed in their various trades.

A damp locality or air is the most favourable to the absorption of hurtful external agents, because moisture affords a natural stimulus to the action of the absorbent vessels. Hence malaria is always most dangerous after sunset and during the night; and hence also, in some measure at least, the full watery lymphatic constitutions of the inhabitants of marshy and moist districts of country, and the prevalence of ague among them. On the same principle, the operation of dry heat in putting a stop to the diffusion of plague, fever, and dysentery, may be partly explained. The absence of moisture leaves the cutaneous absorbents inactive, while the heat increases the exhalation from the skin. For a similar reason, contagion is known to be more likely to take effect on a person who is fasting, than on one who is well fed; because in the former state, the system craves for a supply, and all the absorbents are ready to act; while in the latter the exhalants are more stimulated. In the navy, this principle is recognised and acted upon by never exposing the crews in the morning to the dews and damps of warm climates until after they have breakfasted. In like manner, the alleged immunity from plague of oilmen and others whose skins are more or less covered with oil or grease, may probably be accounted for by absorption being rendered more difficult.

When one is obliged to live in a damp, marshy, or malarious district, the means of protection to be used have a direct reference to the functions of the skin. Whatever keeps up a vigorous circulation and healthy perspiration on the surface, and affords least scope for the action of the absorbents, is most certain to prove efficacious. A good nourishing diet, ample exercise, cheerful activity of mind, flannel-clothing frequently changed, friction, and fires, are all ascertained to be beneficial, and all of them operate on this principle. The value of flannel as a protection has been already pointed out in the experience of Captain Murray in the West Indies, and of Sir George Ballingall, Dr Johnson, and others, in the East Indies; and practically the same confidence is shewn by the shepherds of the Campagna, and the marshy districts of Greece, clothing themselves in woolly sheep-skins even at midsummer.

From what we have said, it will be apparent that, when attending on friends who are ill of contagious or infectious diseases, the more we invigorate the other functions of the skin, and the less we stimulate the absorbents, the greater will be our own security. With regard to the protection of workmen from the noxious fumes of metals, dust, and other impurities, it would require a great extent of detail on matters foreign to my present design, to enter upon its discussion here. All that I can add is that, in adopting protective measures for them, scrupulous regard must be had to the constitution and functions of the skin, if we expect any positive advantage from their adoption.

CHAPTER V.

NATURE OF THE MUSCULAR SYSTEM.

Muscles.—Their structure, number, and uses.—Nature of muscular action.—Influence of nerve.—Muscles the servants of the mind and will—their importance to man.—Mode of action of muscular nerves.—Sense of the state of the muscle necessary to regulated motion.—Illustrations.—Muscles act by alternate contraction and relaxation.—Fatigue consequent on continuing the same attitude explained—Injuries of Spine from neglect of this law, and from sedentary occupations in school.—Effects of muscular exercise on the circulation—and on the bowels.—Consequences of deficient exercise on the organization.

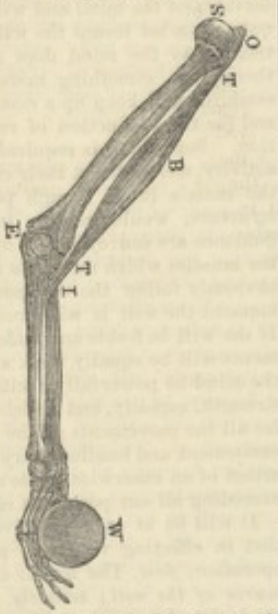
Having examined the nature and uses of the skin, we may next proceed to consider the important system of organs, lying almost immediately under it, viz. the muscles, which, although in constant activity during our waking hours, and of indispensable necessity to man in every movement which he makes, are perhaps less familiarly known than almost any other part of the body. As the study of the muscular system involves an exposition of the principles which ought to regulate exercise, it can scarcely fail to excite the attention of the general reader, and especially of those who, as parents or teachers, are interested in the education of the young.

The muscles are those distinct and compact bundles of fleshy fibres which are found in animals immediately on removing the skin and subjacent fat; and which, although perhaps not known to all under their generic or scientific name, are familiar to every one as constituting the red fleshy part of meat.

Every muscle, or separate bundle of fleshy substance, is composed of innumerable small fibres or threads, each separated from, and at the same time loosely connected with, the others, by a sheath of cellular membrane enveloping it, but which is so thin as not to obscure the colour of the fibre, or attract notice unless specially looked for. Each muscle is in its turn separated from the neighbouring muscles by thicker layers or sheaths of the same membrane, in some of the cells of which fat is deposited, especially where the interval between the muscles is considerable; and hence the elegantly rounded form of the limbs, which, without this fat, would present the rigid, sharp, and prominent outline which we see occasionally in strong persons of a spare habit of body. From the loose texture of the connecting cellular membrane, the muscles enjoy perfect freedom of motion during life, and admit of being easily separated from each other after death, either by the knife, or by simply tearing the cellular tissue.

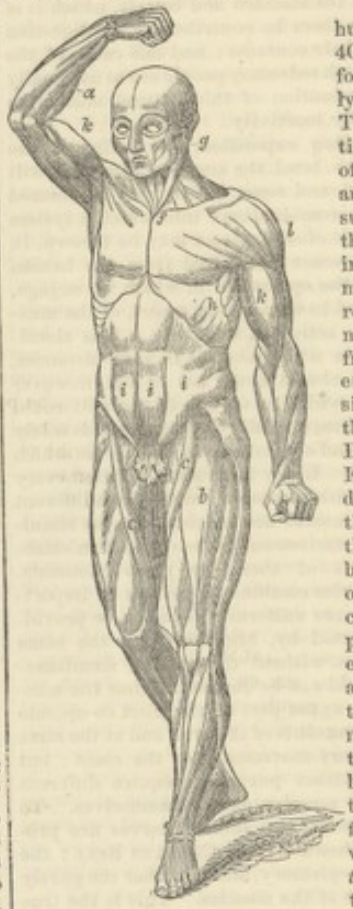
Muscles, speaking generally, may be divided into three parts, of which the middle fleshy portion, called the *belly*, is the most conspicuous and important. The other two are the opposite ends, commonly called the *origin* and *insertion* of the muscle. The belly is the bulky and fleshy part, by the contraction or shortening of the fibres of which the two ends are brought nearer to each other, while the belly itself swells out in a lateral direction. When we attempt to lift a heavy weight in the hand, or to overcome any resistance, the muscles which bend the arm may be seen and felt to start out rigid and well defined in their whole extent, while their extremities tend powerfully to approach each other, and of course to carry along with them the bones to which they are attached. In consequence of this tendency, if a weight be unexpectedly knocked out of the hand before we have time to obviate the result, the muscles, having then no resistance to overcome, will contract violently, and throw the hand up with a sudden jerk. Voluntary motion is, in fact, effected by the contraction of muscles acting upon and changing the re-

lative positions of the bones or solid support of the system, and therefore almost all muscles are attached to one bone by their *origin*, and to another by their *insertion*; the former being merely the fixed extremity, towards which the opposite and more moveable end, called the *insertion*, is carried by the shortening of the intervening belly of the muscle. These points will be readily understood by the inspection of the annexed figure, which represents the bones of the arm and hand, having all the soft parts dissected off except one muscle O B I, of which the function is to bend the arm. O indicates the origin of the muscle. B the belly. I the insertion. T T the tendons. S the shoulder-joint. E the elbow. When the belly contracts, the muscle becomes shorter, and as a consequence, the lower extremity of the muscle I is brought nearer to the origin or fixed point O, and, by thus bending the arm at the elbow-joint, raises up the weight W placed in the hand.



If the muscles are in general attached to bones, it may be asked,—How can the bones, which present comparatively so small a surface, afford space enough for the attachments of muscles which are so much larger, and which even appear in successive layers above each other? This difficulty is obviated in two ways. In the *first* place, the heads and other parts of bones to which muscles are attached, are enlarged so as to present a greater surface than the body of the bone, and form what are called *processes*, for the express purpose of affording greater room; and, *secondly*, instead of *all* the fleshy fibres of a muscle being prolonged to its point of attachment at the bone, they, with a few exceptions, terminate gradually, as they proceed from the belly, in a white shining *tendon*, of a much smaller size than the muscle, but of great strength, which is inserted into the bone. These tendons, or *sinews*, as they are occasionally named, conduce greatly to symmetry, elegance and freedom of motion; and may be traced under the skin on the back of the hand, and in the very powerful specimen at the heel, called the tendon of Achilles. The hamstrings are another obvious example, and may be easily felt becoming tight when an effort is made to bend the knee. There are a few muscles not attached to bones by either extremity, and also a few which have no tendons. Those which surround the eyebrows, the mouth, the gullet, and some of the other natural passages, are of the former description; as is also the heart. Some of the muscles of the trunk have no tendons, but these are few in number, and may at present be considered exceptions to the general rule.

In man, and in most of the animals with which we are familiar, the muscles are of a red colour. This, however, depends entirely on the blood which they contain; for so far is the colour from being essential to their constitution, that it may be destroyed by washing out the blood which produces it, the muscular substance remaining in other respects unchanged. Hence the colour of the muscles varies with that of the blood—is dark where it is dark, as in wild game, pale where it is pale, as in the domestic fowl, and white where it is white, as in most fishes. The true characteristic of muscular fibres is *contractility, or the power of shortening their substance on the application of stimuli, and again relaxing when the stimulus is withdrawn.*



The muscles of the human body exceed 400 in number, and form several layers lying over each other. That some conception may be formed of their arrangement and distribution, the superficial layer, or that which appears immediately on removing the skin, is represented in the annexed woodcut, taken from a little volume entitled "The Physician," published by the Society for the Diffusion of Useful Knowledge. To understand the uses of the various muscles, the reader has only to bear in mind that the object of muscular contraction is simply to bring the two ends of the muscle, and the parts to which they are attached, nearer to each other, the more moveable being always carried towards the more fixed point. Thus when the *sterno-mastoid* muscle *f g* contracts, its extremities approximate, and the head, being the moveable point, is pulled down and turned to one side. This may be easily seen in the living subject, the muscle being not less conspicuous than beautiful in its outline. Again, when the powerful *rectus* or *straight* muscle *b* on the front of the thigh contracts with force, as in the act of kicking, its lower end, attached to the knee-pan and leg, tends to approximate to the upper or more fixed point, and pulls the leg strongly forwards. This occurs in walking. But when the *sartorius* or tailor's muscle *c* is put in action, its course being oblique, the movement of the leg is no longer in a straight line, but in a cross direction, like that in which tailors sit, and hence the name *sartorius*.

Another variety of effect occurs, when, as in the *rectus* or straight muscle of the belly *i i*, sometimes one end and sometimes both are the fixed points. When the lower end is fixed, the muscle bends the body forward, and pulls down the bones of the chest. When, as more rarely happens, the lower end is the moveable point, the effect is to bring forward and raise the pelvis and inferior extremities; and, when both ends are rendered immoveable, the contraction of the muscle tends to compress and diminish the size of the cavity of the belly, and thus not only assists the natural evacuations, but co-operates in the function of respiration.

In contemplating this arrangement, it is impossible not to be struck with the consummate skill with which every act of every organ is turned to account. When the chest is expanded by a full inspiration, the bowels are pushed downwards and forwards to make way for the lungs; when the air is again expelled, and the cavity of the chest diminished, the very muscles, *i i i*, which effect this, by pulling down the ribs, contract upon the bowels also push them upwards and inwards, as can be

plainly perceived by any one who attends to his own breathing. By this contrivance, a gentle and constant impulse is given to the stomach and bowels, which is of great importance to them in contributing to digestion and in propelling their contents; and one cause of the costiveness with which sedentary people are so habitually annoyed, is the diminution of this natural motion in consequence of bodily inactivity.

From the preceding exposition, the action of the muscles *a*, *k*, *l*, which bend the arm and fore-arm, will be easily understood, and some notion may be formed of the innumerable combinations into which a system composed of upwards of 400 pieces may be thrown, in effecting all the movements required from the human frame. In some of the operations in which we engage, nearly the whole, and in others only a part, of the muscles are thrown into action at one time. The simultaneousness of action which obtains in such instances, and which occurs in almost every act of life, however simple, and without which no dictate of the will could be harmoniously and successfully obeyed, depends solely on the distribution and connections of the nerves which animate the muscles. Every individual fibre of every muscle is supplied with nervous filaments, and different fibres of the same muscle are indebted for the simultaneousness of their excitement to the connection established between each of them by these filaments. Wherever many muscles combine to execute an important movement, they are uniformly found to be provided with, and connected by, branches from the same system of nerves; as, without this means, simultaneousness of action could not be insured. Thus the muscles which cover the upper part of the chest co-operate in the voluntary movements of the arm, and at the same time in the respiratory movements of the chest; but these, being two distinct purposes, require different combinations of the muscles among themselves. To effect these combinations, two sets of nerves are provided, as has been shewn by Sir Charles Bell; the one regulating the respiratory, and the other the purely voluntary movements of the muscles. This is the true reason why the same muscle sometimes receives nerves from two or three different quarters; a circumstance which, before the principle was discovered, and when all nerves were considered alike, was altogether inexplicable, and seemed a work of mere supererogation.

From this peculiar constitution of the muscles, it will be already obvious to the reflective reader that their chief purpose is to enable us to carry into effect the various resolutions and designs—or *volitions*, as they are termed by philosophers,—which have been formed by the mind. The muscles, accordingly, form the grand instruments by which man acts and is acted upon by the external world. Whatever impression is made upon him by any other living creature is effected by the aid of muscular power. When the infant clings to its mother's bosom, it is by calling its little muscles into play. When its cries assail her ear and alarm her feelings, it is by muscular action they are produced. When she flies to its relief, or lulls it to sleep by some simple chant, her muscles are still the medium by which her sympathy and affection are expressed. Life itself is sustained by the constant exercise of muscular power; and were either the heart or the muscles of respiration to forget their part, even for a few minutes, existence would be at an end. Without the concurrence of the muscular power, man's grandest conceptions and most energetic resolutions would remain equally unknown and unfulfilled. Without muscular power wherewith to communicate with their fellow-men, Shakspeare and Milton would have remained mute as the statues which now represent their bodily form, and the immortal creations of their minds would have been lost to the world for ever. Mind is, no doubt, the high and directing power; but without obedient muscles, ready at a call to minister to its wants, mind would remain isolated in the midst of creation, and could neither speak, nor hear, nor touch. Amid the loss of children and friends, and even amid the wreck of worlds, mind, without muscles to express its feelings, would look on in apparent apathy, even when its affections were torn and its sufferings were most intense.

The muscles, then, are the indispensable agents and servants of the mind and will. But we have yet to inquire by what means the will exerts its influence over them. As the mind does not reside in the muscles themselves, something more is evidently required to establish and keep up a communication between them, and for the production of regulated or voluntary motion. Something is required at once to excite them to activity, and to direct their contractions. Without this, the muscle itself, though perfect in strength and in structure, would remain inert. This stimulus and guidance are conveyed to it by the *nerves*. As we write, the muscles which move the fingers and guide the pen obviously follow the commands of the will; and the moment the will is withdrawn, they cease to operate. If the will be feeble and undecided, the muscular movements will be equally weak and irresolute; whereas, if the mind be powerfully excited, and the will energetic, strength, rapidity, and decision, will equally characterize all the movements of the body. Under the intense excitement and headlong fury of madness, the muscular action of an otherwise feeble man acquires a force often exceeding all our powers of control.

It will be at once perceived from this description, that in effecting voluntary motion, we must have in operation, *first*, The brain, or organ of mind, as the *source of the will*; *secondly*, The nerves, which *convey* the intimations of the will to the muscles; and, *thirdly*, The muscles themselves, by whose contractile powers motion is *produced*. It will be understood, also, why the number and size of the nerves distributed to a muscle are in proportion, not simply to its volume, but to the variety, frequency, and vivacity of the movements required from it; and why some small muscles employed in many combinations, are therefore supplied with a greater variety of nerves than others double their size, but with more simple functions.

Other circumstances being equal, muscular power is proportioned to the size of the muscle; but it often happens that great power is required where bulk of muscle would be inconvenient or cumbersome. In such cases, the muscle is supplied with an increased endowment of nervous filaments, which compensate, by the strength of stimulus, for what it wants in bulk of fibre. Many birds, for example, require great muscular power to sustain them in their long and rapid flights through the air, and owe its possession chiefly to the strong stimulus imparted to moderate-sized muscles by large nerves, which add extremely little to their weight; whereas, had the greater power been obtainable only from an augmentation of fleshy fibres, the consequent addition of weight would, from the greatly increased difficulty the animal must have felt in raising and sustaining itself in the air, have gone far to counterbalance any advantage gained on the side of power. But in fishes, which float without effort in their own element, size produces no such inconvenience, and their strength, accordingly, is made to depend more on the volume of the muscle than on its nervous endowment,—shewing a beautiful adaptation to the mode of life and wants of the animal.

As voluntary motion depends as much on nervous stimulus as on muscular agency, it happens, that whatever interrupts the action of the nerves puts a stop to motion as effectually as if the muscular fibre itself were divided. Injuries and diseases of the brain, whence the will emanates, are well known to be accompanied with palsy, or want of power in the muscles, although in their own structure the latter remain sound. Sleep and narcotics, too, suspend voluntary motion, solely in con-

sequence of their action on the nervous system. Ardent spirits, in like manner, disturb the regularity of muscular action in no other way than by previously disordering the brain; and hence the unsteady gait and faltering elocution of a semi-intoxicated person are sometimes removed in an instant by some powerful mental impression being suddenly made, sufficient to restore the brain to its natural state, and thereby to give unity and steadiness to the nervous impulse proceeding from it to the muscles. For the same reason, although the brain and muscles be perfectly sound, yet if the communication between them be impaired or destroyed by the compression or division of the nerves, the muscles cease to act.

The influence of the nervous agency upon muscular contraction may be still farther illustrated. When the trunk of a muscular nerve is irritated by the contact of an external body, or by the electric spark, the muscles which it supplies instantly contract, but without either harmony or permanency of motion: the contraction is like the violent and ill-regulated start of convulsion. It is the influence of the brain and mind in the equal diffusion of the required stimulus to each muscle, in the exact proportion needful, that characterizes healthy and sustained voluntary motion, as opposed to the irregular convulsive start. Nothing can be more wonderful than the accuracy with which, in the most delicate movements, this stimulus is adjusted and apportioned to such a variety of parts, particularly where practice, or in other words *education*, has rendered the combination of powers easy and certain. Not to mention the more obvious and graceful movements of dancing, fencing, and riding, we discover, in the management of the hand and fingers by engravers, sculptors, watchmakers, jugglers, and other artists and mechanics, a minute accuracy of muscular adjustment to effect a given end, which is the more surprising the more we consider the complicated means by which it is effected.

In consequence of the co-operation of both nerve and muscular fibre being required to effect motion, excess of action in each is followed by results peculiar to itself. If the NERVES preponderate, either constitutionally or from over-exercise,—as they are apt to do in highly nervous temperaments,—their excessive irritability renders them liable to be unduly excited by ordinary stimuli; and hence, as in hysteric and nervous females, a proneness to sudden starts, cramps, and convulsions, from causes which would scarcely affect an individual differently constituted. Such persons have little muscular power, except under excitement; they then become capable of great efforts of short duration, but sink proportionally low when the stimulus is past. If, on the other hand, the MUSCLES predominate, as in athletic strong-built men, the nervous system is generally dull and little susceptible of excitement, and the muscles which it animates are consequently little prone to the rapid and vivacious action that accompanies the predominance of the nervous functions. Great strength and capability of bodily labour are then the characteristics.

Great muscular power and intense nervous action are rarely conjoined in the same individual; but, when they do happen to meet, they constitute a perfect genius for muscular exertion, and enable their possessor to perform feats of strength and agility, which appear marvellous to those who are deficient in either condition. The most successful wrestlers and gladiators among the ancients seem to have owed their superiority chiefly to the possession of both endowments in a high degree; and among the moderns, the most remarkable combination of the two qualities is exhibited by some of our harlequins, clowns, rope-dancers, and equestrian performers, and also by those who display their strength and power of equilibrium in balancing wheels, ladders, or other heavy bodies, on the chin; and whose performances require, from the small muscles of the jaw and neck, a force of contraction which, when reduced to calculation, almost exceeds belief. Belzoni combined both conditions in a high degree.

From the general resemblance which characterizes the different nerves, a similarity in function was long ascribed to them all, and no explanation could be given why one muscle sometimes received filaments from a variety of nervous trunks. Recently, however, the labours of Sir Charles Bell, Mayo, Magendie, and Bellingeri, have clearly established that in such cases each nerve serves a distinct purpose, in combining the movements of the particular muscles with those of others necessary to effect a given end,—and that without this additional nerve such a combination could not have been produced. The muscular nerves must not be confounded with those which we have seen ramified on the skin for the purposes of sensation. The former are provided for the purposes of motion and not of feeling, and hence muscles may be cut or injured with little pain, compared to what is felt by the skin. Weariness is the sensation recognised by one set of muscular nerves.

So uniformly is a separate instrument provided for every additional function, that there is strong reason to regard the muscular nerves, although running in one sheath, as in reality double, and performing distinct functions. Sir Charles Bell has the merit of this discovery, if such it shall ultimately prove to be. In his work on the Nervous System, he endeavours to shew, that one set of nervous fibres conveys the mandate from the brain to the muscle, and excites the contraction; and that another conveys from the muscle to the brain a peculiar sense of the state or degree of contraction of the muscle, by which we are enabled to judge of the amount of stimulus necessary to accomplish the end desired, and which is obviously an indispensable piece of information to the mind in regulating the movements of the body. Sir Charles has shewn that many of the sensations supposed to be derived from the sense of touch and the skin, arise from the muscular sense, and are wholly imperceptible to the skin, without the co-operation of muscular contraction.

"The muscles have two nerves," says Sir Charles, "which fact has not hitherto been noticed, because they are commonly bound up together. But whenever the nerves, as about the head, go in a separate course, we find that there is a sensitive nerve and a motor nerve distributed to the muscular fibre, and we have reason to conclude that those branches of the spinal nerves which go to the muscles, consist of a motor and a sensitive filament.

"It has been supposed hitherto, that the office of a muscular nerve is only to carry out the mandate of the will, and to excite the muscle to action, but this betrays a very inaccurate knowledge of the action of the muscular system; for, before the muscular system can be controlled under the influence of the will, there must be a consciousness or knowledge of the condition of the muscle.

"When we admit that the various conditions of the muscle must be estimated or perceived, in order to be under the due control of the will, the natural question arises, Is that nerve which carries out the mandate of the will capable of conveying, at the same moment, an impression retrograde to the course of that influence which is going from the brain to the muscle? If we had no facts in anatomy to proceed upon, still reason would declare to us that the same filament of a nerve could not convey a motion, of whatever nature that motion may be, whether vibration or motion of spirits, in opposite directions at the same moment of time.

"I find that, to the full operation of the muscular power, two distinct filaments of nerves are necessary, and that a circle is established between the sensorium and the muscle; that one filament or single nerve carries the influence of the will towards the muscle, which nerve has no power to convey an impression backwards to the brain; and that another nerve connects the muscle with

the brain, and, acting as a sentient nerve, conveys the impression of the condition of the muscle to the mind, but has no operation in a direction outwards from the brain towards the muscle, and does not therefore excite the muscle, however irritated."*

This consciousness of the state of the muscles, or muscular sense, as it may be truly called, is of great importance both to man and to animals, as it is necessarily by information thence derived, that every subsequent exertion is directed and apportioned in intensity to the effort required to be made. If we had no such sense, the delicate and well-directed touches of the engraver, painter, and sculptor, or of the ingenious mechanic, would be at the mercy of hazard; and a single disproportioned movement might ruin the successful labour of months, supposing success to be in reality compatible with chance. Without this sense man could not deliberately proportion the muscular efforts to his real wants; and, even in walking, his gait would be unsteady and insecure, because there would be no harmony between effort and resistance. The loss of equilibrium, and the concussion and disturbance of the system consequent on taking a false step, as it is called, are specimens of what we would always be subject to without the guidance of the muscular sense. When we imagine we have one step more of a stair to descend than really exists, we are placed nearly in the same circumstances as if we had no muscular sense to direct the extent of our intended movement; because, misled by an erroneous impression, we make an effort grievously unsuited to the occasion; and yet so habitually are we protected from this error by the assistance of the sense alluded to, and so little are we conscious of its operation, that it is only after mature reflection that we perceive the necessity of its existence.

In chewing our food, in turning the eye towards an object looked at, in raising the hand to the mouth, and, in fact, in every variety of muscular movement which we perform, we are guided by the muscular sense in proportioning the effort to the resistance to be overcome; and, where this harmony is destroyed by disease, the extent of the service rendered us becomes more apparent. The shake of the arm and hand which we see in drunkards, and their consequent incapability of carrying the morsel directly to the mouth, are examples of what would be of daily occurrence, unless we were directed and assisted by a muscular sense.†

Life and the nervous stimulus are essential to muscular power. Separated from the body, and deprived of both, the muscle which formerly contracted with a power equal to 100 pounds, would be torn asunder by a weight of ten. This fact is of itself sufficient to give a tolerable notion of the extent to which muscular contraction depends on other causes than the mere structure of the fleshy fibres; for that structure continues unaltered for some time after death, and after the nervous communication has been suspended—and yet how feeble is the power of resistance which the muscle then possesses!

The required movement having been once effected by the nervous impulse stimulating the muscular fibre to contraction, relaxation speedily follows, and is in its turn succeeded by a fresh contraction proportioned to the object in view. *Muscular action, therefore, consists properly in alternate contraction and relaxation of the fleshy fibres.* A state of permanent contraction is both unnatural and impossible; and, accordingly, the most fatiguing muscular employment to which a man can be subjected, is that of remaining immoveable in any given attitude. To an unreflecting person it may seem a very easy and pleasant service to stand for half a day in the attitude of an Apollo or a Gladiator, as a model to a statuary; but, on trying it, he will find, to his astonishment, that stone-breaking or the tread-mill are pastimes in comparison: in the one case, the muscles which preserve the attitude are kept incessantly on the strain; while in the other, they enjoy that play and variety of motion for which they were destined by nature. We may easily put the fact to the test, by attempting to hold the arm extended at a right angle to the body for the short space of ten minutes. He whose muscles, if indeed capable of the exertion, do not feel sore with fatigue at the end of that time, may think himself peculiarly fortunate in being blessed with a powerful constitution.

The principle just stated explains very obviously the weariness, debility, and injury to health, which invariably follow forced confinement to one position or to one limited variety of movement, as is often witnessed in the education of young females. Alternate contraction and relaxation, or, in other words, exercise, of the muscles which support the trunk of the body, are the only means which, according to the Creator's laws, can conduce to muscular development, and by which bodily strength and vigour can be secured. Instead of promoting such exercise, however, the prevailing system of female education places the muscles of the trunk, in particular, under the most unfavourable circumstances, and renders their exercise nearly impossible. Left to its own weight, the body would fall to the ground, in obedience to the ordinary law of gravitation; in sitting and standing, therefore, as well as in walking, the position is preserved only by active muscular exertion. But if we confine ourselves to one attitude, such as that of sitting erect upon a chair—or, what is still worse, on benches without backs, as is the common practice in schools,—it is obvious that we place the muscles which support the spine and trunk in the very disadvantageous position of *permanent* instead of *alternate* contraction; which we have seen to be in reality more fatiguing and debilitating to them than severe labour. Girls thus restrained daily for many successive hours, invariably suffer—being deprived of the sports and exercise after school-hours which strengthen the muscles of boys, and enable them to withstand the oppression. The muscles being thus enfeebled, the girls either lean over insensibly to one side, and thus contract curvature of the spine; or, their weakness being perceived, they are forthwith cased in stiffer and stronger stays—that support being sought for in steel and whalebone, which Nature intended they should obtain from the bones and muscles of their own bodies. The patient, finding the maintenance of an erect carriage (the grand object for which all the suffering is inflicted) thus rendered more easy, at first welcomes the stays, and, like her teacher, fancies them highly useful. Speedily, however, their effects shew them to be the reverse of beneficial. The same want of varied motion, which was the prime cause of the muscular weakness, is still farther aggravated by the tight pressure of the stays interrupting the play of the muscles, and rendering them in a few months more powerless than ever. In spite, however, of the weariness and mischief which result from it, the same system is persevered in; and, during the short time allotted to that nominal exercise, the formal walk, the body is left almost as motionless as before, and only the legs are called into activity. The natural consequences of this treatment are, debility of the body, curvature of the spine, impaired digestion, and, from the diminished tone of all the animal and vital functions, general ill health;—and yet, while we thus set Nature and her laws at defiance, we presume to express surprise at the prevalence of female deformity and disease!

It would be easy, were it required, to prove that the picture here drawn is not overcharged. A single instance, from a note appended by Dr Forbes to an excellent treatise on 'Physical Education," by Dr Bar-

* Bell's Anatomy, seventh edition, vol. ii. p. 372; and also his works on the nerves.

† The reader will find some very ingenious speculations on this subject by Mr James Simpson and others in the Phrenological Journal, vols. ix. x. xi. xii.

low of Bath, will suffice. After copying the programme of a boarding-school for young ladies, which exhibits only one hour's exercise, consisting of a walk, arm in arm, on the high road, *and that only when the weather is fine at the particular hour allotted to it*, in contrast with *nine* hours at school or tasks, and *three and a half* at optional studies or work,—Dr Forbes adds:—"That the practical results of such an astounding regimen are by no means overdrawn in the preceding pages, is sufficiently evinced by the following fact—a fact which, we will venture to say, may be verified by inspection of thousands of boarding-schools in this country. *We lately visited in a large town a boarding-school containing forty girls; and we learnt, on close and accurate inquiry, that there was not one of the girls who had been at the school two years (and the majority had been as long,) that was not more or less* CROOKED! Our patient was in this predicament; and we could perceive (what all may perceive who meet that most melancholy of all processions, —a boarding-school of young ladies in their walk) that *all* her companions were pallid, sallow, and listless. We can assert, *on the same authority of personal observation*, and on an extensive scale, that *scarcely a single girl (more especially of the middle classes) that has been at a boarding-school for two or three years returns home with unimpaired health*; and for the truth of the assertion, we may appeal to every candid *father* whose daughters have been placed in this situation."*

Dr Barlow justly remarks, that the superintendents of such schools cannot generally be blamed for indifference about the welfare of their pupils; that most of them are extremely anxious to do their utmost to improve those under their charge; and that it is *ignorance* alone which misleads them as to the proper means: he might have adverted also to the ignorance of *parents*, who insist on so many hours a-day being dedicated to the study of accomplishments for which their children have neither taste, capacity, nor use. From similar ignorance, the young girls in a public hospital in this country used to be *shut up in the hall and school-room during play-hours from November till March, and no romping or noise—in other words, no real play, relaxation, or exercise—allowed*; and in 1830-31, from fear of typhus fever, they were seldom if ever out of doors, except at church, from November to April—than which a more efficient method of infringing the laws of health could scarcely have been devised. Here, too, the object was unquestionably benevolent, but the method was radically bad; and, in consequence, a great deal of sickness prevailed.

The reality of the mischief done in this way was forcibly pointed out by Mr Carmichael of Dublin, in his excellent "Essay on the Nature of Scrofula," published so long ago as 1810, and which contains many valuable practical truths, which were then little known and coolly received, but to which great importance is now generally attached. In noticing the want of exercise as a cause of scrofula, Mr Carmichael mentions, that in St Thomas's Parochial School, *seven* out of *twenty-four* girls were affected with that disease during the preceding summer, owing to their exercise having been entirely interrupted, first, by the flooding of the playground by heavy rains, and subsequently by the mistress having received orders "*to keep the children perpetually within doors at their school-books.*" In a very short time after "this cruel and impolitic injunction" was acted upon, scrofula began to make its appearance, and afterwards affected nearly a third of their number; although none of them had the disease when admitted, and there was no fault of diet or other cause to which it could be ascribed. Mr Carmichael adds that, in the Bethesda School of the same city (Dublin), *six* out of *thirty* girls, fed in the best possible manner, and free from the disease on their admission, were *badly affected* with it during the same summer. In these cases it evidently arose from their having neither yard nor playground attached to the institution, in consequence of which "the children were necessitated to remain either in the school or bed-rooms during play-hours. On ascertaining this fact, Mr Carmichael remonstrated with the governors, and the evil no longer exists; but the circumstance itself affords an instructive example of the extent of misery which may arise, not from the institutions of Nature, as we are so apt to affirm, but from sheer ignorance on our own part of what these institutions are.

Mr Carmichael adduces other facts of a striking nature, for which I must refer to the work itself, to shew the needless suffering which is still inflicted on thousands by the sedentary and unvaried occupations which follow each other for hours in succession in many of our schools, and I agree with him that it is high time that a sound physiology should step in to root out all such erroneous and hurtful practices. Taken in connexion with the long confinement, the custom of causing the young to sit on benches without any support to the back, and without any variety of motion, cannot be too soon exploded. If the muscles of the spine were strengthened by the exercise which they require, but which is so generally denied,—and if the school employments were varied or interrupted at reasonable intervals, to admit of change of position and of motion,—nothing could be better adapted for giving an easy and erect carriage than seats without backs, because the play of the muscles necessary for preserving the erect position would give them activity and vigour;—and, accordingly, the want is scarcely, if at all, felt in infant-schools, for the very reason that such variety of motion is, in them, carefully provided for. But it is a gross misconception to suppose that the same good result will follow the absence of support, when the muscles are weakened by constant straining and want of play. The incessant and fidgetty restlessness observable after the second or third hour of common school confinement, shews the earnest call of Nature for a little wholesome exercise: and the quiet that ensues when it is granted, indicates clearly enough that the restlessness springs even more from bodily than from mental weariness. It is, in fact, a degree of what we all feel when kept long standing on our feet, or sitting at a desk. We become weary and uneasy from the continued strain on the same muscles, and feel at once relieved by a walk, a drive, or any change whatever. The same principle explains the fatigue so often complained of, as experienced in "shopping," or in an exhibition-room. We saunter about till the muscles become sore from the fatigue of being always in the same attitude, and we are refreshed by a walk or a dance, or anything which alters the position. The same languor of the muscles is felt after witnessing a pantomime, or other continuous spectacle, by which we are induced to keep the neck for a long time in a constrained and unvaried position. Children with thin bodies, weak muscles, and large heads, sometimes suffer much by being taken to church, and, that due respect may be shewn to the sanctity of the place, not allowed by their parents to lean their heads on the board, or on the arm of the person sitting next them, so as to support themselves more easily.

Man being intended for a life of activity, all his functions are constituted by Nature to fit him for this object, and they never go on so successfully as when his external situation is such as to demand the regular exercise of all his organs. It is, accordingly, curious to observe the admirable manner in which each is linked in its action and sympathies with the rest. When the muscular system, for example, is duly exercised, increased action in its vessels and nerves takes place, but the effect is not by any means limited to the mere organs of motion. The principal bloodvessels in all parts of the body lie imbedded among muscles, both for

* Cyclopædia of Practical Medicine, article Physical Education, vol. i. p. 698.

the protection and for the aid which the latter afford them. Every contraction of the muscles compresses and lessens the diameter of the vessels; and as the blood contained in them cannot retrograde in its course, it is propelled in the arteries from the heart *towards* the extreme parts, and in the veins *from* the latter towards the heart with greater force and velocity than before. This will be better understood on examining the annexed engraving of the blood-vessels of the arm, copied from Fyfe's Anatomy. The letters A, B, C, D, E, represent the principal muscles of the arm, and F, G, H, I, K, L, M, N, those of the forearm; though, as the preparation is dried, and the muscles consequently much shrunk, they do not appear in their natural situation. The letters in italics point out the *humeral* artery, which is seen dividing at the elbow into two branches. The one called the *radial* artery passes on the outer side of the forearm towards the thumb, and is the branch in which the pulse is generally felt; the other called the *ulnar*, passes along the inner side of the forearm.

In the natural state, these bloodvessels are covered and protected in almost their whole course by the adjacent muscles. In consequence of this position, the muscles cannot contract without, at the same time, compressing the bloodvessels, and propelling their contents; for, as we saw in a former chapter, the muscles swell out laterally at every contraction. The assistance afforded to the circulation of the blood by this arrangement is familiarly exemplified in the operation of blood-letting from the arm. When the blood stops or flows slowly, it is customary to put a ball or other hard body into the hand of the patient, and desire him to squeeze and turn it round. The utility of this depends simply on the muscles of the arm compressing the interjacent bloodvessels and forcing onwards the current of the contained blood by their successive contractions. Muscular action is, indeed, one of the powers provided for effecting a regular circulation; and hence when its assistance is neglected, as it is by those who take no active exercise, the blood begins to flow less freely, till at last it finds some difficulty in returning against the law of gravitation from the lower extremities, which then gradually swell. People engaged for years in sedentary professions, are thus very subject to *varicose* or dilated veins, and swelled feet.

The chain of connection among all the living functions is nowhere more visible than in this relation between muscular exercise and the circulation of the blood. Action requires the presence of arterial blood, and in the case of the muscles, the very circumstance of their being active favours the circulation and increases the supply. This increase, in its turn, enables the parts to which it is sent to act with greater energy and effect, and the augmented action is attended by corresponding waste and exhalation, and proportionate nutrition of the parts. To replenish the blood thus exhausted of its nutritive principle, a greater quantity of food is required; and, to prompt us to attend to this condition, the appetite becomes keener and more imperative, and the power of digestion proportionally vigorous. The food taken is more speedily converted into chyle, and its absorption from the surface of the intestines and transmission into the circulating current more rapid. That the blood so improved may be properly and quickly animalised in the laboratory of the lungs, respiration becomes deeper and more frequent, thus admitting a larger quantity of air and freer circulation through them than before; and the blood in this way renewed and re-endowed with the pabulum of life, imparts fresh nutriment and vigour to all the organs of the body, and fits them for that active exertion which the proper discharge of his duties imperatively requires from every member of the human race.

Considered in this point of view, the hurried breathing and quickened circulation, of which we are so apt to complain when engaged in muscular exercise, instead of being evils, are, in fact, the beneficent means by which we become fitted to continue the exertion. Without a more than usually rapid flow of blood to the part in use, the necessary stimulus to its vessels and nerves could not take place, and its action could not be sustained. But were the bloodvessels not so situate among the muscles as to have their contents propelled more quickly by the compression to which every muscular contraction necessarily subjects them, it is obvious that no increase of circulation could take place. And if respiration, on the other hand, were not to be accelerated, so as to oxygenate the venous blood more quickly as it arrived at the lungs, it is obvious that the requisite stimulus must again have failed; as, in that case, the blood must either have accumulated in the lungs and caused death, or have passed through them imperfectly prepared, and extinguished life more slowly, but not less certainly.

It is from this effect of muscular compression in promoting the flow of blood through the arteries and veins, that *shampooing*, which consists in a kind of kneading of the flesh, is so successfully resorted to in the warm climates of the East, and among the richer class of invalids in our own country, as a substitute for active exercise. Shampooing furnishes from without that impulse to the circulation which the Creator has destined it to receive from active muscular exertion; and the principle of its action being the same, we cannot wonder that it should prove indisputably useful in promoting circulation, strength, and nutrition, in cases where active exercise cannot be enjoyed. Hence also its utility in dispersing indolent swellings, in restoring tone to weakened joints, and in the cure of rheumatism.

It is a common observation, that sedentary persons are habitually subject to costiveness and its attendant evils. The reason is the same. In the natural state, the contents of the bowels are propelled partly by the successive contractions of the muscles which form the walls of the belly and separate that cavity from the chest, and partly by the contraction of the muscular fibres which constitute an important part of the structure of the intestines themselves. If, however, exercise be refrained from, and the same position be preserved for many hours a-day, as in sitting at a desk, the bowels are necessarily deprived of one important source of power; and, thus weakened, they are unable to act upon and propel their contents with the same regularity as when assisted by exercise. A slowness of action ensues, which no course of medicine, and scarcely any modification of diet, can overcome so long as sedentary habits are indulged in; but which also may often be relieved by daily pressing over the region of the abdomen with a kind of kneading motion, imitating, though feebly, the effects of muscular action. Females suffer much from intestinal debility caused by sedentary habits.

The evils arising from *deficiency* of exercise to all the functions of the mind and body will now be equally evident and intelligible, for they are the converse of what we have seen to be the advantages of adequate exercise. The circulation, from want of stimulus, becomes languid, especially in the extreme vessels; the feebleness of action occasions little waste of materials, and little demand for a new supply; the appetite and digestion consequently become weak; respiration heavy and

imperfect; and the blood so ill conditioned that, when distributed through the body, it proves inadequate to communicate the stimulus requisite for healthy and vigorous action. The concatenation of causes and consequences thus exhibited, cannot fail, when the principle connecting them is perceived, to interest and instruct every thinking mind.

CHAPTER VI.

RULES FOR MUSCULAR EXERCISE.

Principles of exercise.—The co-operation of an active, mental, and nervous stimulus, is the first requisite.—Advantages of this illustrated by examples—but neglected in practice and in schools.—Exercise should involve great variety of motion.—Monotonous and formal walks merely counterfeit exercise.—The constitution of the muscular system requires varied movements.—Evils from neglect of this in factory-children and in girls.—Deformity in factory-children in France from monotonous over-exertion.—Free and varied motion the best protection against deformity.—Proofs of this.—Excellent remarks of Madame Necker on female education and health.—Spinal deformity unknown among savages.—Impaired health often its first stage or precursor.—Exercise to be proportioned to age, strength, habit, and constitution.—Rules for deciding on its amount.—Effects on nutrition useful as a guide.—Times at which exercise ought to be taken—never immediately before or after meals—the early part of the day the best time—and ought to be repeated at intervals.—Different kinds of exercise.—Games.—Excursions.—Cautions regarding excursions and regarding violent exercises.—Riding—its mode of action and advantages.—Dancing.—Gymnastic and calisthenic exercises.—Reading aloud and singing.—Case illustrative of the above principles.

The laws and conditions of healthy muscular action having now been sufficiently explained, I shall next endeavour to shew how usefully our acquaintance with them may be applied to the proper regulation of exercise in the ordinary conduct of life.

In attempting to lay down rules for exercise, our aim should be always to act in accordance with the physiological constitution of the muscular system. With this principle to guide us, and keeping in view the conditions of muscular action as explained in the preceding chapter, we can have no difficulty in perceiving, that, to derive proper advantage from exercise, it is necessary, *first*, that it should spring from, and be continued under, the influence of an active nervous or mental stimulus; *secondly*, that it should always involve as much variety of movement as possible; *thirdly*, that it should be proportioned to the age, strength, and constitution; *fourthly*, that it should be taken at the most favourable times of the day; and, *lastly*, that it should be of a kind calculated to ensure all the good effects which well-conducted exercise is capable of affording.

That *exercise should always spring from, and be continued under, the influence of an active and harmonious nervous and mental stimulus*, will scarcely require any additional evidence; but as the principle is not sufficiently appreciated or acted upon, a few remarks seem still to be called for to enforce its observance. The simple fact that the muscles are expressly constructed for the purpose of fulfilling the commands of the will, might of itself lead to the inference that a healthy mental stimulus ought to be considered an essential condition or accompaniment of exercise; and, accordingly, we have already seen how easy and pleasant muscular action becomes under the influence of mental excitement, and how useful a vigorous nervous impulse is in sustaining and directing it. We have seen also how difficult, wearisome, and inefficient, muscular contraction becomes, when the mind, which directs it, is languid or absorbed by other employments. Hence the superiority, as exercises for the young, of social and inspiriting games which, by their joyous and boisterous mirth, call forth the requisite nervous stimulus to put the muscles into vigorous and varied action; and hence the utter inefficiency of the dull and monotonous daily walk which sets all physiological conditions at defiance, and which, in so many schools, is made to supersede the exercise which it only counterfeits. Even the playful gamboling and varied movements which are so characteristic of the young of all animals, man not excepted, and which are at once so pleasing and attractive, might have taught us that activity of feeling and affection, and sprightliness of mind, are intended by Nature to be the sources and accompaniments of healthful and invigorating muscular exercise; and that the system of bodily confinement and mental cultivation now so much in vogue, is calculated to inflict lasting injury on all who are subjected to its restraints. The buoyancy of spirit and comparative independence enjoyed by boys when out of school prevent them from suffering under it so much as girls do; but the mischief done to both is the more unpardonable when it does occur, because it might so easily have been entirely avoided. Even in some infant schools, where properly conducted exercise ought to be considered as a necessary of life, the principle on which I am insisting is so little understood or valued that no play-grounds have been provided, and the very best means of moral as well as physical training—play with companions—has, to the great injury of the poor children, been wholly omitted. Under judicious direction, the play-ground affords the most valuable and effective aid to the parent and teacher, not only in eliciting the highest degree of physical health, but in developing the general character by the practical inculcation of moral principle, kindness, and affection, in the daily and hourly conduct of the children committed to their charge. A double evil is thus incurred in its neglect or omission.

Facts illustrative of the beneficial influence of a mental stimulus as the only legitimate source of muscular activity abound everywhere, and must be familiar to every reflecting mind; but as the practical inferences deducible from them have, to a great extent, escaped the notice of parents and teachers, I shall add a few remarks in their farther elucidation.

Every body knows how wearisome and disagreeable it is to saunter along, without having some object to attain; and how listless and unprofitable a walk taken against the inclination and merely for exercise is, compared to the same exertion made in pursuit of an object on which we are intent. The difference is simply, that, in the former case, the muscles are obliged to work without that full nervous impulse which nature has decreed to be essential to their healthy and energetic action; and that, in the latter, the nervous impulse is in full and harmonious operation. The great superiority of active sports, botanical and geological excursions, gardening and turning, as means of exercise, over mere monotonous movements, is referable to the same principle. Every kind of youthful play and mechanical operation interests and excites the mind, as well as occupies the body; and by thus placing the muscles in the best position for wholesome and beneficial exertion, enables them to act without fatigue, for a length of time which, if occupied in mere walking for exercise, would utterly exhaust their powers.

The elastic spring, bright eye, and cheerful glow of beings thus excited, form a perfect contrast to the spiritless and inanimate aspect of many of our boarding-school processions; and the results in point of health and activity are not less different. So influential, indeed, is the nervous stimulus, that examples have occurred of strong mental emotions having instantaneously given life and vigour to paralytic limbs. This has happened in cases of shipwrecks, fires, and sea-fights, and shews how indispensable it is to have the mind engaged and interested along with the muscles. Many a person

who feels ready to drop from fatigue, after a merely mechanical walk, would have no difficulty in subsequently undergoing much continuous exertion in active play or in dancing; and it is absurd, therefore, to say that exercise is not beneficial, when in reality proper exercise has not been tried.

The amount of bodily exertion of which soldiers are capable, is well known to be prodigiously increased by the mental stimulus of pursuit, of fighting, or of victory. In the retreat of the French from Moscow, for example, when no enemy was near, the soldiers became depressed in courage and enfeebled in body, and nearly sank to the earth through exhaustion and cold; but no sooner did the report of the Russian guns sound in their ears, or the gleam of hostile bayonets flash in their eyes, than new life seemed to pervade them, and they wielded powerfully the arms which, a few moments before, they could scarcely drag along the ground. No sooner, however, was the enemy repulsed, and the nervous stimulus which animated their muscles withdrawn, than their feebleness returned. Dr Sparrman, in like manner, after describing the fatigue and exhaustion which he and his party endured in their travels at the Cape, adds,—"yet, what even now appears to me a matter of wonder is, that *as soon as we got a glimpse of the game, all this languor left us in an instant.*" On the principle already mentioned, this result is perfectly natural, and in strict harmony with what we observe in sportsmen, cricketers, golfers, skaters, and others, who, moved by a mental aim, are able to undergo a much greater amount of bodily labour than men of stronger muscular frames, actuated by no excitement of mind or vigorous nervous impulse. I have heard an intelligent engineer remark the astonishment often felt by country people, at finding him and his town companions, although more slightly made, withstand the fatigues and exposure of a day's surveying better than themselves; but, said he, they overlooked the fact that our employment gives to the mind, as well as to the body, a stimulus which they were entirely without, as their only object was to afford us bodily aid, when required, in dragging the chains or carrying our instruments.—The conversation of a friend is, in the same way, a powerful alleviator of the fatigue of walking.

The same important principle was implied in the advice which the Spectator tells us was given by a physician to one of the eastern kings, when he brought him a racket, and told him that the remedy was concealed in the handle, and could act upon him only by passing into the palms of his hands when engaged in playing with it —and that as soon as perspiration was induced, he might desist for the time, as that would be a proof of the medicine being received into the general system. The effect, we are told, was marvellous; and, looking to the principle just stated, to the cheerful nervous stimulus arising from the confident expectation of a cure, and to the consequent advantages of exercise thus judiciously managed, we have no reason to doubt that the fable is in perfect accordance with nature.

The story of an Englishman who conceived himself so ill as to be unable to stir, but who was prevailed upon by his medical advisers to go down from London to consult an eminent physician at Inverness who did not exist, may serve as another illustration. The stimulus of expecting the means of cure from the northern luminary, was sufficient to enable the patient not only to bear, but to reap benefit from, the exertion of making the journey down; and his wrath at finding no such person at Inverness, and perceiving that he had been tricked, sustained him in returning, so that on his arrival at home he was nearly cured. Hence also the superiority of battledoor and shuttlecock, and similar games, which require society and some mental stimulus, over listless exercise. It is in fact a positive misnomer to call a solemn procession *exercise*. Nature will not be cheated; and the healthful results of complete cheerful exertion will never be obtained where the nervous impulse which animates the muscles is denied.

It must not, however, be supposed, that a walk simply for the sake of exercise can never be beneficial. If a person be thoroughly satisfied that exercise is requisite, and perfectly *willing*, or rather desirous, to obey the call which demands it, he is from that very circumstance in a fit state for deriving benefit from it, because the *desire* then becomes a sufficient nervous impulse, and one in perfect harmony with the muscular action. It is only where a person goes to walk, either from a sense of duty or at the command of another, but against his own inclination, that exercise is comparatively useless.

This constitution of Nature, whereby a mental impulse is required to direct and excite muscular action, points to the propriety of teaching the young to observe and examine the qualities and arrangements of external objects. The most pleasing and healthful exercise may be thus secured, and every step be made to add to useful knowledge and to individual enjoyment. The botanist, the geologist, and the natural historian, experience pleasures in their walks and rambles, of which, from disuse of their eyes and observing powers, the multitude is deprived. This truth is acted upon by many teachers in Germany. In our own country, too, it is beginning to be felt, and one of the professed objects of Infant education is to correct the omission. It must not, however, be supposed that *any* kind of mental activity will give the necessary stimulus to muscular action, and that, in walking, it will do equally well to read a book or carry on a train of abstract thinking, as to seek the necessary nervous stimulus in picking up plants, hammering rocks, or engaging in games. This were a great mistake; for in such cases the nervous impulse is *opposed* rather than favourable to muscular action. Ready and pleasant mental activity, like that which accompanies easy conversation with a friend, is indeed beneficial by diffusing a gentle stimulus over the nervous system; and it may be laid down as a general rule that any agreeable employment of an inspiriting and active kind, and which does not absorb the mind, adds to the advantages of muscular exercise; but wherever the mind is engaged in reading or in abstract speculation, the muscles are drained as it were of their nervous energy by reason of the great exhaustion of it by the brain; the active will to set them in motion is proportionally weakened, and their action is reduced to that inanimate kind I have already condemned as almost useless. From this exposition, the reader will be able to appreciate the hurtfulness of the practice in many boarding-schools, of sending out the girls to walk with a book in their hands, and even obliging them to learn by heart while in the act of walking. It would be difficult, indeed, to invent a method by which the ends in view could be more completely defeated as regards both mind and body. The very effort of fixing the eye on the printed page when in motion, strains the attention, impedes the act of breathing, distracts the nervous influence, and thus deprives the exercise of all its advantages. For true and beneficial exercise, there must, in cases where the mind is seriously occupied, be *harmony of action between the mind which impels, and the part which obeys and acts. The will and the muscles must be both directed to the same end and at the same time*, otherwise the effect will be imperfect. But in reading during exercise, this can never be the case. The force exerted by strong muscles, animated by strong nervous impulse or will, is prodigiously greater than when the impulse is weak or discordant; and as man was made not to do two things at once, but to direct his whole powers to one thing at a time, he has ever excelled most when he has followed this law of his nature.

The second rule for the management of exercise is, that *it should involve as much variety of movement as possible*, for the double purpose of calling into play the greatest possible number of the muscles, and of fulfil-

ing the law which requires their alternate contraction and relaxation as the condition of their well-being. The absolute necessity of attention to this rule will be apparent when we consider that the sphere of action of each muscle is strictly local, and that it is only by calling them all into play that a *general* effect can be produced. Thus, by much walking, we may greatly develope the muscles of the legs, and yet leave those of the arms and chest comparatively feeble; or, by wielding a ponderous hammer, or rowing a boat, we may greatly develope those of the chest and arms, and leave the legs weak, and their circulation languid. For the same reason, a slow formal walk, with demure look and motionless arms, is much less useful than a smart walk or run, in which we cannot refrain from exercising the arms and chest also. In the former case, the influence is entirely confined to the legs, and is small even on them; while, from the trunk and arms remaining rigid and inactive, no *general* advantage is obtained.

Another reason for varied movements in exercise is, that the constitution of the muscles requires their frequent contraction and relaxation; and if this is neglected, and they are kept long in the same state of tension, they become wearied and weakened by exhaustion. Let this physiological law be kept in view, and then let the reader consider the motionless attitudes required of the young for hours together in schools and at home, and say whether any plan more opposed to the intentions of the Creator could be devised for their management! When we thus sow the seeds of bad health and physical deformity, have we any right to be surprised and grieved when the crop which we have cherished arrives at maturity? God has kindly laid the conditions of our welfare before us without mystery and without obscurity. If we prefer our own way to that which He in his wisdom has marked out for our guidance, can we, without presumption, complain of the consequences? The path of duty is obvious as the sun at noonday. The human body is composed of bones and muscles in addition to other organs. These bones and muscles, exceeding together upwards of 600 in number, were made expressly for active use; and their health and that of the body depend on this condition being fulfilled by all of them being called into play by varied and vigorous movements, with proper intervals of repose. But if we reject this variety, and restrict the body to the constrained observance of certain attitudes and motions, a few of the muscles will suffer from being overstrained, but the great majority of them and the bones will become weakened from inactivity, and impaired health and debility necessarily follow.

The principle of varied exercise is often transgressed to an injurious extent among the manufacturing classes, and its results are seen in their impaired physical condition. We are constantly told that the working of young children in factories for eight or ten hours a-day is not hurtful in any degree, because the labour is so light as not to fatigue them. But a statuary might, on nearly the same grounds, assure his living model, when requested to stand for hours in the same attitude, that his doing so cannot fatigue him, as no active exertion is required of him. But when we recollect that to preserve the same attitude, the same muscles must be in a constant state of tension, and the remainder in a constant state of relaxation, and that all of them are thus denied that *alternate contraction and relaxation*, and those intervals of repose, which are so essential to their well-being; the case of the factory-children assumes a far more serious aspect. And, accordingly, we know, from indisputable evidence, that the factory system has, notwithstanding the boasted lightness of the labour, produced a large amount of impaired health and physical deformity. In England there are no statistical data of a sufficiently precise or trustworthy character to be adduced as evidence; but it is otherwise in France, where the system of examining the yearly levy of conscripts affords an excellent test, as it shews the exact proportions found unfit for the army, from physical deformity, in every part of the country. All the young men above twenty years of age, liable to serve, are examined one by one with the greatest care by a council composed one-half of military men, and the other half of civilians; and the following are the results of a comparison made between ten departments which are principally agricultural, with ten which are principaliy engaged in manufactures. "In 10,000 young men capable of supporting the fatigues of military service, the ten agricultural departments give only 4029 infirm or deformed persons; while the ten departments which are chiefly manufacturing give 9930 (more than double the number) of infirm or deformed persons. These numbers are the *averages* of the ten departments." But this is not the worst of the picture. In the department of the Eure, the proportion of infirm and deformed persons rises so high as 14,451; and according to Baron Charles Dupin, in a speech reported in the Moniteur of March 7, 1840, "the fearful consequences that arise from excessive labour in childhood and youth may be judged of from the following facts. In Normandy, for every 100 men strong enough to be passed as recruits for the army, there were rejected 170 young men of twenty years of age at Rouen, 200 at Elbeuf, and 500 at Bolbec, all manufacturing towns!!"* Well may it be added in the report, that "such immense disproportions ought not to be looked upon with indifference by the legislature; they are proofs of deep and grievous wounds; they shew that there must be individual suffering of the most afflicting kind. . . . . *We should blush for the state of our agriculture if we could only rear for its operations so small a proportion of oxen and horses able to work, in comparison of so large a number of weak and misshapen animals.*"

I am quite aware that the wholesome regulations already in force in this country, prevent the production of an equal extent of deformity and bad health in our factories; and that in many mills the most active measures are employed to diminish the evils of the system; but it is nevertheless certain that in the best of them the mischief is only mitigated and not extinguished, while in by far the greater number the amount of injury inflicted is still very great. A humane and active spirit of inquiry has, however, been excited, and the general sympathy which it has called forth gives a promise that much more will yet be done to improve the physical and moral wellbeing of our large manufacturing population. But it would be foreign to my present purpose to pursue the subject here, and I have already said enough to shew the necessity which exists of consulting variety in the exercise and employments of the young.

To render exercise as beneficial as possible, particularly in educating the young, it ought always to be taken in the open air, and to be of a nature to occupy the mind as well as the body. Gardening, boeing, social play, and active sports of every kind, cricket, bowls, shuttlecock, the ball, archery, quoits, hide and seek, and similar occupations and recreations well known to the young, are infinitely preferable to regular and unmeaning walks, and tend in a much higher degree to develope and strengthen the bodily frame, and to secure a straight spine and an erect and firm but easy and graceful carriage. A formal walk is odious and useless to many girls who would be delighted and benefited by spending three or four hours a-day in spirited exercise and useful employment.

Let those mothers, who are *afraid* to trust to Nature for strengthening and developing the limbs and spines of their daughters, attend to FACTS, and their fears will vanish. It is notorious that a majority of those girls who, in opposition to the laws of Nature, are encased

* Leonard Horner on the Employment of Children in Factories and other works. Longman and Co., 1840, p. 51-2.

in stays, and get insufficient exercise, become deformed, an occurrence which is, on the other hand, comparatively rare in boys, who are left, in conformity with the designs of Nature, to acquire strength and symmetry from free and unrestricted muscular action. In a seminary for young ladies, for example, containing forty pupils, it was discovered on examination, by Dr FORBES, that *only two* out of those who had been resident in it for two years had straight spines; while out of an equal number of boys, imperfect as their exercise often is, it would be difficult to discover as many whose spines were not straight. Here, then, is ample proof, that stays and absence of exercise, so far from contributing to an elegant carriage, are directly opposed to its acquisition; and that the absence of stays and indulgence in exercise, even when not carried so far as the wants of the system require, instead of being hurtful to the spine, contribute powerfully to its strength and security. Yet such is the dominion of prejudice and habit, that, with these results meeting our observation in every quarter, we continue to make as great a distinction in the physical education of the two sexes in early life, as if they belonged to different orders of beings, and were constructed on such opposite principles that what was to benefit the one must necessarily hurt the other. It is true that there are cases *of disease* in which the use of stays may be beneficially resorted to; but so far from sanctioning their general employment, such cases are sufficient to prove that, like every other remedy, they ought to be used only under the direction of the medical attendant.

I make this earnest appeal to mothers, because, in truth, *it is they who are responsible* to both God and man for any suffering entailed upon their children from this cause. They are the guides to whom their daughters look up with deference and respect, and if they neglect their trust evil cannot fail to result. To mothers, I would say, Listen to the clear-sighted evidence of one of your own sex, whose worth and talents entitle her opinions and judgment to have weight with you, and who writes only to do good. "We are now so much accustomed to see delicate women," remarks Madame Necker de Saussure, "that, from want of good models, the ideal of a good figure has altogether disappeared from the imaginations of many. What features do we boast of in romance? Is it a dazzling freshness, or the graceful elasticity and vivacity of youth? No, it is a fragile and airy form, a sylph-like figure, an interesting paleness occasionally relieved by a tinge of carnation; it is an expressive look softly shaded by melancholy. But *the most of these indications are precisely those of feeble health.* Extreme delicacy of form, a colour which comes and goes, and a languor of expression forbode nothing good for the future mother or wife called upon perhaps to aid her husband in adversity. And yet, in the mean time, pictures of this kind fascinate the imagination of a young girl and even of a mother, and make them afraid of injuring charms so seductive. One young person will not eat from the fear of becoming too stout, another will not walk lest her foot should become too large. What miserable folly!"

"We have no wish to form Clorindas or stately Amazons; assuredly not; but the opposite extreme into which women have lately fallen, shews that the sex has degenerated. This complaint is heard every where, in England, in Switzerland, and even in America, more than any where else. The victims of maternity multiply daily, youthful widowers often afflict our sight. Physicians often forbid mothers from nursing, so much would it weaken both them and their nurslings. Numerous orthopedic (or deformity-correcting) establishments, sad and uncertain remedies for a defective education, are evidences of its fatal consequences. How does it happen that in an age remarkable for the progress of medical science, the application of hygiène to woman should be so much in arrear,—to that half of the human family on whom the health of the whole race essentially depends? To her will be due the existence of a healthy, active, and vigorous generation, or of one soft, vacillating, enervated, and subjected to the empire of excessive nervous susceptibility, such as characterizes so many women of the present day."

"In towns, especially, physical inaction and inability have deplorable effects. Much is believed to be done when the young girls are taken out to walk in fine weather. But what elasticity, I ask, can a monotonous march give them when they are compelled to keep themselves erect, to keep a guard on their expression, to take care of their clothes, and to speak very low? The blood is scarcely sufficiently accelerated by it to diffuse any heat through their limbs. The muscles of the arms, the shoulders, and the loins, remain inactive; those muscles which are so necessary in uniting the bones together, and preventing them from yielding, and which, by their free play, support and maintain the spinal column in its proper position; these very muscles receive no increase of strength from exercise; the spine, left to its natural flexibility, yields under the weight of the head and arms, and becomes curved in its weakest part."*

Were there any real difficulty in determining the best means of developing the body and preventing deformity, even the comparison of savage with civilized man would at once remove it. Mr Henry Marshall, in his late excellent work "*On the Enlisting, the Discharging, and the Pensioning of Soldiers*," states, that "lateral curvature of the spine is intimately connected with civilized life. In the male sex, it occurs more frequently among boys who study very closely, clerks, and persons who exercise sedentary trades. The agricultural peasant is seldom affected with it, and *the tribes of people commonly denominated savage perhaps never.* I have had good opportunities of observing the form of the natives of India, and of the Malay islands, and I do not recollect having seen a single case of this deformity among them." P. 21. Mr Marshall's testimony is strongly supported by an intelligent old author, who, in describing the Caribs 170 years ago, says, in a tone of regret, "They do not swaddle their infants, but leave them to tumble about at liberty in their little hammocks, or on beds of leaves spread on the earth in a corner of their huts; and NEVERTHELESS *their limbs do not become crooked, and their whole body is perfectly well made!*" And, again, "ALTHOUGH *the little creatures are left to roll about on the ground in a state of nudity, they* NEVERTHELESS *grow marvellously well*, and most of them become so robust as to be able to walk without support at six months old."†

The naiveté of this expression of surprise at the little Caribs growing *marvellously well* with the assistance of Nature alone, and without the use of stays and bandages imported from Europe, is extremely amusing, and shews to what extent prejudice and custom, once established, will continue to prevail, even where we have before our eyes the strongest evidence of their being hurtful. Our excellent author seems never to have allowed the thought to enter his head, that the Europeans *produced* the deformity by means of swaddling and bandages, and that the Caribs *escaped* it, simply by avoiding its causes, and giving liberty to both limbs and trunk of the body.

It is mentioned of the Araucanian Indians, also, in Stevenson's narrative of a Twenty Years' Residence in South America, that "the children are never swaddled nor their bodies confined by any tight clothing." "They are allowed to crawl about nearly naked until they can walk." "To the loose clothing," adds Mr Stevenson, "which the children wear from their infancy, may doubtless be attributed the total absence of deformity among the Indians." Vol. i. p. 9, 10.

* Madame Necker de Saussure sur l'Education Progressive, &c. Paris, 1838. Vol. iii. p. 168.

† Histoire Naturelle et Morale des Isles Antilles. Rotterdam, 1658.

But there is another important consequence of excessive tasking of the mind, and confinement within doors, and neglect of proper exercise in the open air, to which the attention of all mothers ought to be earnestly directed. I allude to the delicacy and lowered tone of the general health, so graphically described by Madame Necker de Saussure, and which frequently assumes so many of the features of increased refinement as to be considered and hailed by the unreflecting mother as a new charm added to her daughter's former attractions. But too often this "interesting paleness," "sylph-like form," and "expression tinged with melancholy," are only the harbingers of a deep-seated and insidious disease, which is destined to destroy the mother's fondest hopes when excited to the utmost. The same indications are often the first clear evidences of an infirmity of constitution which becomes, in its turn, the source of many evils, and which Mr Hare has shewn to precede, in most cases, the actual occurrence of spinal deformity in youth. In this sense, Mr Hare justly enough *considers the impaired health as the first stage of the spinal disease*, and affirms that the same amount of physical confinement would not be sufficient to produce the deformity if the general health remained unbroken.* In this view I entirely concur; and it affords a double reason for putting an end to the present system of excessive confinement and mental cultivation; and there can be no doubt that in numerous instances it induces that form of impaired health which Sir James Clark has shewn to be so favourable to the production of tuberculous consumption, and which, when confirmed, is scarcely susceptible of cure.†

The next rule for the regulation of exercise is, that *it should always be proportioned in amount to the age, strength, state of the constitution, and former habits of the individual.* From overlooking this condition, it is usual for persons of an indolent or sedentary habit to tell the physician, when he urges upon them the necessity of exercise, that even a short walk fatigues them so much as to render them unfit for every thing for some days afterwards, and that they are never so well as when allowed to remain in the house. But if, in perfect reliance on the regularity of the Creator's laws, we seek out the cause of this apparent exception, we shall almost uniformly find, that, instead of beginning with a degree of exertion proportioned to the weakened state of the system, such persons have (under the notion that it was not worth while to go out for a short time) forced their muscles, already weakened by inactivity and confinement, to perform a walk to which only regularly exercised muscles were adequate. The amount of exertion which is always followed by exhaustion is thus, through mere impatience and ignorance, substituted for that lesser degree which always gives strength; and because the former is followed by headach and debility, it is argued that the latter also must be prejudicial! Many sensible people delude themselves by such puerile plausibilities as this; and it is only by the diffusion of a knowledge of the laws of exercise as part of a useful education, that individuals can be enabled to avoid such mistakes. This, however, will be made more clear by the following considerations.

When any living part is called into activity, the processes of waste and renovation, which are incessantly going on in every part of the body, proceed with greater rapidity, and in due proportion to each other. At the same time the vessels and nerves become excited to higher action, and the supply of arterial or nutritive blood and of nervous energy becomes greater. When the active exercise ceases, the excitement thus given to the vital functions subsides, and the vessels and nerves return at length to their original state.

If the exercise be resumed frequently, and at moderate intervals, the increased action of the bloodvessels and nerves becomes more permanent, and does not sink to the same low degree as formerly; NUTRITION *rather exceeds waste, and the part* GAINS *consequently in size, vigour, and activity.* But if the exercise be resumed too often, or be carried too far, so as to fatigue and exhaust the vital powers of the part, the results become reversed: WASTE *then exceeds nutrition, and a* LOSS of volume and of power takes place, accompanied with a painful sense of exhaustion and fatigue. When, on the other hand, exercise is altogether refrained from, the vital functions decay from the want of their requisite stimulus; little blood is sent to the part, and nutrition and strength fail in equal proportion. A limb which has been long in disuse becomes weak and shrivelled from this cause, and its muscles present an unusual paleness and flabbiness, strongly contrasting with the florid redness and rigid fulness of the muscles of a well-exercised limb.

Even sensation gives faithful notice of these changes, and therefore serves as a guide to the amount of exercise. When muscular employment is neglected, the body becomes weak, dull, and unfit for powerful efforts, and all the functions languish. When exercise is taken regularly and in due proportion, a grateful sense of activity and comfort prevails, and we feel ourselves fit for every duty, both mental and bodily. Lastly, when we are subjected to excessive exertion, a painful sense of weariness and exhaustion ensues, which is not relieved by rest, and which for a long time prevents sleep. A person who has greatly over-fatigued himself in walking, for example, is feeble and restless; and, on lying down, either cannot sleep at all, and rises in the morning weak in body and languid in mind, or has uneasy and disturbed sleep till the exhaustion is partially recovered from, after which he may enjoy sound and refreshing repose.

From this exposition of the effects of exercise in its different stages, it becomes easy to deduce rules applicable to all, for promoting the healthy development of the muscular system, and to trace the errors by which indolent people are accustomed to maintain that exercise is hurtful to their constitutions. *The second stage of exercise, or that in which, by its frequency, moderation, and regularity, nutrition and vigour are preserved at their highest pitch, is of course to be aimed at;* but the quantity of exercise which corresponds to it, must vary according to the constitution and previous habits of the individual, as is well exemplified in training for pedestrian feats, for the ring, and for racing. *The assertion made by many, that exercise hurts them, arises entirely from overlooking this circumstance.*

A person, accustomed to daily activity, will feel invigorated by a walk of four or five miles in the open air, whereas the same distance will weaken another who has not been in the habit of walking at all. But, instead of inferring from this, as is often done, that exercise in the open air is positively hurtful to the latter, reason and experience coincide in telling us, that he has erred only in over-tasking the powers of his system, and that to acquire strength and activity, he ought to have begun with one mile, and to have gradually extended his walk in proportion as the muscles became invigorated by the increased nutrition consequent on well regulated exercise. A person recovering from fever begins by walking across his room perhaps ten times in a day, and gradually extends to twenty or thirty times, till he gains strength to go into the open air. On going out, a walk of ten minutes proves sufficient for him at first; but by degrees his strength and flesh increase, and his exercise is prolonged till he arrives at his usual standard. Such is the order of Nature: but many sedentary people have no patience for such slow progress, and when urged to take exercise, they grudge the trouble of going out for a short time, and think that, if a walk of half a mile does them good,

* Hare on Spinal Diseases. London, 1838.

† Sir James Clark on Consumption and Scrofula.

one of a whole mile will do more; and when they suffer from the error, they shelter their ignorance under the general assumption that exercise does not agree with them! And the same persons who argue thus would think themselves entitled to laugh at the Irishman, who, finding himself relieved by five pills taken at night, inferred that he would necessarily be cured if he took the whole boxful at once, and on doing so narrowly escaped with his life.

From these principles it follows, *first*, that, to be beneficial, exercise ought always to be proportioned to the strength and constitution, and not carried beyond the point, easily discoverable by experience, at which waste begins to succeed nutrition, and exhaustion to take the place of strength; *secondly*, that it ought to be regularly resumed after a sufficient interval of rest, in order to ensure the permanence of the healthy impulse given to the vital powers of the muscular system; and, *lastly*, that it is of the utmost consequence to join with it a mental and nervous stimulus. Those who go out only once in four or five days, are always at work, but never advancing; for the increased action induced by the previous exercise, has fully subsided long before the succeeding effort is begun; and so far as increased nutrition, strength, and greater aptitude for exertion are concerned, no progress whatever is made.

From the influence which muscular activity exercises upon the general circulation, and also in increasing the waste from the system, it is evident that the supply of nourishment ought at all ages to hold a direct relation to the activity of the mode of life, particularly in youth, when fresh materials are required for growth, as well as to repair the waste caused by exercise. In strict conformity with this principle, the first effect of exercise, if properly regulated, is always to increase the appetite; and hence in youth a quantity of food is both required and digested, which, at a more inactive period of life, would speedily oppress the system and disorder the health. If this full supply of nourishment be denied, the development of the bodily organs often receives a check which no subsequent treatment can remedy, and a foundation is laid for diseases of debility which afterwards embitter and endanger life. From pretty extensive inquiry, I am satisfied that in boarding-schools, especially for females, this important principle is occasionally disregarded; while the conductors are at the same time without the least suspicion of the evil they are producing, and even take credit to themselves for only checking sensual appetites, and promoting temperance in eating as well as in drinking. Youth requires the best and most nutritious food, and such ought regularly to be provided, and the infringement of this condition entails much misery upon our young manufacturing population. Wasted by excessive labour, long confinement, and miserable diet, the muscular system is stinted in growth and weakened in structure; and the blood, impoverished by insufficiency of nourishing food and by a vitiated atmosphere, is no longer capable of repairing the waste consequent upon exercise, or of affording a healthy stimulus to the vessels and nerves which animate the muscles. Languor, debility, and exhaustion of mind, necessarily follow; and the individual is left susceptible of no stimulus but that of ardent spirits or of excited and reckless passion. In health, consequently, activity and appetite are generally proportioned to each other, and those suffer most who attempt to combine the pleasures of appetite with bodily indolence.

The next subject for consideration is *the times at which exercise ought to be taken*. Those who are in perfect health may engage in exercise at almost any hour, except immediately after a full meal; but those who are not robust, ought to confine themselves within narrower limits. To a person in full vigour, a good walk in the country before breakfast may be highly beneficial and exhilarating; while to most invalids and delicate persons, it will prove more detrimental than useful, and will induce a sense of weariness which will spoil the pleasure of the whole day. To some, however, who have no appetite on rising, a short walk in the open air before breakfast proves very beneficial. All that is required is, that we should not prescribe morning exercise indiscriminately, but only in the class of cases for which it is adapted. From losing sight of this precaution many persons, deceived by the current poetical praises of the freshness of morning, hurt themselves in summer by seeking health in untimely promenades.

In order to prove beneficial, exercise must be resorted to only when the system is sufficiently vigorous to be able to meet it. In delicate constitutions, this is the case after a lapse of from two to four hours after a moderate meal, and consequently the forenoon is the best time for them. If exercise be delayed till some degree of exhaustion from the want of food has occurred, it speedily dissipates instead of increasing the strength which remains, and impairs rather than promotes digestion. The result is quite natural; for exercise of every kind causes increased action and waste in the organs, and, if there be not materials and vigour enough in the general system to keep up that action and supply the waste, nothing but increased debility can reasonably be expected.

For the same reason, exercise *immediately before meals*, unless of a very gentle description, is injurious, and an interval of rest ought always to intervene. Muscular action causes an afflux of blood and nervous energy to the surface and extremities, and if food be swallowed whenever the activity ceases, and before time has been allowed for a different distribution of the vital powers to take place, the stomach is taken at disadvantage, and from want of the necessary action in its vessels and nerves, is unable to carry on digestion with success. This is very obviously the case where the exercise has been severe or protracted, and the consequence is so well known, that it is an invariable rule in the management of horses, never to feed them immediately after work, but always to allow them an interval of rest proportioned to the previous labour. "*Eat not*," therefore, "until you be fully reduced to that temper and *moderate heat* as when you began, and when the spirits are retired to their proper stations."* Even instinct would lead to this conduct, for appetite revives after repose.

Active exercise ought to be equally avoided *immediately after* a heavy meal. In such circumstances, the functions of the digestive organs are in the highest state of activity; and if the muscular system be then called into considerable action, the withdrawal of the vital stimuli of the blood and nervous influence from the stomach to the extremities, is sufficient almost to stop the digestive process. This is no supposition, but demonstrated fact; and accordingly, there is a natural and marked aversion to active pursuits after a full meal. In a dog, which had hunted for an hour or two directly after eating, digestion was found on dissection to have scarcely begun; while in another dog, fed at the same time, and left at home, digestion was nearly completed.

A mere stroll which requires no exertion, and does not fatigue, will not be injurious before or after eating; but exercise beyond this limit is at such times hurtful. All, therefore, whose object is to improve or preserve health, and whose occupations are in their own power, ought to arrange these, so as to observe faithfully this important law, for they will otherwise deprive themselves of most of the benefits resulting from exercise.

When we know that we shall be forced to exertion soon after eating, we ought to make a very moderate meal, in order to avoid setting the stomach and muscles

* Maynwaringe, p. 14.

at variance with each other, and exciting feverish disturbance. In travelling by a stage-coach, where no repose is allowed, this precaution is invaluable. If we eat heartily as appetite suggests, and then enter the coach, restlessness, flushing, and fatigue, are inevitable; whereas, by eating sparingly, the journey may be continued for two or three days and nights, with less weariness than is felt during one-fourth of the time under full feeding. I observed this when travelling as an invalid on rather low diet, and was surprised to find myself less fatigued at the end of seventy-two hours, than I had previously been, when in health and living fully, with half the journey; and I have heard the same remark made by others, also from experience. But for full information on this and other practical questions connected with diet and digestion, I must refer the reader to my separate work in which they are discussed in detail.*

It is the custom in many families and schools, apparently for the purpose of saving time, to take young people out to walk about the close of the day, because there is not light enough to do any thing in the house. Nothing can be more injudicious than this plan—for, in the *first* place, *exercise once a-day is very insufficient for the young*, and even supposing that it were enough, the air is then more loaded with moisture, colder, and proportionably more unhealthy, than at any other time; and, *secondly*, the absence of the beneficial stimulus of the solar light, diminishes not a little its invigorating influence. For those, consequently, who are so little out of doors as the inmates of boarding-schools and children living in towns, and who are all at the period of growth, *the very best times of the day ought to be chosen for exercise*, particularly as in-door occupations are, after nightfall, more in accordance with the order of nature.

By devoting part of the forenoon to exercise, another obvious advantage is gained. If the weather prove unfavourable at an early hour, it may clear up in time to admit of going out later in the day; whereas, if the afternoon alone be allotted to exercise, and the weather then proves bad, the day is altogether lost. In winter, indeed, it is not unusual for girls to be thus confined from Sunday to Sunday, simply because the weather is rainy at the regular hour of going out. When the muscular system is duly exercised in the open air early in the day, the power of mental application is considerably increased; while, by delaying till late, the efficiency of the whole previous mental labour is diminished by the restless craving for motion which is evinced by the young of all animals, and which, when unsatisfied, distracts attention, and leads to idleness in school. It would be well to copy in this respect the practice adopted in the infant schools, where the children are turned out to play for a few minutes, as soon as the wandering of mind and restlessness of body indicate that the one has been too much and the other too little exerted. After such an interval, work goes on briskly again, and every one is alive. For these reasons I cannot too strongly condemn the system still pursued even in our best schools, of confining the young during the whole day at lessons, or preparations for lessons, with the exception of only one hour, or an hour and a half, of intermission. I am acquainted with an excellent and very large school of this kind where the boys are allowed only an hour and a half for play, and in this the dinner time is included! By way of making the most of every moment, the boys are led out to play at football the instant dinner is swallowed. This is well meant, as is proved by the masters sharing in the play; but a more irrational method could not be devised. *Three* hours at least ought to be spent in the open air daily, and five hours would be still better, joined, of course, to useful occupation.

* The Physiology of Digestion considered with reference to the Principles of Dietetics. 1 vol. post 8vo. Simpkin & Co., London; Maclachlan & Co., Edinburgh.

The *different kinds of exercise* fall now to be considered. The object being to employ all the muscles of the body, exercise ought to be often varied, and always adapted to the peculiarities of individuals. Speaking generally, *walking* agrees well with every body; but as it brings into play chiefly the lower limbs and the muscles of the loins, and affords little scope for the play of the arms and muscles of the chest, it is insufficient of itself to constitute adequate exercise; and hence the advantage of combining with it movements performed by the upper half of the body, as in rowing a boat, fencing, shuttlecock, and many other useful sports. Such exercises have the additional advantage of animating the mind, and by increasing the nervous stimulus, making exertion easy, pleasant, and invigorating. Nature, indeed, has shewn her intention that the upper part of the body should always partake in the exercise of the lower, by rendering it impossible for us even to walk gracefully without the arms keeping time, as it were, with the movements of the legs.

Active play, running, leap-frog, foot-ball, cricket, gardening, pedestrian, botanical, and geological excursions, combine in their results all the advantages which well-conducted exercise is capable of yielding; and the latter are much resorted to in the German seminaries, for the purpose of developing the mental and bodily powers. On the Continent generally, more attention is paid to physical health and development in the education of the young than with us; and in many institutions a regular system of useful manual occupation is substituted for mere play, and with decided advantage. For not only is the physical organization thereby strengthened and developed, but the mental energy and dignity of character are increased, and the mind becomes better fitted for independent action. Among the ancients the training and invigoration of the body formed a leading object in education; but physical strength having become of less importance in war since the invention of gunpowder, the moderns have too generally restricted their attention to the direct improvement of the mind.

In summer, walking excursions to the Highlands of Scotland are common among the youth of our cities, and when proportioned in extent to the constitution and previous habits of the individual, nothing can be more advantageous and delightful. But not a season passes in which health is not sacrificed and life lost by young men imprudently exceeding their natural powers, and undertaking journeys for which they are totally unfit. It is no unusual thing for youths, still weak from rapid growth, and perhaps accustomed to the desk, to set out in high spirits at the rate of twenty-five or thirty miles a-day, on a walking excursion, and (in consequence of carrying exercise, for days in succession, to the third degree, or that in which *waste exceeds nutrition*) to come home so much worn out and debilitated that they never recover. Young soldiers, whose growth is scarcely finished, are well known to die in great numbers, when exposed to long and heavy marches, particularly when food is at the same time scanty. Violent exercise is not less pernicious, and, as well remarked by Dr Johnson, "it did great harm even when nations were more in a state of nature than they now are. Galen, in his discourse on Thrasibulus, inveighs against the athletic practices of the gymnasium. A smart walk of a mile is to a valetudinarian what a furious wrestle would be to an athletic. If we trace those dreadful aneurismal affections of the heart and arteries in early life, we shall find their origins in violent exercise or sudden overexertion, in nine cases out of ten, where age and ossification are not concerned."* Even a single day of excessive fatigue will sometimes suffice to interrupt growth and produce permanent bad health; and I know one instance of a strong young man, who brought on a severe illness and permanent debility, by sudden return

* Johnson on Derangement of the Liver, &c. p. 129.

to hard exercise for a single day, although some years before he had been accustomed to every species of muscular exertion in running, leaping, and swimming. Many young men hurry on the premature development of consumption by excessive fatigue during the shooting season in cases where, by prudent management, they might have escaped it for years, if not altogether. The principle already laid down, of not exceeding the point at which *exercise promotes nutrition and increases strength*, will serve as a safe guide on all occasions, and indicate the rate at which it may be extended. Old sportsmen know the rule by experience, and generally prepare themselves for the moors by several weeks of previous training. The science and judgment which fox-hunters display in preparing their horses for their future exertions in coursing are well known, and might be still more usefully applied by their riders to the training of their own families.

Since the above remarks appeared in the third edition of this volume, I have had occasion to examine carefully two young gentlemen, who, during their attendance at Cambridge, were in the habit of using very violent and continued exertion in rowing. In the one the muscles of the arm and upper part of the chest were of an almost unnatural size and hardness from excess of nutrition, while the rest of the body was only moderately developed. In the other there was no such disproportion, but there was a liability to palpitations and severe pain in the region of the heart, which, he said, were first brought on by excessive exertion. On cautioning him against the probable consequences of continuing such trials of strength as occurred during their frequent boat-races, he told me, that in looking back to his own companions at college, he could name several dead within the last four years whose lives were distinctly ascertained to have been sacrificed in this way, —a fact strikingly corroborating Dr Johnson's testimony, and which certainly ought to make a salutary impression on the minds of those who, in the pursuit of pleasure, rush so thoughtlessly into danger.

As the subject is one of much practical importance, I may add another melancholy but instructive example, with which a friend has furnished me, of the operation of the principles just inculcated. He says, "A young gentleman, whom I knew, was employed as a clerk in one of the banks in Edinburgh. He was closely confined to his desk during the summer, and, towards the end of July, had become weak and emaciated from deficient exercise in the open air. His strength continued to decline till Friday the 12th of August, when he went to shoot on Falkirk Moor. On Friday and Saturday he was much fatigued by excessive and unusual exertion, and on Sunday evening was feverish and heated, and perspired very much during the night. In this condition, he rose about three or four o'clock on Monday morning, and returned to Edinburgh on the top of a coach. When he reached home he felt very unwell, but went to the bank. At two o'clock he became so sick as to be unable to sit at his desk. He was then bled by a medical gentleman, but without much effect; and after passing three months in a feverish and sleepless condition, he died in the beginning of November. He was previously of a healthy constitution." It is more than probable that this young man's life became a sacrifice to his ignorance of the structure and functions of the human body.

Riding is a most salubrious exercise, and, where the lungs are weak, possesses a great advantage over walking, as it does not hurry the breathing. It calls into more equal play all the muscles of the body, and, at the same time, engages the mind in the management of the animal, and exhilarates by the free contact of the air and more rapid change of scene. Even at a walking pace, a gentle but universal and constant action of the muscles is required to preserve the seat, and adapt the rider's position to the movements of the horse; and this kind of muscular action is extremely favourable to the proper and equal circulation of the blood through the extreme vessels, and to the prevention of its undue accumulation in the central organs. The gentleness of the action admits of its being kept up without accelerating respiration, and enables a delicate person to reap the combined advantages of the open air and proper exercise, for a much longer period than would otherwise be possible.

From the tendency of riding to equalize the circulation, stimulate the skin, and promote the action of the bowels, it is also excellently adapted as an exercise for dyspeptic and nervous invalids.

Dancing is a cheerful and useful exercise, but has the disadvantage of being used within doors, in confined air, and often in dusty rooms and at most unseasonable hours. Practised in the open air, and in the day-time, as is common in France, dancing is certainly an invigorating pastime; but in heated rooms, and at late hours, it is the reverse, as these drawbacks do more harm than can be compensated by the healthful exercise of the dance.

Gymnastic and calisthenic exercises have been in vogue for some years, for the purpose of promoting muscular and general growth and strength, but they are now rather sinking in public estimation; partly, I believe, from absurdly making them supersede instead of aiding exercise in the open air, and partly from overlooking the necessity of adapting the kind and extent of them not only to the individual constitution, but to the natural structure of the body; the consequence of which has been, that some of the more weakly pupils have been injured by exertions beyond their strength, and discredit has thus been brought upon the system. It is certain, indeed, that some of the common gymnastic exercises are altogether unnatural and at variance with the design of the bodily organization; and that others are fit only for robust and healthy boys, and not at all for improving those who are delicately constituted, and who stand most in need of a well-planned training. It is impossible to enter minutely into this subject at present, but the best guide we can have is to follow the footsteps of Nature, and, before adopting any exercise, to consider whether it is in harmony with the mode of action assigned by the Creator to the parts which are to perform it. If it be so, we may proceed with perfect confidence that it will not only improve the health, but add to the freedom, elegance, precision, and strength of our movements; whereas, if it be opposed to the obvious intention of the Creator, we may rest assured that no good can accrue from it.

If, for example, we examine the various attitudes and motions of the body which occur in fencing, dancing, swimming, shuttlecock-playing, and some of the better class of gymnastic exercises, we find that they are not less graceful and beneficial to the young who engage in them, than pleasing to those by whom they are witnessed,—just because they are in perfect harmony with Nature, or, in other words, with the structure and mode of action of the joints, ligaments, and muscles by which they are executed. But it is far otherwise with some of the anomalous exercises which were at one time so fashionable, and which are not yet extinct in schools and gymnasia, and seem to have for their chief object the conversion of future men and women into foresters, firemen, or savages, rather than into beings who are to continue to have the use of stairs, ladders, carriages, steam-boats, and the other conveniencies of civilized life. It is no doubt a good thing for a boy to be able to climb up a perpendicular pole or a slippery rope, when no other means present themselves of attaining an important object at its upper end; and it is an equally good thing for a young lady to be able to sustain her own weight hanging by one or both hands, when there is no possibility of resting her feet on *terra firma*; and where boys and girls are strong enough to take pleasure

in such amusements, there is no great reason to hinder them, provided they are impelled to them, not by emulation or any secondary motive which may lead to over-exertion, but by the pure love of the exercise itself. In all ordinary circumstances, those only who are vigorously constituted will attempt them, and, if left to themselves, will be sure to desist before any harm can be done. But the case is entirely altered when such extraordinary evolutions are not only encouraged but taught to all indiscriminately, whether they be strong or weak, resolute or timid. We have only to reflect for a moment on the structure of the shoulder-joint, and on the sphere of action of the muscles surrounding it, to perceive at once that the position of the one and the strain upon the other, caused by the exercises alluded to, are so *forced* and *unnatural* as to exclude the possibility of the Creator having intended either to be practised except upon occasions of urgent necessity, and to discover how preposterous it is, therefore, to make them a subject of general instruction. Nay, the very violence of the effort required to sustain the body when hanging by the hands is far beyond that moderate exertion which adds to nutrition and to strength; and in delicate subjects it may even induce relaxation and stretching of the ligaments and bloodvessels, and thus, as in the case of the young men at Cambridge, lay the foundation for future and fatal disease. The same remarks apply to a common practice of making the pupils slide down an inclined plane resting on the hands alone, by which unnatural effort the shoulders are pushed halfway up the neck, and the wrists, arms, and chest severely tried. But in these and other similar evolutions, it requires only to look at the dragging and distortion which they produce, and which form such a painful contrast to the ease and grace of all natural motions and attitudes, to perceive that they are *out of the order of Nature*, and that neither health nor elegance can result from them.

I am aware that these exercises are said to stretch the spine and to remedy its deformities; but it would be quite as sound logic to maintain that, because a *broken* leg requires to be tied up with splints and bandages, therefore the best way to strengthen a *sound* leg must be to bandage it also, as to infer that, because a few *diseased* spines require to be stretched, therefore all *healthy* spines must also derive benefit from the same process,—although, in the latter case, it is obvious to reason that the stretching will be much likelier to put the bones out of their places than to fix them more firmly in those which they already occupy. It is not by such extravagant means that a soldier-like carriage is obtained in the army, and yet there the uniformity of result—the erect and steady gait—is scarcely less remarkable than the discordant materials and variety of slouching and awkward attitudes out of which it is formed by perseverance in a rational system of drilling.

In the selection of exercises for the young, then, we should not be misled by a vain desire of surmounting difficulties and performing feats at the serious risk of inducing aneurism or rupture, but rather endeavour to strengthen the body by active amusements, which shall call the social and moral feelings and intellect into play at the same time, and by the practice of such gymnastic evolutions only as tend to improve and give tone to the *natural action* of the moving powers. And, in endeavouring to attain this object, we should be always careful to avoid great fatigue, and to modify the kind, degree, and duration of the exercise, so as to produce the desired results of *increased nutrition and strength*; and to remember that the point at which these results are to be obtained, is not the same in any two individuals, and can be discovered only by experience and careful observation.

For giving strength to the chest, *fencing* is a good exercise for boys, and what is called the *club exercise* for females; but the above limit ought never to be exceeded, as it often is, by measuring the length of a lesson by the hour-hand of a clock, instead of its effects on the constitution. *Shuttlecock*, as an exercise which calls into play the muscles of the chest, trunk, and arms, is also very beneficial, and would be still more so, were it transferred to the open air. After a little practice, it can be played with the left as easily as with the right hand, and is, therefore, very useful in preventing curvature and giving vigour to the spine in females. It is an excellent plan to play with a battledoor in each hand, and to strike with them alternately. The play called the *graces* is also well adapted for expanding the chest, and giving strength to the muscles of the back, and has the advantage of being practicable in the open air.

Dumb-bells are less in repute than they were some years ago, but when they are not too heavy, and the various movements gone through are not too eccentric or difficult, they are very useful. They do harm occasionally from their weight being disproportioned to the weak frames which use them; in which case they pull down the shoulders by dint of mere dragging. When this or any other exercise is resorted to in the house, the windows ought to be thrown open, so as to make the nearest possible approach to the external air.

Reading aloud, recitation, and singing, are more useful and invigorating muscular exercises than is generally imagined, and are extremely useful in promoting the development of the lungs and chest, at least when managed with due regard to the natural powers of the individual, so as to avoid effort and fatigue. They all require the varied activity of most of the muscles of the trunk to a degree of which few are conscious, till their attention is turned to it. In forming and modulating the voice, not only the chest but also the diaphragm and abdominal muscles are in constant action, and communicate to the stomach and bowels a healthy and agreeable stimulus; and consequently, where the voice is raised and elocution rapid, as in many kinds of public speaking, the muscular effort comes to be even more fatiguing than the mental, especially to those who are unaccustomed to it, and hence the copious perspiration and bodily exhaustion of popular orators and preachers. When care is taken, however, not to carry reading aloud or reciting so far at one time as to excite the least sensation of soreness or fatigue in the chest, and it is duly repeated, it is extremely useful in developing and giving tone to the organs of respiration, and to the general system. To the invigorating effects of this kind of exercise, the celebrated and lamented CUVIER was in the habit of ascribing his own exemption from consumption, to which, at the time of his appointment to a professorship, it was believed he would otherwise have fallen a sacrifice. The exercise of lecturing gradually strengthened his lungs and improved his health so much that he was never afterwards threatened with any serious pulmonary disease. But of course this happy result followed only because the exertion of lecturing was not too great for the then existing condition of his lungs. Had the delicacy of which he complained been farther advanced, the fatigue of lecturing would only have accelerated his fate; and this must never be lost sight of in practically applying the rules of exercise.

It appears, then, from the foregoing remarks, that the most perfect of all exercises are those sports which combine free play of all the muscles of the body, mental excitement, and the unrestrained use of the voice; and to such sports, accordingly, are the young so instinctively addicted, that nothing but the strictest vigilance and fear of punishment can deter them from engaging in them the moment the restraint of school is at an end. Many parents, absorbed in their own pursuits, forgetful of their own former experience, and ignorant that such are the benevolent dictates of Nature, abhor these wholesome outpourings of the juvenile voice, and lay restric-

tions upon their children, which, by preventing the full development of the lungs and muscles, inflict permanent injury upon them in the very point where in this climate parents are most anxious to protect them. In accordance with this, we find that what are called wild romping boys or girls, or those who break through all such restrictions, often turn out the strongest and healthiest; while those who submit generally become more delicate as they grow older.

Enough has, I trust, been said to enable any rational parent or teacher to determine the fitness of the different kinds of muscular exercise, and to adapt the time, manner, and degree of each to every individual under his care; but, before taking leave of the subject, and with a view to impress the more deeply upon the mind of the reader the practical importance of the principles inculcated in the preceding pages, I cannot refrain from subjoining a case which affords an extremely apposite illustration of almost every one of them. The particulars were furnished to me by a young friend who was allowed to peruse the manuscript of these pages, and who, as himself the subject of the case, was struck with the perfect accordance between his own experience and the doctrines here expounded. It is proper to keep in view, that at the time of his experiment, my friend was about seventeen years of age, and growing rapidly. I shall use nearly his own words.

After having passed the winter closely engaged in a sedentary profession, and unaccustomed to much exercise, he was induced by the beauty of returning spring to dedicate a day to seeking enjoyment in a country excursion; and for that purpose set off one morning in the month of May, without previous preparation, to walk to Haddington by way of North Berwick,—a distance of 34 miles. Being at the time entirely unacquainted with physiology, he was not aware that the power of exerting the muscles depended in any degree upon the previous mode of life, but thought that if a man were once able to walk thirty miles, he must necessarily continue to possess the same power, under all circumstances, while youth and health remained. The nervous stimulus arising from his escape from the desk, and from the expected delights of the excursion, carried him briskly and pleasantly over the ground for the first twelve miles, but then naturally began to decrease. Unfortunately, the next part of the road lay through a dull, monotonous, and sandy tract, presenting no object of interest to the mind, and no variety of any description; so that the mental stimulus, already greatly impaired in intensity, became still weaker. Being *alone*, his intellect and feelings could not be excited by the pleasure of companionship and conversation; weariness consequently increased at every step; and long before his arrival at North Berwick (25 miles), "every vestige of enjoyment had disappeared, time seemed to move at a marvellously tardy pace, and every mile appeared doubled in length."

Not being aware that excessive exercise without a succeeding period of repose is unfavourable to digestion, and having a lively recollection of the pleasure and refreshment consequent upon eating a good dinner with an appetite whetted by a *proper* degree of bodily labour in the open air, he looked forward with confidence to some recompence and consolation for his toils when dinner should make its appearance. In this, however, he was doubly disappointed; for, from having started with too light a breakfast, and walked so far, his digestive organs were, in common with every part of his system, so much impaired, that he looked upon the viands placed before him almost without appetite; and as they were in themselves not remarkably nutritive or digestible, he infringed still further that condition of muscular action which consists in a full supply of nourishing arterial blood, made from plenty of nutritious food, —a condition which I have stated to be essential, especially in youth and during growth.

After a rest of two hours, and taking a moderate allowance of wine, which, however, he says, "seemed to have lost its ancient virtue of imparting cheerfulness to the human heart," he set out to complete the remaining nine miles to Haddington. The country was more beautiful and varied, but the charms of nature had, by this time, lost all attractions, for our pedestrian was "now wholly occupied in counting the tedious miles yet to be traversed, and in making a pious vow that this *pleasure excursion*, though not the first, should certainly be the *last* in his life." Being reduced to the utmost degree of exhaustion, it required an extraordinary effort to persevere; but at last he arrived at Haddington, in a state of exquisite misery. Unable to read from fatigue, and having no body to converse with, he sought refuge in bed at an early hour, in the expectation that "tired Nature's sweet restorer, balmy sleep," would visit his couch and bring him relief. But in accordance with what is mentioned on page 41, he tossed and tumbled incessantly till four in the morning, a period of seven hours, after which sleep came on. Next day my youthful friend returned home in the stage-coach, wiser at least, if not happier, for his pleasure excursion; and now makes the observation, that if he had been instructed in the least degree in the nature of the human constitution, he would never for a moment have entertained an expectation of enjoyment from a proceeding so utterly in defiance of all the laws of exercise, as that of which he reaped the unpalatable fruits. He adds justly, that the number of young men who suffer in a similar way is by no means small, and that he has reason to be thankful that he has not, like some of his companions, carried his transgression so far as permanently to injure health, or even sacrifice life.

My aim being practical utility, I have said nothing in this place on the subject of what are called the *Involuntary* Muscles, or those over which the will has no power, in contradistinction to the *Voluntary*, or those which obey the direction of the will. Most of the involuntary muscles are the agents of important vital functions, which are carried on by them unconsciously to ourselves, and which it would have been dangerous to leave under our control. The chief of them is the heart, which goes on in one unvarying round of alternate contraction and relaxation, from the commencement till the close of existence. The next in importance are those connected with respiration, which, like the heart, continue to act by night and by day for the whole period of a long life, without weariness and without interruption. The muscular fibres of the stomach, bowels, and other viscera, are excellent examples of the same class; and the beneficence of Providence in withdrawing them from our control cannot be sufficiently admired. Had the action of the heart and respiratory muscles depended on the will, as that of the muscles of locomotion does, the circulation of the blood and the process of breathing would both have ceased whenever sleep or any other cause overcame the power of attention, and life would in consequence have been extinguished.

From the different constitution of the voluntary and involuntary muscles, it is clear that the former were designed for alternate activity and repose. Had it so pleased the Creator, He could as easily have rendered the one set of muscles incapable of fatigue, as he has actually rendered the other; but then the powers of man would not have been in harmony with the purpose of his existence. Incessant muscular activity would not only have been incompatible with the highest human enjoyment,—that arising from the gratification of the moral and intellectual faculties,—but it would have lacked objects on which to expend itself usefully, and, unguided by intellect, would only have served to overturn and destroy the best provisions of Nature for our happiness.

CHAPTER VII.

THE BONES, THEIR STRUCTURE, USES, AND CONDITIONS OF HEALTH.

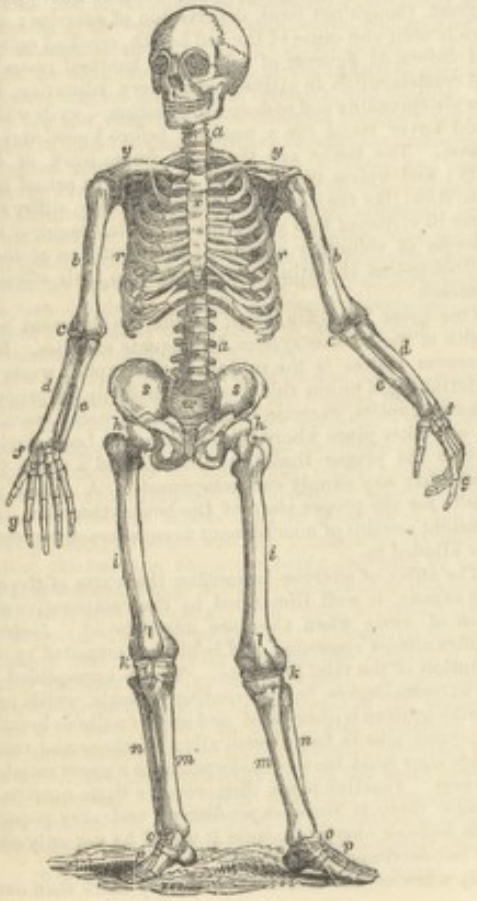
The bones essential to motion, and to the security of the vital organs.—The Skeleton.—Bones are composed of animal and of earthy matter.—The animal part the seat of their vitality.—The proportions between these vary at different periods of life.—Vessels, nerves, life, growth, and decay of bones.—Advantages of their vitality and insensibility.—Their adaptation to contained parts.—Conditions of health.—Necessity of exercise.

THE hardness, strength, and insensibility, which form the distinguishing properties of healthy bones, fit them in a remarkable degree for serving as a basis of support to the softer and more active textures of the body. By their means, the human frame is enabled to unite the most finished symmetry of form, with the most perfect freedom of motion and security to life.

Some of the bones, such as those which compose the skull and the socket for the eye, are designed exclusively for the protection of important organs contained within them. But by far the greater number are constructed with a direct reference to voluntary motion, and serve only incidentally the purposes of protection.

In proportion to the variety of movements which any piece of mechanism is required to perform, its component parts must be numerous and varied. Considered in this light, the animal frame is the most wonderful of all combinations of machinery. No production of art can be compared with it for the multiplicity and nicety of its evolutions; and yet all these are executed simply by muscular power, acting upon the bones or other parts, and changing their relative positions.

The incalculable variety of movements required from man, is the reason why the bones composing the skeleton are so numerous (as may be seen from the annexed figure), and each so admirably connected with the others by articulations, constructed so as to admit of precisely that kind of motion which the animal requires from it, and of no other. The advantages of this arrangement are not less obvious than admirable. Had the osseous frame-work consisted of one entire piece, not only would man and animals have been incapable of motion, but every external shock would have been communicated undiminished to the whole system. Whereas, by the division of its parts, and by the interposition of elastic cartilages and ligaments at the joints, free and extensive motion is secured, and the impetus of every external shock is deadened in its force and diffused over the body, in the same way as, to a person riding in a carriage, the jolt of the wheel passing over a stone is diminished by being equally diffused over the whole vehicle, in consequence of the elasticity of the springs. The safety imparted by this arrangement to the delicate and important vital organs, is apt to be lost sight of, from the very smoothness with which it enables us to move along, but it will be perceived if we reflect on the shock given to the whole system by taking a single false step in going up or down stairs. The parts have then no time to adapt themselves to the exigencies of the moment, and to put the proper springs in play for the equal distribution of the impetus. Death has been occasioned by accidents of this kind.



Bones consist of two kinds of substances, viz. those of an animal and those of an earthy nature. To the former belongs every thing connected with the life and growth of bones, and to the latter the hardness and power of resistance by which they are characterized. At birth, many of the bones are, properly speaking, of a cartilaginous nature. As ossification advances, the cartilage is removed by the absorbents, and its place supplied by a kind of cellular membrane, in the interstices of which the earthy particles are deposited, the two forming, by their union, the homogeneous whole called Bone. Although, therefore, it is to the softer material alone that vital properties essentially belong, it is usual to speak of the life, the vessels, and the nerves of bones, as if life belonged equally to the earthy and animal portions. This is correct enough in reality, because the union between the earthy and animal tissues is always the product of life; and the parts thus united are, to all intents and purposes, living parts. Insensible as they may seem, the bones thus possess all the attributes of living and organized parts. They are all provided with bloodvessels, with nerves, and with exhaling and absorbing vessels; and they are constantly undergoing the same process of decay and renovation to which all other living parts are subjected.

Bones, being in their very nature so hard and durable, may be thought not to require any such supply of nourishment or undergo any such change of parts, as we have just alluded to. But if we look for a moment to the advantages consequent upon this order of things, we shall see abundant reason for their being subjected in this respect to the general laws of animated nature.

It is only by means of the processes of growth and renewal that the bones can adapt themselves to the wants and state of the system. If the bones were not endowed with the principle of life, the stature of the infant must have been that of the future man. Or even supposing the osseous system to have grown to maturity, and then remained unchanged, the withered form of old age would necessarily have been oppressed and overcome by the large and massive bones which the vigorous muscles of manhood alone can easily put in motion. Had the bones been created unsusceptible of internal change and unendowed with life, it is obvious that, when broken by accident, they must have remained for ever disunited, and therefore an incumbrance instead of an assistance to the animal. But, from possessing bloodvessels of their own to supply them with

nourishment, and nerves to give power of action to those bloodvessels, the very irritation of the broken end is made to serve the purpose of increasing the vital powers of the injured parts, and producing that excitement which is necessary for the formation of a new bond of union, and for filling up the gap that would otherwise have remained.

In a state of health, the bones are insensible to pain; and here also the most provident benevolence appears. For, surrounded as they are by the softer and more sensitive parts, these afford them ample protection, while their insensibility enables them to act, for any length of time, without weariness or pain. But when a severe accident occurs to break them asunder, or destroy their texture, pain then becomes their kindest guardian, and the surest promoter of their recovery. In such circumstances, indeed, nothing can be more truly benevolent than pain. It accompanies that inflammation and vascular activity, without which the work of reunion of the broken part cannot be accomplished; and is the means of securing the repose and quietude which are essential to the exact adaptation of the parts to each other, and which can be effected only by causing great pain to follow even the slightest motion. Of such utility is inflammation on these occasions, that when, as sometimes happens, the requisite degree of it, from want of nervous sensibility in the part, does not take place, and the bone remains un-united for many weeks, surgeons are in the habit of using violence to produce the necessary stimulus. In this case, they either rub the broken ends rudely against each other, or introduce an instrument between them, by which pain and irritation may be excited; and then reunion is accomplished. On the other hand, if pain did not guard the limb from motion when the process of recovery is going on, the union would be incessantly disturbed by every heedless and unavoidable start altering the relative position of the parts. This, also, is occasionally exemplified in practice. Looking at these facts, it is impossible not to admire the wisdom and the benevolence manifested in the adaptation of the structure of bones in every particular to the circumstances and occurrences of life.

I have already stated, that, besides a large proportion of earthy matter, which gives to them dryness and hardness, bones contain a large quantity of animal matter, which is essential to their constitution. In early life, this cartilaginous matter preponderates, and the bones are consequently less heavy, more pliable and elastic, and possessed of greater vitality. In old age, again, the earthy parts predominate, and with them fragility, insensibility, and a lower degree of life. It is from this difference that bones broken in youth reunite in one-third of the time necessary for their reunion in advanced life.

In some unhealthy states of the system, the proportion of earthy matter is greatly diminished, and in some parts it is even altogether removed. The bones become soft, compressible, and incapable of affording protection or support to the other parts, to such a degree, that instances have occurred, in which the lower extremities could be twisted behind as if made of wire. A slighter degree of the same affection is common in weak, rickety children; and hence the deformity of limbs, so often occurring from absolute insufficiency of the bones to support the weight of the body.

The practical application to be made of our knowledge of the constitution of the bones, as parts of our animal frame, and as governed by the ordinary organic laws, will now be obvious. Their health we have seen to depend on the regular supply of nourishment by the bloodvessels, on a due supply of nervous energy by the nerves, and on a due balance between the action of the nutrient and absorbent or removing vessels. To the steady fulfilment of these conditions, therefore, we are bound to attend.

It is a common fault to consider the study of an organ or function complete, when we have viewed it on all sides as an isolated part, without regarding its external relations as constituting an essential portion of its history. Thus, in the case of the bones, we are apt to describe their hardness, their mobility, and other qualities, without sufficiently adverting to the fact, that, being organs of support and resistance, the frequent and regular performance of a full but not excessive amount of their duties, is as essential to their wellbeing as blood is to the heart, air to the lungs, or light to the eyes. And, accordingly, when that condition is not fulfilled the bones become feeble, diseased, and unfit for their functions, just as the softer parts of the body do. In practice, it is of the utmost importance to be fully aware of this fact.

It is familiar to the professional mind, that a part deprived of that exercise or action which nature destined it to fulfil, becomes weakened, diminishes in size, and at last shrivels and alters so much in appearance, as not to be recognizable. Thus, if an artery—the large artery which supplies the arm with blood, for example—be tied, and the flow of blood obstructed, a change of structure immediately begins, and goes on progressively, till, at the end of a few weeks, what was formerly a hollow elastic tube, presents the appearance of a ligamentous inelastic cord. A muscle condemned to inaction, is speedily reduced to half its original bulk; and if long unexercised, at last loses entirely its power of contraction and muscular appearance. The same rule holds with all other parts of the system, and, in an especial manner, even with the hard and apparently unalterable fabric of the bones. It is ascertained by extensive experience, that complete inaction, besides diminishing the size of the bone, injures its structure so much as to deprive it of hardness, and render it susceptible of being cut with a knife. Now, what is strongly marked in the extreme case is not less active, although it may be less palpably apparent, in cases where there is great, though not total, deprivation of exercise; and here is seen one cause of the bad health, crooked spines, and deformed figures, of which the habitual restraint and condemnation to attitude in modern education, lay so wide-spreading and so deep a foundation,—evils which could never stand for a moment before knowledge or reason. The bones are the solid frame-work of the body; and unless they be duly exercised in actual motion, they, like the muscles which move them, suffer and decay in virtue of that universal law which requires the exercise of voluntary organs as the condition of their wellbeing—as the stimulus necessary to their efficient existence.

One great requisite, then, for the development and health of the osseous system, is adequate exercise. But wherever matter is the subject, *action* implies waste of materials, and unless this waste be made up by proportionate supplies, exercise leads to speedy decay, such as we see takes place where the exertion has been carried beyond the proper limits, and occasioned a waste beyond what any supply can compensate. A second requisite for the proper state of the bones, therefore, is a sufficient amount of nourishment to counteract the waste now alluded to.

The effect of exercise in causing the waste of the active organs, is well illustrated by the comparative absence of waste when they are unemployed. *Inaction* implies almost *stagnation*, and is always attended by diminution of the vital functions. This is exemplified in the extreme degree, in hybernating animals, which pass months in sleep without food, and almost without breathing,—and also in frogs found alive in stones and trees, where they must have been dormant for a great number of years. Inactive parts, then, require little nutrition, because there is little expenditure; and they require little force or energy, because it would be not only useless but detrimental to them.

By a law of the constitution already more than once

alluded to, and manifestly arranged with relation to this principle, when any part of the system is active, it attracts to itself, by the simple stimulus of that activity, an increased supply of blood and nervous energy. The former repairs the waste of substance which action produces, and the latter gives an increased tone in harmony with the greater call made on its powers. If the exercise is momentary and is not repeated, the extraordinary flow of blood soon disappears, and the nervous power falls to the usual standard: But if it is continued for a time, and is recurred to at regular intervals, a more active nutrition is established; a permanently greater supply of blood enters the vessels, even during the intervals of inaction; and an increase of development takes place, attended with increased facility and vigour of function.

If, again, any part is not duly exercised, there is no local stimulus to attract a large supply of blood or abundant flow of the nervous fluid; there is no activity of nutrition, no perfection of development, and no vigour of function. And hence, in partial exercise, there is always predominance of some part over others; the one too strong, the other too feeble. In the muscular system, the arms of a blacksmith contrasted with those of a dancing-master, are a sufficient illustration.

This law of increased afflux of fluids and increased nutrition to exercised parts, and of diminished afflux and nutrition to inactive parts, is not only highly important in its practical consequences, but is in exact and obvious accordance with the plainest principles of reason. By this benevolent arrangement, parts acting strongly receive large supplies, and parts doing nothing are left in the state of weakness befitting the demands made upon them. To every one who sees the principle, it must appear the height of folly to expect great nutrition and great energy to follow inaction, and *vice versa*; and yet this is what is, in ignorance, daily looked for by mankind at large.

This law of exercise, as influencing nutrition and function, is universal in its application, and applies to the osseous as much as to any other system. If the bones are duly exercised, then active nutrition goes on, and they acquire dimensions, strength, and solidity. If they are not exercised, the stimulus required for the supply of blood to them becomes insufficient; imperfect nutrition takes place; and debility, softness, and unfitness for duty follow in the train. This cause of defective formation is most active and most commonly seen in the bones of the spine in growing girls, who are denied free exercise in that part; and the consequent weakness in the bones and cartilages, as well as in the muscles, is a very frequent cause of the swollen joints and curvature in the bones of the limbs in young people, which no subsequent care can ever remove.

The beneficial effects of exercise and diet in imparting solidity to the bones, have not escaped the observation of trainers and veterinary surgeons. Sir John Sinclair expressly mentions that the bones of persons trained become, in a remarkable degree, *harder* and *tougher*, and less liable to be injured by blows or accidents.* Delabere Blaine also, in speaking of the deposit of earthy matter and the consequent consolidation of the bones of the horse being hastened by anything that permanently quickens the circulation through them, adds that Nature gives to young animals a playful disposition for the purpose of "increasing the flow of blood, and occasioning a more free deposit of the earthy particles."—"The earthy deposit," he continues, "is usually proportioned to the wants of the animal; it is thus most perfect in those whose exertions are most considerable; in the full-bred horse, therefore, the bones will be found more solid than in the bulky lower-bred varieties." But from this very circumstance, when the animal is subjected to premature exertion, the consolidation of the bones becomes complete before their softer portion has increased to its full dimensions, and hence "horses early and hard worked never arrive at their full size."* Testimony of this kind ought to be of great weight, as based, not on theory, but on the broad and well-marked experience of practical men.

It must be observed, however, that defective nutrition, may arise from other causes than inadequate exercise; but even then the consequences attending it are analogous in their nature. Among the poor it often arises from deficiency of wholesome food, and from damp dark habitations; among the rich, from feeble digestive and assimilating powers, and pampering in diet; and also from errors in clothing, and neglect of sufficient ventilation, and due exposure to the open air. Rickets, softness of the bones, and white swelling, are accordingly observed to be almost confined to children belonging to one or other of these classes.

To understand more clearly the relative uses of bones and muscles, we may be allowed to use a comparison, although, like all other comparisons, it presents many points of difference. The bones are to the body what the masts and spars are to a ship; they give support and the power of resistance; and the muscles are to the bones what the ropes are to the masts and spars. It is to the muscles that the bones are indebted for the preservation or change of their relative position. If the bones or masts are too feeble in proportion to the weight which they are required to sustain, then a deviation from their shape or position takes place; and, on the other hand, if the muscles or ropes are not sufficiently strong and well braced, then insufficiency of support must necessarily result. Early infancy affords an instance of both imperfections; the bones being infirm, and the muscles small and destitute of true fleshy fibres. The diseased state, called *mollities ossium*, or softness of the bones, is an instance of what may be called a weak mast of the body, which must yield if its muscles be strongly drawn. The state of muscular debility consequent on fever and many acute diseases, or even on sudden fright, is, on the other hand, an instance of the inability of the bones alone to preserve an attitude, or execute motion when the muscular system is weakened by disease. These differences merit attention.

A knowledge of the condition of the bones at different periods of life, is not without its practical uses,—particularly in regulating our treatment of children. In my *Treatise on the Management of Infancy*, I have already shewn that many parents, disregarding the fact that the bones are comparatively soft and pliable in infancy, and in their haste to see the little objects walk without support, are continually soliciting attempts at standing or walking, long before the bones have acquired sufficient power of resistance, and the muscles sufficient power of contraction, to cope with the laws of gravitation. The natural consequence is a curvature of the bone, which yields just like an elastic stick bending under a weight. The two ends approach nearer to each other than they ought to do; and to accommodate themselves to the change, the muscles become shorter on one side, and perhaps longer on the other, each losing part of its efficiency in the unnatural change which it undergoes.

From this view, it will be seen how hurtful leading-strings must be. In the first place, by their mechanical force, they compress the chest and impede respiration; and, in the second, by preventing the body from falling to the ground, or rather by preserving an upright position, they cause more of the weight to fall on the bones of the spine and lower extremities, than these parts are fitted to carry. From this noxious practice, flatness of the chest, confined lungs, distorted spine, and deformed legs, too often originate.

The impropriety of an indiscriminate use of dumb-

* Code of Health, 5th edit. Appendix, p. 35.

* Blaine's Outlines of the Veterinary Art. Third edition. p. 93.

bells in early life, will also be easily understood. If the weight of these be disproportioned to the strength of the *bones*, it is obvious that we must produce the same kind of evil as by premature attempts to walk, viz. yielding of the bones, and stretching and relaxation of their connecting ligaments. If, again, they be disproportionate to the *muscular* power, their effect will be to exhaust instead of increasing the strength of the body.

From the exposition I have given of the laws of exercise, as affecting the muscular and osseous systems, the absurdity of expecting to *strengthen* either the one or the other by the use of stays, or by lying for hours on a horizontal or inclined plane, will be abundantly manifest. There is no royal road to health and strength, and no method by which, while exercise is dispensed with, its advantages can be obtained. *In the intervals between exercise*, reclining on a plane is very useful in delicate fast-growing girls; but it should be resorted to, only when the feeling of fatigue exists, either from previous exercise or from mere sitting up. As soon, however, as this feeling is entirely recovered from, it ought to be discontinued, and never employed for hours and days in succession, without reference to previous weariness, as it often is, on the false notion of its being conducive to strength.

In this chapter, as well as that on the muscles, I have dwelt perhaps too long on the principles by which exercise ought to be regulated; but as the subject is little understood by those who have the direction of youth, and is of paramount importance, I am inclined to hope that the tediousness of repetition may be forgiven, if clearness and conviction are obtained.

CHAPTER VIII.

ON THE BLOOD AND THE ORGANS OF CIRCULATION.

The blood the source of life and nourishment.—Its supply to all parts proportioned to their importance and activity.—Health depends on its proper quality and quantity.—The blood also the source of the secretions and excretions,—and its supply bears a direct relation to their amount.—Example in the kidneys and tears.—The arterial or red blood alone is capable of supporting life, and loses its properties in the act of doing so, and becomes dark or venous. The arteries and capillaries described.—The general or systemic circulation and its uses.—Digestion and respiration the chief sources of arterial blood.—The veins and their course described and illustrated.—The pulmonic or lesser circulation and its uses in converting the venous into arterial blood.—The blood peculiarly the vital fluid.—Causes affecting its quality and their influence on health.—exemplified in all classes of society—in scurvy, cholera, and the effects of transfusion of blood.—All the organs of the body and the mind itself affected by the quality of the blood.—Importance of respiration in its formation.

In the former editions of this work, the next subject discussed was the important function of respiration; but as the chief object of that process is to effect a change in the properties of the blood, it will be useful to give a brief account of the latter before entering upon the consideration of the changes produced in it, in its passage through the lungs.

The blood is the fluid by which the vitality of all other parts of the system is supported, and from which they all derive their nourishment. It is also the source from which all the secretions and excretions are derived, and consequently the medium through which the waste or effete materials are thrown out of the system. Before the food, which is taken into the stomach, can become a part of the living structure, the chyle, which is formed from it by the organs of digestion, must be converted into blood and distributed throughout the body. It is only when thus converted into blood that the nutriment becomes organized or endowed with living properties, and it is only then that it becomes capable of supporting the life and action of the parts to which it is sent.

Within the limits of health, organic activity and the supply of nourishing blood are always proportioned to each other. When a part is sufficiently but not too much exercised, a more vigorous circulation takes place through its vessels, and it increases in size and in power. When it is left inactive, it receives a diminished supply of blood, and becomes comparatively enfeebled. In like manner, when the natural supply of blood to an organ is cut off or diminished, as sometimes happens from tumours pressing upon the principal bloodvessels going to it, its nutrition and its functional power immediately become impaired. As might be expected, similar consequences ensue when the blood itself is imperfectly constituted and inadequate to supply the proper stimulus and the requisite nourishment. This frequently happens among the poor from deficiency of wholesome food; among the rich from an impaired state of the digestive organs; in the consumptive from defective respiration; and in many trades from the impurity of the surrounding atmosphere. An opposite condition of the blood may also exist and equally endanger health. From too full living, aided by a good deal of exercise in the open air, which gives keenness to the appetite and vigour to the digestive powers, blood may be formed in so large a quantity, and of so rich a quality, as to keep the system habitually in a state of excitement bordering on, and easily convertible into, active disease by the application of any accidental cause. Many young men, in what may be termed a florid state of health, are thus cut off after a few days' illness, by some acute disease, often to the great surprise of all around them, although obvious signs of danger may have been long present, if the sufferers had only been sufficiently instructed to be able to understand them.

From these considerations, it follows that a due supply and proper quality of blood, are indispensable to the life, nutrition, and activity, of every organ of the body; and that, for the continued preservation of health, both the supply and the quality of the blood ought to bear a constant relation to the age, constitution, and mode of life of the individual. In youth, when growth is rapid, and the mode of life characterized by activity, a full supply of well-constituted blood is much more essential than in old age when growth is at an end, and the bodily energies have become impaired. In youth, accordingly, the effects of impoverished diet are felt much sooner than in maturity; and hence, in cases of shipwreck and starvation, the young are generally the first to perish.

But the blood, as already hinted, serves other purposes besides those of supporting life and nutrition. It supplies the materials of all the various *secretions and excretions*, and consequently, every secreting and excreting organ receives a supply of blood proportioned to its own size, and to the importance and extent of its function. Thus, the urine is separated or secreted from the blood by the kidneys, and these are, in consequence, provided with arteries of a size corresponding to the average copiousness of their secretion. In like manner, the perspiration is derived from the blood, and we have already seen in what profusion its vessels are distributed to the skin. The excretion from the bowels is another example of a similar correspondence. The bland and oily fluids which lubricate the joints, the mucus which moistens the air-passages, and the tears which bedim the eye, are all instances of *secretions* derived more or less directly from the blood, and they cease to be formed if the supply of blood to their respective organs be arrested. In the case of the tears, indeed, we can often see this direct relation between the secretion and

the activity of the circulation in the vessels which furnish it. In the natural state of the eye, no bloodvessels are visible on its surface, and the tears are secreted only in sufficient quantity to moisten that organ. But when a particle of dust or lime comes into contact with, and irritates, the eyeball, an instantaneous redness is observed to ensue, and innumerable vessels appear as if just called into existence. This redness arises from the increased afflux of blood, produced by the irritation, forcing its way into vessels previously too small to admit its red particles; and the immediate consequence is, an increase of the secreting function to so great an extent that the natural channel becomes insufficient to convey the tears fast enough into the nose, and hence they overflow the cheek sometimes with considerable rapidity.

This increased activity under an additional supply of blood, is an exact type of what happens in every organ when it is stimulated to a *moderate* extent. Its vessels then enlarge and receive more blood, and its function becomes more energetic. If, however, the stimulus be carried too far, *diseased* action will follow, and the regular or physiological order of events become interrupted, so that the function may be even altogether arrested.

The greatly increased quantity of blood which is thus directed towards a secreting organ when in full activity, may be easily conceived from what happens in the case of the kidney, when its function is highly excited. It is a matter of common remark, what a copious discharge of urine often follows within a few minutes after drinking a pint or two of mineral water in a cold morning, or on going into the open air in winter after leaving a convivial party in a warm room. But as every drop of the urine thus rapidly thrown out is secreted *from the blood sent to the kidneys*, it is obvious that the whole quantity of blood circulating through them at that time, must have been very large; otherwise no such extensive secretion could have taken place.

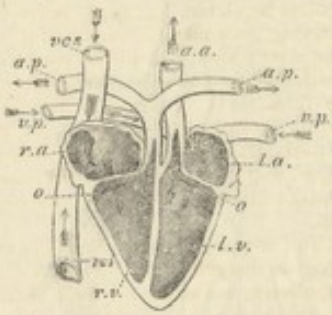
The blood which thus supports life, imparts nourishment, and furnishes the materials of the secretions and excretions, is called the *vital*, *red*, or *arterial* blood. The first name is derived from its exclusive property of *sustaining life*; the second from *its florid red colour*; and the third from the vessels or *arteries* in which it is contained. It is this blood we have now to speak.

In man and the higher classes of animals, the *arterial* or *vital* blood is of a florid red hue, but in many invertebrate animals it is entirely colourless. As already mentioned, it is the arterial blood alone which is capable of supporting life and yielding nourishment to the different parts of the organization, and from the moment that it ceases to be supplied to any part, that part begins to decay and die. By the very act, however, of thus supporting life and carrying on nutrition, the arterial blood itself undergoes a change. It loses its bright red colour, assumes a darker hue, and is found to be no longer available for its former purposes. These changes do not take place to any visible extent in the larger arteries, which may therefore be regarded, in a general sense, as serving only for the *conveyance* of the blood. It is in the very minute subdivisions or branches by which the nutrient particles are deposited in the tissue of all living parts, that the change from the arterial to the venous character is first observed.

From the arterial blood being indispensable to the continuance of life and nutrition, it follows that it must, by some means or other, be distributed in due quantity *to every part* of the living body. The solid parts being fixed and immoveable in their respective places, they cannot go in quest of blood, and thus the only alternative is that the blood be brought to them. But it is not sufficient that arterial blood be sent *once* to every organ of the body. By the very act of supporting life and imparting nourishment, the arterial blood itself undergoes a change, and loses its characteristic properties. Hence the supply must be *continuous* and proportioned to the nature and activity of the part. Such accordingly is the fact. The current of vital blood *is* continuous, and ceases only with the extinction of life; and our next step is to investigate the means by which that supply is effected with the required regularity and constancy.

Putting all other questions out of sight for the present, I may mention that the arterial blood is sent as fast as it is prepared to the *left side of the heart*, as the fountainhead from which it is distributed throughout the body. At this point, therefore, we shall take it up.

In the annexed woodcut representing a section of the heart, the two sides are seen separated by a white perpendicular line. The letters *v c s*, and *v c i*, indicate the two *venæ cavæ* by which the venous blood is returned from the rest of the body to the *right auricle r.a.* From the right auricle it passes by the hole *o*, into the *right ventricle r.v.* The venous blood next enters the *pulmonary arteries a.p.*, *a.p.*, to go to the lungs, whence it returns *arterialized* by the *pulmonary* veins *v.p.*, *v.p.*, to the *left auricle l.a.* The arterial blood next passes through the orifice *o*, into the *left ventricle l.v.*, to be distributed through the body by the *aorta a.a.* The right auricle and ventricle constitute the *right side* of the heart, and contain *venous* blood. The left auricle and ventricle constitute the *left side*, and contain *arterial* blood. For the sake of simplicity we shall, at present, confine ourselves to the distribution of the arterial blood.

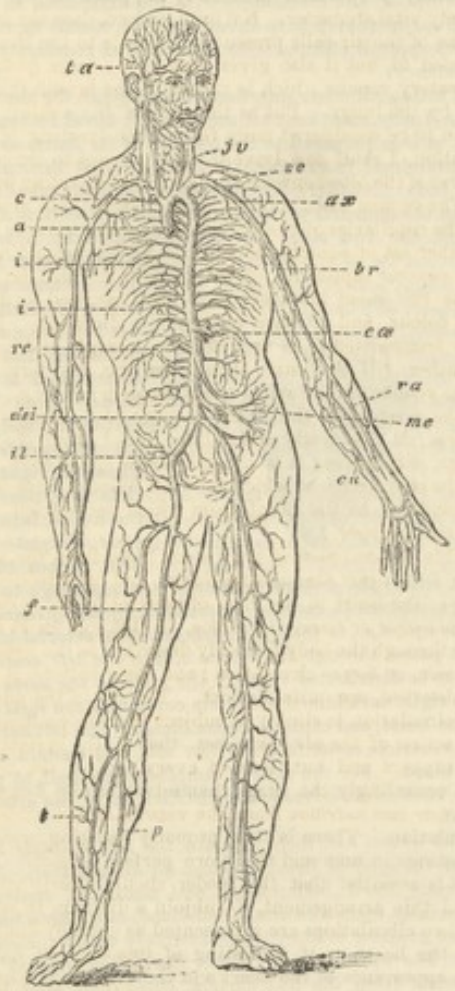


The letters *l.v.*, then, indicate the *left ventricle* into which the arterial blood is poured for distribution. The ventricle itself being thick and muscular, contracts powerfully upon the contained blood, and like a force-pump, projects it into the great artery called the *aorta*, *a.a.* The opening *o*, by which the blood entered the ventricle from the left auricle, being now shut by a valve which admits of the current flowing only in one direction, the blood cannot retrograde in its course; and as another valve at the beginning of the aorta prevents its return into the ventricle from which it has been expelled, the only channel left open to it is that which it actually follows along the aorta.

By every successive contraction of the ventricle, a fresh quantity of blood is projected into the aorta, and it in its turn impels that which preceded it; just as happens with the successive quantities of water raised or propelled by a pump. It is chiefly by this contraction of the left ventricle that the blood is circulated in the arteries, and what is called *the pulse* is merely the successive dilatation and contraction of the arteries as they receive and contract upon every successive quantity discharged by the heart. Hence, in the healthy state, the pulse and the beating of the heart always correspond and preserve the same relation to each other.

The course of the arterial blood after it has entered the *aorta*, and its gradual distribution through its smaller and smaller branches, will be easily understood from the figure on the next page, representing the aorta *a*, just where it leaves the heart, and its various subdivisions as they spread over the whole body. At *a*, just after leaving the heart, the aorta forms a kind of semicircle, which is thence called the *arch of the aorta*. From the upper part of this arch, the arteries supplying the head, shoulders, and arms, are seen to arise and branch into *c* the *carotid*, *s c* the *subclavian*, *a x* the

axillary, *t a* the *temporal* arteries. At the termination of the arch, the aorta passes downwards along the spine, and gives off branches to the parts lying on each side and to the organs contained in the chest and abdomen,



such as *i i* the intercostals running between the ribs, *cæ* the *cœliac* going to the digestive organs, *re* the *renal* going to the kidneys. At the lower part of the spine it divides in two great branches called the *iliac* arteries, *il*, which pass down and subdivide to supply the lower extremities and lower parts of the trunk. The other letters refer to the names of arteries which need not now be particularized.

As the arteries continue, in the manner above represented, to divide and subdivide into smaller and smaller branches, like the branches of a tree from the parent stem, they ultimately reach a size in the intimate tissues of the organization which renders them almost invisible, and they become proportionally numerous. To appearance they are even smaller than hairs, and hence they are often called *capillary (hair-like) vessels*, or branches of the arteries. So minute are they in size and innumerable in quantity, that the point of the finest needle cannot penetrate the skin without piercing them and drawing blood. When, therefore, the expression *capillary vessels* or *branches*, or simply the *capillaries*, occurs, the reader ought to keep in mind that all of these are merely different names for the continuous and minute subdivisions of the larger bloodvessels; and when the *capillary circulation* is spoken of, it is not a distinct entity which is meant, but merely that part of the general circulation which is carried on by the minute branches of the larger bloodvessels. Strictly speaking, the capillaries form a kind of network of almost microscopic vessels between what are considered the terminations of the arteries and the commencement of the veins, and are consequently common to both. But in a general sense, the capillary vessels and circulation bear much the same relation to the larger bloodvessels and circulation, which the small gas or water pipes distributed through a private house do to the main pipes and larger subdivisions extending along the streets and alleys. They are all parts of the same great whole, and the venous capillaries are merely those branches by which the now venous blood is transmitted from the arterial capillaries to the extremities of the veins.

As it is in the capillaries that the changes incident to nutrition and the support of life take place, and that the arterial blood loses its florid colour and characteristic properties, it follows that if the now exhausted blood were not sent away, and its place supplied by fresh arterial blood, the part would speedily die. We have, therefore, next to shew what becomes of the blood after it has given out the nutrient particles and the various secretions and excretions already referred to, and thereby lost its vital power.

The principal means which the Creator has appointed for renewing and restoring the lost properties of the arterial blood, are the digestion of food and the process of respiration. By the former, fresh materials of nutrition are supplied in the form of chyle, as fully explained in my work on Digestion and Diet; and by the latter, the now dark blood absorbs a portion of oxygen, and gives out the excess of carbon, the presence of which is the chief cause of its being no longer capable of supporting life. But before the chyle can be converted into vital blood, it also must be subjected to the process of respiration: and hence in man and the more perfect animals, the dark blood and the chyle must be made to pass together through the lungs or organs of respiration before arterial blood can be formed from them. The next step in the circulation, therefore, is, *to trace the blood from the remote capillary branches of the arteries where we left it to the lungs or organs of respiration.*

On carefully observing with a microscope the circulation in the thin membranous web of the foot of a frog, the red blood is seen to pass from the minute arterial capillaries into other vessels equally minute and numerous which gradually coalesce into larger and larger branches, and these again into others still larger, just as the fine roots of a tree gradually unite and at last terminate in one common stem. These minute vessels are also termed capillaries, but, from their containing dark blood, they are named *venous*, to distinguish them from the others as *arterial* capillaries. In point of fact, however, the two are continuous, and analogous in structure and appearance. The only differences are, that the blood which they contain is *dark* or *venous*, and that the course which it follows is exactly *the opposite* of that in the arteries. Thus the venous blood proceeds from all parts of the body *towards the heart*; while the arterial, as we have seen, proceeds *from the heart* towards all other parts. The two thus form a current and counter-current, and these two currents constitute what is called the *general*, *systemic*, or *larger* circulation, the capillaries being merely the small vessels intermediate between the larger branches of the arteries and veins.

Of the course of the veins no particular description need be given, as it is nearly the same as that of the arteries. In most instances, indeed, the deeper seated veins and arteries lie side by side; but frequently there are two veins where there is only one artery. The more superficial veins, such as those seen on the back of the hand, on the arm, and legs, do not accompany arteries. The branches of the veins, in common with those of the arteries, every where communicate freely with each other by what are called *anastomosing* or cross branches;

and by this arrangement, when the current is for a time accidentally stopped in one vessel, the blood can always find a passage by another.

From the blood running in opposite directions in the arteries and veins, it follows that when a wound is inflicted, a different method must be employed to arrest the loss of blood according as it proceeds from an artery or a vein. If an artery is laid open and red blood is flowing, the pressure or ligature ought to be applied on the side *nearest the heart*; whereas if a vein is wounded and dark blood escapes, the pressure should be applied on the side *farthest from the heart* or beyond the wound. We see this principle exemplified in common bloodletting. The object being then *to cause the blood to flow*, the ligature is always placed nearer the heart than the intended puncture, so as to intercept the current upwards from the hand and fore-arm. When it is wished to stop the flow of blood, the ligature is removed. To those unacquainted with anatomy, the florid or dark colour of the blood which escapes from a wounded vessel will indicate whether it proceeds from an artery or a vein, and whether the chief pressure should be applied above or below the wound.

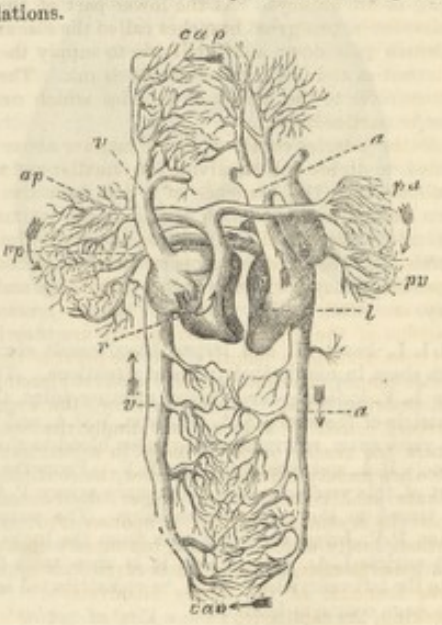
The object of the dark blood being thus returned to the heart by the veins is, that, after receiving the nutriment prepared from the food in the form of chyle, it may then be *transmitted through the lungs, there to undergo the changes required for imparting vital properties to the chyle, and re-converting the venous into vital blood*. This transmission is effected in the following manner.

We have already stated that the vital blood is transmitted by the *left* side of the heart into the aorta *a* for general distribution. By the veins, however, it is returned to the *right side of the heart*. From the head, arms, and upper part of the body, the dark blood returns by a variety of veins, which ultimately terminate in one large trunk called the *vena cava superior*, or *descendens* (the superior or *descending* hollow vein), *v c s*, in the figure of the heart on p. 51. From the inferior extremities and lower part of the body, the venous blood is returned by a great number of veins which, in like manner, ultimately coalesce into one trunk, called the *vena cava inferior*, or *ascendens* (the inferior or *ascending* hollow vein), *v c i*, in the figure. These two great veins are seen to terminate at one common point, where their two currents accordingly meet, as indicated by the arrows, in the cavity termed the *right auricle of the heart*, *r.a.* The venous blood being the proper stimulus of the auricle, causes it immediately to contract, and the necessary result is to propel its contained blood, in the direction of the arrow, through the opening *o*, into the triangular-looking cavity called the *right ventricle* *r.v.* The right ventricle is now in its turn stimulated to powerful contraction, and, as a valve at *o* prevents the return of the blood into the auricle, the current must once more flow, in the direction of the arrow, into the large vessel seen at its upper corner, and called the *pulmonary* or *lung artery*. This artery divides into two branches, *a.p.*, *a.p.*, one going to each of the two lungs, and spreads through their substance in endless ramifications, of infinite minuteness, resembling the capillary vessels already described. These minute capillaries are ramified extensively upon the delicate lining membrane of the innumerable air-cells of the lungs; and it is while circulating through them that the dark blood, by absorbing oxygen from the inhaled air and giving out its carbon in the form of carbonic acid, becomes converted into arterial blood.

To an uninformed person, it may seem impossible that any chemical action should take place between the blood and the external air when the membranous structure of the air-cells is interposed between them. This, however, forms no obstacle to the requisite changes taking place, for it is found by experiment that venous blood is acted upon by the air even through the thick and firm texture of bladder. Of late years, too, it has been discovered, that both living and dead tissues give passage to gases and fluids by a peculiar interchange of particles, termed *endosmosis* and *exosmosis*, processes which I cannot stop to explain, but which play a part in many phenomena previously supposed to be of a purely vital character. Not only, indeed, does the membrane of the air-cells present no obstacle to the changes alluded to, but it also gives passage to a large quantity of watery vapour which is visible in the breath thrown out by the lungs. But as this part of the subject will come to be considered more fully when treating of respiration, I shall now leave it, and proceed to trace the course of the blood onwards to our original starting point.

The venous blood being thus reconverted into arterial in the capillaries of the air-cells, proceeds onwards into another set of equally minute vessels, corresponding to the venous capillaries of the general circulation. In these the blood is observed to have resumed its florid red colour, and to have changed its direction. It is now transmitted from very minute to larger and larger branches, till the latter at last coalesce, and form the large venous trunks called the *pulmonary veins* *v.p.*, *v.p.*, in the woodcut of the heart on page 51. These veins collect all the newly arterialized blood from the two lungs, and convey it to the *left auricle of the heart*, *l.a.*, by the contraction of which the vital blood is once more transmitted to the point from which we started, viz. the *left ventricle*, *l.v.*

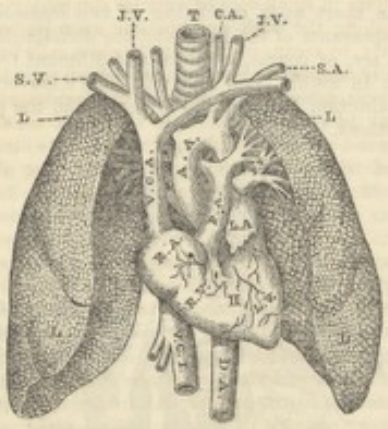
This transmission of the venous blood from the right side of the heart through the lungs, and back to the left side of the heart in the form of arterial blood, is called *the pulmonic* or *lesser circulation*, to distinguish it from that through the body formerly described as the general, *systemic*, or *larger* circulation; and their objects, it will be observed, are quite distinct. The use of the pulmonic circulation is simply to subject the venous blood to the action of the air; whereas, that of the systemic is the support and nutrition of every part of the body; and accordingly the lungs themselves receive branches *for their own nutrition* from the vessels of the systemic circulation. There is thus, properly speaking, *a double circulation* in man and the more perfect animals. But as it is essential that the reader should clearly understand this arrangement, I subjoin a diagram in which the two circulations are represented as entirely distinct, and the heart as if consisting of two *separate* halves. The appearance of the heart and the distribution of the vessels are, of course, artificial and different from what is seen in nature, but they will give a correct idea of the distinction between the systemic and the pulmonic circulations.



Starting as before from the *left ventricle*, *l*, the vital blood passes into the aorta at *a*, and is thence distributed by the arteries, *a, a*, which branch out as already described till they terminate in the very minute capillary ramifications, *c a p*. These arterial capillaries are seen to join with the equally minute venous capillaries, which coalesce into larger and larger branches of veins, till at length they form the two ascending and descending *venæ cavæ*, *v v*, which terminate at the *right auricle* of the heart. This includes the whole of the systemic circulation. In the diagram, it is represented by the *upward* and *downward* vessels, and the course of the blood is indicated by the direction of the arrows.

Arrived at the *right auricle*, the venous blood passes into the *right ventricle*, *v*, from which, as indicated by the bent arrow, it is propelled into the *pulmonary artery*, *a p* and *p a*, to be distributed to the two lungs. In one sense it is a misnomer to call it an *artery*, as it contains venous blood; but it has received that name partly from its structure, and partly from its bearing the same relation to the right ventricle which the aorta does to the left, and from its branching out into smaller and smaller ramifications just as an artery does. On arriving at the *pulmonary capillaries*, the venous blood regains its florid colour and life-supporting properties, and is thence collected by the venous capillaries which coalesce into larger and larger branches, and ultimately unite to form the pulmonary veins, *v p* and *p v*, which, as formerly mentioned, return the now arterial blood into the left auricle of the heart, and thence into the left ventricle, *l*, from which we started. This shorter course is called the *pulmonic* or *lesser* circulation, and in the diagram it is represented by the vessels branching out *horizontally* to the right and left where the lungs are supposed to be. The sole object of this circulation is the aëration of the venous blood, and consequently it varies in the different classes of animals, according to the mode in which the aëration is effected. Here also it is, however, necessary to explain, that the pulmonary veins, although containing *arterial* blood, take the name of veins from their structure and mode of distribution.

Having now explained the course of the blood throughout both circulations, the reader will be able easily to understand the subjoined figure representing the lungs



L L L L, heart H, and larger bloodvessels connected with them in nearly their natural situations. The letters L. V. indicate our original starting-point, the left ventricle of the heart, A.A. the aorta, V.C.A. and V.C.I. the venæ cavæ returning the venous blood to the right auricle R.A. and right ventricle R.V. From the upper part of this ventricle, the pulmonary artery P.A. may be traced to the root of each lung. The pulmonary veins P.V. bring the blood back from the lungs to the left auricle L.A., from which it is once more thrown into the left ventricle, L.V., to be redistributed and run the same course as before.

On the present occasion, it would be entirely foreign to my purpose to enter upon a detailed or scientific investigation of the properties, sources, and uses of the blood. My principal object is to consider it only as connected with the subject of respiration treated of in the following chapter; and the few remarks which I shall now make will therefore be of a very general nature.

If the term vital can be justly applied to one part of the animal economy more than another, the blood may be said to be peculiarly the *vital fluid* of the body. It is not only the direct support of life in all other organized parts, but it is the medium by which the external and inanimate matter contained in the food becomes organized and endowed with life. On the proper qualities and due renewal of the blood, therefore, the health and welfare of every living part, and of the system at large, must essentially depend. If, from defective food or bad digestion, the blood be insufficiently supplied with nourishing chyle to replace its waste, the general health must necessarily suffer, because every organ will then be partially deprived of its healthy support and stimulus. If, from excessive labour, the waste from the system be also rendered excessive, and the food be of merely the usual quantity and quality, a gradual deterioration of health will again ensue, because the proper constitution of the blood will be altered. In like manner, if the food be innutritious or unwholesome in quality, the formation of well-constituted blood will cease, and that which is supplied will prove insufficient for the continued preservation of health and life. And, again, if the air which we breathe be impure or of an unusual temperature, the proper aëration of the blood in the lungs will be prevented, and the blood, consequently, be rendered partially unfit for its destined purposes in the animal economy, and the health become impaired.

In society, examples of all these departures from the physiological or healthy standard unfortunately abound. Among the poor, how many thousands constantly suffer from their blood being impoverished by insufficient food, joined to excess of labour and impurity of air! How many also, even among the rich, have ill-constituted blood flowing in their veins owing to impaired digestion or excess in regimen! Of the influence of innutritious food on the qualities of the blood, we have familiar examples in the effects of salt provisions in producing scurvy and altering the state of all the circulating fluids. The influence of a scanty diet also is visible in the unhealthy condition of the inmates of some of our workhouses. Not to speak vaguely, I may refer to the condition of the children in the West Church Charity-Workhouse at Edinburgh in 1838. Fifty of them, being one-fourth of the whole number, were then afflicted with scrofulous ophthalmia; seventeen died consumptive within seven months, and there were thirty-six cases of fever. An inquiry into the causes of this unusual sickness and mortality took place, and proved them to proceed from inadequate diet and clothing, and an immediate improvement followed a more liberal allowance of food.* A similar instance is mentioned by Mr Combe in his "Notes on the United States of America" (vol. ii. p. 253), when describing the asylum for coloured orphans at New York. Out of between 50 and 60 inmates, no fewer than fifteen died within eighteen months, while many more suffered from disease. On examination, these results were found to be chiefly owing to a defective diet, and on this cause being removed, a year passed without the occurrence of a single death! But for the farther elucidation of this subject, I must refer the reader to my work on "Digestion and Diet" already alluded to.

Of the deteriorating influence of impure air upon the healthy constitution of the blood, proofs everywhere

* Chambers's Edinburgh Journal, 2d and 19th February 1839.

abound, but as these will be fully considered in the next chapter, when treating of the function of respiration, it will be needless to enumerate them here.

Aided by these remarks, the reflecting reader will be able to appreciate the powerful and direct influence which the good or bad condition of the blood exercises upon the general health and vigour. Where, from neglect of the organic laws, the constitution of the blood has become impaired, bad health will never be far distant; and, on the contrary, where all the conditions for the formation of good blood are fulfilled, the greatest facilities which the system can still afford for the recovery of health will undoubtedly be enjoyed. Let those who are not aware of the extent of this influence, consider what occasionally occurs in disease, and they will obtain a more correct idea of the fact. Cases are not wanting, for example, in which women in childbed, apparently at the gates of death from loss of blood, have been resuscitated, and ultimately restored to health by having blood from a healthy person transfused into their veins. In cholera also, in which the blood almost ceases to circulate and undergoes a greater change than in perhaps any other disease, being dark and thick even in the arteries, an extraordinary and instantaneous resuscitation has been observed to follow the injection of a largely diluted solution of soda into the veins. In many cases in which this remedy was tried by the late Dr Mackintosh, the patients lay without perceptible sense or motion, almost as if already dead; and yet before the whole of the fluid was injected, they were sitting up in bed talking and apparently well. The effect, unfortunately, was not permanent, for in most of them the fluid was drained off by the bowels in a short time, and collapse again ensued. But it was nevertheless sufficient to shew, in a striking manner, how much the whole animal machine is under the influence of the blood, and how directly it is affected by any change in its qualities.

The original formation of well-constituted nourishing blood, and the proper reconversion of venous into life-sustaining blood, thus become most important processes, not only in the preservation and restoration of health, but in enabling all the organs of the body to work with efficiency and vigour. Even the mind, the affections, and the dispositions are directly influenced by the good or bad quality of the blood, because the co-operation of the nervous system is indispensable to the action of the mental faculties, and consequently, when the brain is imperfectly sustained by the blood, their tone and activity also become reduced. We have, therefore, the greatest interest in making ourselves acquainted with, and fulfilling all the conditions required for the restoration of the lost properties of the venous blood; and having already in my other work fully discussed all of those connected with the reception and digestion of the food, it now only remains for me to explain the conditions connected with the important function of respiration. This I shall attempt to do in the following chapter.

CHAPTER IX.

THE LUNGS, THEIR STRUCTURE AND FUNCTIONS.—RESPIRATION AND ITS USES.

Respiration defined—nearly analogous with sanguification and aëration of the blood.—The lungs the organs of respiration in man—the gills in fishes—and air-holes in insects.—The structure of the lungs—the air-cells—the vessels and tissue of the lungs.—The changes in the air and blood during respiration.—Quantity of air inhaled—constitution of air required for breathing.—Air as indispensable to fishes, insects, and plants, as to man.—Quantity of blood subjected to the action of the air in the lungs—changes produced in it.—Pure atmospheric air alone adapted for respiration.—The production of animal heat depends on respiration.—Analogy between combustion and respiration.—Important practical results.

The word *respiration*, as employed in ordinary conversation, signifies the mere act of breathing or of inhaling and expelling air from the lungs. But, as often used physiologically, it designates not only the act of breathing, but the whole series of phenomena connected with the conversion of venous into arterial blood. In this latter sense, however, the terms *sanguification* and *aëration of the blood*, also in general use, are more appropriate in themselves; because, while they apply with equal accuracy to all classes of animals, the term respiration is almost irrevocably associated in the public mind *with the existence of lungs*—a condition which is so far from being indispensable to the process, that in fishes and many of the less perfect animals, which have no lungs, the aëration of the blood, nevertheless, goes on with the same regularity as in man.

When we consider the variety of circumstances under which the different classes of animals exist, it becomes obvious that the same kind of apparatus could not possibly serve for the aëration of the blood in them all. Lungs, for example, are admirably suited for man, quadrupeds, and birds, which live and breathe in the atmospheric air, and die when immersed in water; but they would be very ill adapted for fishes which live in water and perish in the open air. Fishes, therefore, have no lungs; but what is a great deal better for them, they are supplied with *gills*, so constructed as to present a prodigious extent of surface for the necessary ramification of the bloodvessels and capillaries, and for the exposure of the blood contained in them to the contact of the air which is intimately mixed in greater or less quantity with the water in which they live. By this arrangement, the same changes are effected in the venous blood passing through the gills of fishes, as in the venous blood circulating through the lungs in the higher classes of animals.

In worms, again, and other animals of a similar structure, no single organ is set apart for the conversion of venous into arterial blood. The requisite changes take place in small sacs or vesicles commonly placed in pairs along the back and opening upon the surface of the body, by means of pores in the skin, called *spiracula*, specially adapted to this end, and which cannot be shut up or obstructed any more than the real lungs or gills, without inducing death. "In the common earthworm there are no less than 120 of these minute air-vesicles, each of which is provided with an opening placed between the segments of the body. In the leech, the number is reduced to sixteen on each side, which open externally by the same number of minute orifices."* So necessary, indeed, is atmospheric air to the vitality of the blood, in all classes of animals, and even to plants, that its abstraction inevitably induces death: and a fish can no more live in water deprived of air, than a man can do in an atmosphere devoid of oxygen. And thus the fish requires a renewal of air, and perishes when it is denied, or when the air is expelled from the water by boiling, exactly as man would do under a similar deprivation.

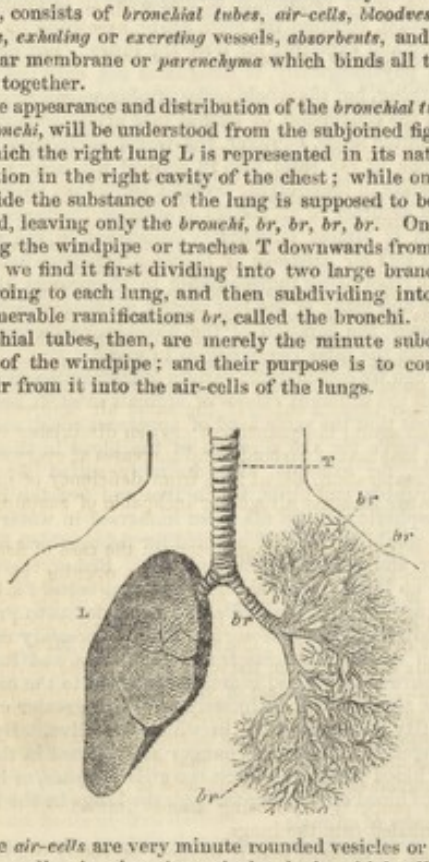
In man, *the lungs* are those large, light, elastic, and spongy bodies, which, along with the heart, completely fill the two lateral cavities of the chest. They vary much in size in different persons, and, as the chest is framed for their protection, and moulded on their form, we find it either large and capacious, or the reverse, according to the size which the lungs have attained. In women and in youth, the lungs are less developed than in men and in mature age, and hence the smaller

* Smith's Philosophy of Health, vol. ii. p. 29.

breadth of shoulder and greater narrowness of chest by which the former are characterized.

In the figure on page 54 we have already seen the external appearance of both lungs, and the position which they occupy relatively to the heart and large bloodvessels. The substance of which they are composed, consists of *bronchial tubes, air-cells, bloodvessels, nerves, exhaling* or *excreting* vessels, *absorbents*, and the cellular membrane or *parenchyma* which binds all these parts together.

The appearance and distribution of the *bronchial tubes*, or *bronchi*, will be understood from the subjoined figure, in which the right lung L is represented in its natural situation in the right cavity of the chest; while on the left side the substance of the lung is supposed to be removed, leaving only the *bronchi*, *br*, *br*, *br*, *br*. On following the windpipe or trachea T downwards from the neck, we find it first dividing into two large branches, one going to each lung, and then subdividing into the innumerable ramifications *br*, called the bronchi. The bronchial tubes, then, are merely the minute subdivisions of the windpipe; and their purpose is to convey the air from it into the air-cells of the lungs.



The *air-cells* are very minute rounded vesicles or shut bags, smaller in size than pin-heads, in which all the minute ramifications of the bronchial tubes terminate. They are so very numerous, that, when fully distended by air, they seem to constitute the chief part of the pulmonary tissue. Keil estimates their entire number at 174,000,000, and calculates the surface they present to the air as equal to 21,900 square inches. Lieberkuhn rates the latter at 150 cubic feet; and Monro, again, at thirty times the surface of the human body.* The diameter of each air-cell is stated by Hales and other physiologists at the 100th part of an inch. It is very probable that these estimates are not entirely correct; but the very magnitude of even the lowest of them will give the reader an idea how great the number, and how vast the extent of surface, of the air-cells must really be to warrant such calculations being seriously founded upon them.

Numerous, however, and closely compacted as the air-cells are, they have no direct communication with each other; but, according to Reissessen, a small artery, with its accompanying vein, goes to each of them, and, by its ramifications upon the fine, thin, and continuous membrane with which they are lined, forms upon it a kind of network of capillary vessels; and it is while circulating through these capillaries, and exposed in them to direct contact with the air in the air-cells, that the blood undergoes the change from the venous to the arterial state.

Bloodvessels necessarily form a large constituent portion of the substance of the lungs. Besides the arteries and veins which the lungs possess in common with other parts for the purposes of nutrition, they have, as we have seen, the large pulmonary arteries and veins, dividing everywhere through their substance into innumerable branches, conveying *the whole blood of the body* to and from the capillaries of the air-cells. Indeed, from the rapidity with which the blood performs its circuit through the body, in rather less than 2½ minutes, and the quantity which consequently passes through the lungs in a given time (being, according to Müller, not less than *ten pounds in a minute*), it is clear that the vessels of these organs *must* be so large as to constitute no small portion of their tissue; otherwise such a mass of blood could not flow through them so quickly.

The lungs, it need hardly be said, are provided with *nerves*. The sobbing attendant on grief and the hurried breathing which accompanies excitement, are clear proofs of the powerful and direct action of the nervous system in respiration; and it is certain that, without the constant influence of the nervous stimulus, both their life and special function would speedily cease.

When treating of the skin as the seat of a copious exhalation of waste matter from the system, I mentioned that in this respect the lungs were somewhat analogous to it, as they also are the seat of an abundant exhalation, and consequently are provided with *exhaling* or *excreting vessels*. Every one who has observed the clouds of vapour issuing from a horse's nostrils in a cold day, must be aware of the existence of this exhalation. Even when invisible it still goes on, the proof of which is the familiar test of holding a cool mirror near the mouth of a person apparently dead, to ascertain whether breathing has entirely ceased. The quantity of watery vapour thus exhaled by an adult in 24 hours, has been estimated by Müller, from the average of many experiments, at 7963 grains, or *nearly seventeen ounces*. The pulmonary exhalation is in fact one of the outlets of waste matter from the system; and the air, which we expel from the lungs in breathing, is thus vitiated, not only by the subtraction of its oxygen and the addition of carbonic acid, but also by watery vapour and animal effluvia derived from the exhalants. In some individuals whose bowels are habitually disordered, this last source of impurity is so powerful as to render their breath offensive, and even insupportable to the bystanders. The presence of this effluvia in a concentrated form, is, in common with perspiration, one of the chief sources of the disagreeable sickening smell which prevails in crowded rooms.

That the lungs are also provided with *absorbents*, is proved by the fact that absorption takes place from the lining membrane of the air-cells more easily and rapidly than it does by the skin. When a person breathes an atmosphere loaded with fumes of spirits, of tobacco, of turpentine, or of any other volatile substance, a portion of the fumes is taken up by the absorbing vessels of the lungs and carried into the system, and there produces precisely the same effects as if introduced into the stomach: dogs, for example, have been killed by being made to inhale the fumes of prussic acid for a few minutes. The lungs thus become a ready inlet to contagion, miasmata, and other poisonous influences diffused through the air which we breathe. Hence typhus fever is much more easily communicated by breathing the confined and loaded air near the body of the patient, than even by touch. Hence, also, the general safety of the attendants where ventilation is sufficiently observed. The frequent renewal of the air dilutes and carries off the poison.

The *parenchyma* of the lungs is merely the substance which connects all their other tissues and vessels together. It may thus be more intelligibly described negatively than positively. That part of the pulmonary structure which does not belong to the bronchial tubes, air-cells, bloodvessels, nerves, glands, exhalants, or absorbents, is *parenchyma*. Hence we have parenchyma in the liver, in the kidneys, and in other organs where it designates a similar connecting substance.

* Smith's Philosophy of Health, vol. ii. p. 48.

Having now given a general idea of the structure of the lungs, let us next examine the changes which occur in the constitution of the air and of the blood during the process of respiration, and the conditions upon which these changes depend.

Atmospheric air consists of 79 parts of nitrogen gas, 21 parts of oxygen, and a very small quantity of carbonic acid, not amounting, according to Saussure, to more than 4.15 in 10,000 parts. The proportion of carbonic acid varies, however, in different situations, and is larger in towns than in the open country, but nowhere is it found to exceed perhaps one-fifth, or at most one-half per cent.

The *quantity* of air taken into the lungs at each inspiration varies according to the age, constitution, and circumstances at the time. It has been variously estimated at from 15 to 40 cubic inches. Sir Humphrey Davy valued it so low as from 13 to 17 cubic inches. Herbst again states, that adults of large stature breathing tranquilly, inspire from 20 to 25 cubic inches; and persons of smaller stature from 16 to 18.* Menzies, on the other hand, who also experimented with great care, estimates the amount at 40 cubic inches. Southwood Smith states, that the largest quantity ever inhaled at one inspiration is nine pints and a quarter. He adds, that the quantity received at an ordinary inspiration without any effort at all, is about one pint Winchester measure; while at an easy inspiration, *free from any great effort*, it amounts to 2½ pints (vol. ii. p. 8). Females take in a smaller quantity than males.

The popular notion that the whole of the air is expelled from the lungs at each expiration, is entirely erroneous. Even after forcing out as much as we can, it is calculated that at least 40 cubic inches remain in the air-cells; while, after an ordinary expiration, about 120 inches remain behind. According to Sir H. Davy, the whole quantity of air in the lungs after a natural inspiration, amounts to 135 cubic inches; so that, taking an ordinary inspiration and expiration at 20 inches, the quantity of air remaining in the chest is at least *five times greater* than that expired. Dr Smith estimates the quantity of air remaining at eleven pints. It is by this continuance of the air in the lungs that its requisite action on the blood is rendered continuous, and has time to take place, and also that we are enabled for a time to "hold the breath," as it is called, when under water, as in diving. Without this stock to continue the oxygenation of the blood, diving would be immediately fatal. The average number of respirations varies in health from fourteen to twenty in a minute. In disease, it is often much greater, and sometimes also considerably less.

With these data to guide us, we can now form a correct conception of the extent to which a constant renewal of the air we breathe is required for the support of human and animal life. Taking the consumpt of air at each inspiration at even the moderate rate of 20 cubic inches, and rating the number of respirations at only 15 per minute, it appears that, in that short space of time, no less than 300 cubic inches of air are required for the respiration of a single person. But to place this in a still more striking light to the general reader, I shall extract from the excellent work of Dr Southwood Smith (vol. ii. p. 84), the results of some very careful and elaborate calculations made for him by Mr Finlaison, the celebrated actuary, from data communicated to him for the purpose.

Mr Finlaison estimates the fresh air inspired in one minute of time at 616 cubic inches, or, "as nearly as may be, eighteen pints." In one hour, it amounts "to 1066⅔ pints, or 2 hogsheads, 20 gallons, and 10⅔ pints!" In one day, it amounts "*to 57 hogsheads, 1 gallon, and 7⅓ pints!*"

To this quantity of air are presented for aëration in one minute of time 144 ounces of blood, being 259½ cubic inches, or nearly an imperial gallon. In one hour, 540 pounds avoirdupois, or 1 hogshead, and 1¼ pints; and in twenty-four hours, 12,960 pounds, or 10,782½ pints, or 24 hogsheads and 4 gallons. Or, in other words, "there flow to the human lungs every minute nearly 18 pints of air, and nearly 8 pints of blood;" and "*in twenty-four hours, upwards of 57 hogsheads of air*" *are inhaled to oxygenate* "*24 hogsheads of blood!*"

Before entering the lungs, the atmospheric air consists, as we have seen, of twenty-one parts of oxygen and seventy-nine of nitrogen, with a very small trace of carbonic acid. When it is expelled, however, it is found to be greatly altered. The bulk of the air expired continues to be nearly equal to that inspired, but, on analyzing its composition, we now find that rather more than eight out of the twenty-one parts, or nearly two-fifths of the oxygen, have disappeared; that their place has been supplied by an equal volume of carbonic acid. The nitrogen is the only constituent which remains almost unaltered. Along with this expired air, a large quantity of watery vapour and some animal matter are also thrown out. If the same air is breathed again and again, the quantity of oxygen diminishes still further, and that of carbonic acid increases at every successive respiration, till at last, from deficiency of oxygen, the air becomes altogether incapable of sustaining life.

Precisely the same changes occur in the case of fishes, and of animals breathing by spiracula opening on the surface of the body. The air contained in the water passing through the gills of fishes, loses its oxygen and acquires carbonic acid. The same alteration takes place in the air expelled from the air vesicles of the worm or the leech. In every class of animals, from the highest to the lowest, the presence of oxygen in the fluid which they breathe is thus essential to the continuance of life. Hence is derived the name of *vital air*, by which oxygen is distinguished from carbonic acid or *fixed air*, which has the property of causing almost immediate death when inhaled into the lungs.

It may be thought that if oxygen be really the life-sustaining part of the atmospheric air, life should go on better by increasing the proportion of it in the air we breathe, and that invalids might therefore be restored to health by causing them to inhale a highly oxygenated air. To a certain extent the inference is just: and accordingly we find that an animal placed in a vessel full of pure oxygen breathes with greater energy and lives longer than in the same bulk of common air, in the proportion of fourteen minutes to six minutes (Smith, p. 86). But as the function of respiration and all the processes connected with it were originally instituted by the Creator with relation to an atmosphere containing only one-fifth part of oxygen, the excitement in the animal economy, caused by breathing the latter gas in its pure state, is far too great to admit of its being continued for any length of time without inducing disease and the ultimate extinction of life. Similar results follow, although more slowly, even when the proportion of oxygen in common air is only partially increased.

The only kind of air, then, which is calculated to sustain animal life in permanent health and vigour, is that containing the precise ingredients in the precise proportions ascertained to exist in the atmosphere. If the relative quantity of any ingredient be increased or diminished, the proper constitution of the blood will be immediately changed, and the general health endangered. If, for instance, the air contain more carbonic acid than the minute trace of it which exists in pure air, it will be to that extent unfit for the purposes of respiration, and act deleteriously upon the blood and general system. This effect is exemplified in the feebleness, headach, and other symptoms produced by breathing air vitiated by the carbonic acid poured out from several hundred pairs

* Müller's Elements of Physiology, second edition, vol. i. p. 312.

of lungs in a crowded room or church. When the quantity of carbonic acid in the air amounts to ten per cent., it acts as a poison, and renders the air incapable of supporting life. Hence the fatal accidents so common in breweries and other places, from the workmen rashly entering fermenting vats filled with fixed air. Hence also the immediate insensibility of dogs and other animals thrown into the stratum of fixed air, which occupies the lower part of the celebrated Grotto del Cane, near Naples.

If, on the other hand, the quantity of oxygen in the air we breathe be artificially increased, a feeling of active energy is felt at first, which soon passes into morbid excitement; and the more narrowly we observe what is passing around us, we shall become only the more satisfied that the proportion of the ingredients in the air, as determined by the Creator, is the only one conducive to our permanent comfort and welfare, and is consequently that which we should, in all circumstances, and at all times, endeavour to secure as an indispensable condition of really healthy respiration.

Experiments have been made to determine whether respiration could be carried on by means of any other gas, or mixture of gases, than common air. Some which contain oxygen support life for a shorter or longer time in proportion to its quantity; and those which contain none do not sustain it at all. Nitrous oxide, in which oxygen abounds, may be breathed for a few minutes with comparative impunity, and its intensely exciting effects are well known. Other gases seem to act as direct poisons. Thus, air containing $\frac{1}{150}$ of sulphuretted hydrogen destroys a bird, and $\frac{1}{250}$ suffices to kill a horse. Carbonic acid is also poisonous, and acts by producing narcotism and fatal stupor.

The changes effected by respiration in the appearance and constitution of *the blood*, are not less remarkable than those produced on the air. From being of a dark purple hue, it passes immediately to a bright red colour. This change is caused by the action of the oxygen on the red particles of the blood; and it takes place even out of the body when venous blood is exposed to the contact of oxygen. In effecting this change, the oxygen is absorbed, and carbonic acid is exhaled. Arterial blood, accordingly, is stated by Müller to contain more oxygen and less carbon than venous blood. From the experiments of Mayer, Müller, and others, the arterial blood seems to contain more fibrin than venous blood, in the proportion of 29 to 24; and its temperature is also believed to be from 1° to 1½° higher.

During respiration, the properties of the blood undergo as great a change as its composition. The venous blood, from being incapable of supporting life or affording nourishment, and acting even like a poison when again distributed through the body, becomes, by its conversion into arterial blood, the source of vital energy and health to every organized part.

It is not easy to offer a perfectly satisfactory explanation of the various changes described as occurring during respiration. But the probabilities seem to me decidedly in favour of the recent theory of Lagrange and Hassenfratz, who think that the combination of the absorbed oxygen with the carbon of the venous blood takes place not in the lungs but in the course of the circulation, and that the carbonic acid thus formed is only set free on reaching the lungs. According to this view, the formation of carbonic acid takes place in the capillaries of every part, because it is only there that arterial blood loses its bright colour and becomes venous. But, whatever may be the true theory, all physiologists agree as to the fact that the arterialization of the blood in the lungs is essentially dependent on the supply of oxygen contained in the air which we breathe, and that air is fit or unfit for respiration in exact proportion as its quantity of oxygen approaches to, or differs from, that contained in pure air. If, consequently, we attempt to breathe nitrogen, hydrogen, or any other gas not containing oxygen, the result will be speedy suffocation; while, if we breathe air containing a too high proportion of oxygen, the vital powers will speedily suffer from excess of stimulus. All agree, farther, that oxygen is absorbed and carbon given out, and that the process essentially resembles the slow combustion of other inflammable bodies. Hence, the venous blood is sometimes said to be *oxygenated*, and, at other times, to be *decarbonised*, during respiration.

The restoration of the vital properties of the venous blood, is not the only change which is effected during its passage through the lungs. The *development of animal heat* is another and very important result of its oxygenation, and one scarcely less essential to the continuance of life. If the human body did not possess within itself the power of generating heat, so as to maintain nearly an equality of temperature in all climates, it could not long exist. In winter, and especially in the northern regions, the blood would speedily be converted into a solid mass, and life be extinguished, if no provision existed for replacing the caloric withdrawn from the system by the cold air surrounding it. In most parts of the globe, the heat of the atmosphere is, even in summer, inferior to that of the human body, and consequently a loss of caloric is always going on which must be made up in some way, otherwise, disease and death would speedily ensue.

During the ordinary combustion of carbon or pure charcoal in the open air, the carbon combines with the oxygen of the atmosphere, and forms carbonic acid. During this process, heat is evolved with a rapidity proportioned to the intensity of the combustion. The very same changes occur during respiration, and the relation between the production of animal heat and the condition of the respiratory functions in all classes of animals is so direct and remarkable as to be admitted by every one, however divergent the theories may be by which the explanation of the phenomena is attempted. In general, other conditions being alike, the quantity of heat generated is in proportion to the size and vigour of the lungs; and when these are impaired, its production is diminished. Hence many persons with imperfectly developed lungs, and a predisposition to consumption, complain habitually of coldness of the surface and feet; and many who were previously in good health, become more and more sensible to cold, in proportion as the approach of disease weakens the functions of the lungs. I have noticed this increased sensibility to cold, as a precursor of chronic pulmonary disease, both in myself and in others, before any other very obvious symptom had appeared, and I think I have seen its farther progress arrested by the timely use of proper means, where much greater difficulty would have been experienced, had the warning not been attended to.

The generation of heat in the living system being so immediately connected with the lungs, we find the temperature highest in those animals which possess them in the greatest perfection, namely birds. In many species, the internal heat exceeds that of man by twenty or thirty degrees; while that of man exceeds, to as great an extent, the heat of such of the inferior animals as are remarkable for imperfect organs of respiration, till we arrive at last at the cold-blooded animals in which the respiratory functions are very feebly performed. Animal heat, then, is really the produce of a physiological combustion, and bears a direct relation to the intensity with which the carbon and oxygen are brought into combination.

There is still another point of analogy between the processes of combustion and respiration, to which, from its important practical consequences, I am anxious to direct the particular attention of the reader. On burning a given quantity of carbon or pure charcoal in a given quantity of air, *they invariably combine in the same proportions and form precisely the same amount of carbonic*

acid. For the combustion of 12.7 grains of carbon, for example, 100 cubic inches of oxygen are required, and the result is always 100 inches of carbonic acid. If the portion of air in which the charcoal is burned contain only 75 cubic inches of oxygen, combustion will cease, and 3.2 grains of the carbon will remain unconsumed. If, again, the oxygen exceed 100 cubic inches, the whole of the carbon will be consumed, and the excess of oxygen remain behind. The relative quantities, in short, are fixed and definite, and the results depend directly on the proportions in which they are presented to each other.

In respiration, precisely the same law holds. *Other conditions being alike, a given quantity of atmospheric air can oxygenate only a certain and invariable quantity of similarly constituted venous blood.* When the proportion of air is too small, it is unable to furnish the requisite amount of oxygen, and consequently, a portion of the venous blood remains unchanged, and becoming mixed with the portion which has been oxygenated, it circulates with it, and proportionately impairs its powers of sustaining life and nutrition. When, again, the proportion of oxygen in the inhaled air is artificially made to exceed its due relation to the quantity of blood passing through the lungs, the amount of carbon required to combine with it is wanting, and the excess of oxygen thus absorbed proves so highly stimulating as speedily to disturb the general health. Dr Southwood Smith calculates that each contraction of the heart propels to the lungs two ounces of blood, and that the proportion of air decomposed by it amounts to 8.5603 cubic inches, or very nearly a quarter of a pint. According to this estimate, as the heart contracts on an average four times for each act of inspiration, it follows that for every time we breathe, eight ounces of blood will be acted upon by one pint of air. But if from any cause the quantity of air entering the lungs be reduced to three-fourths of a pint, or, what is the same thing, if the air inhaled be so impure as to contain only three-fourths of its proper proportion of oxygen, it is clear that the oxygenation of the blood will be incomplete, and that it will be insufficient for the purposes of health.

In like manner, to use Mr Finlaison's results, it appears that in one individual 24 hogsheads of blood are acted upon by 57 hogsheads of air in 24 hours, and that in the course of this action the air loses 328½ ounces, or about 11½ hogsheads of oxygen, and is farther deteriorated by the addition of a corresponding bulk of carbonic acid given out from the lungs. In other words, 24 persons inhale 57 hogsheads of air, and deteriorate its composition to the extent just stated, *in one hour.* So that, where a hundred people are shut up for an hour in one room, in attending a lecture for example, they breathe in that time upwards of 228 hogsheads of air, consume 45 hogsheads of its oxygen, and vitiate it by the addition of a proportionate bulk of carbonic acid, besides the watery vapour which is also thrown out. But as air is capable of supporting healthy respiration only when it contains its full proportion of oxygen, it is obvious that if the audience continue to *breathe the same air for another hour*, they must suffer from the imperfect oxygenation of the blood. Hence, where on such occasions adequate means are not used to renew the air within the room, at least as fast as it is vitiated, the oxygen diminishes, and the carbonic acid accumulates, in undue proportion, till the air becomes altogether unfit for the complete aëration of the blood, and for the support of life. Hence the languor, exhaustion, and headachs which ensue in churches, theatres, and ball-rooms, are just so many warnings that the lungs are insufficiently supplied with oxygen to decarbonise the blood passing through them, and that the system is suffering the penalty.

When these warnings are neglected, and the same air continues to be breathed again and again, the proportion of carbonic acid at last becomes so large as to cause it to act as a poison, and extinguish life. This result occurs when the quantity of carbonic acid in the air reaches the amount of 10 per cent. Beyond this point, insensibility and death are speedily induced, and hence the frequent loss of life from charcoal fires or stoves being left burning all night in close bed-rooms; and hence, also, the deaths from suffocation mentioned on p. 4, as having lately occurred in the confined cabins of several sloops. But of all the terrible catastrophes known to have arisen from this cause, that which occurred in the Black Hole of Calcutta in 1756, was the most frightful and attended with the greatest suffering. One hundred and forty-six Englishmen were thrust into a wretched prison only 18 feet square, in which there were only two very small windows by which air could be admitted, but as both of these were on the same side, ventilation was utterly impossible. Scarcely was the door shut upon the prisoners, when their sufferings commenced, and in a short time a delirious and mortal struggle ensued to get near the windows. Within four hours, those who survived lay in the silence of apoplectic stupor; and at the end of six hours, *ninety-six* were relieved by death! In the morning when the door was opened, 23 only were found alive, many of whom were subsequently cut off by putrid fever, caused by the dreadful effluvia and corruption of the air.

But it may be said, such a catastrophe as the above could happen only among a barbarous and ignorant people. One would think so, and yet such is the ignorance prevailing among ourselves, that more than one parallel to it can be pointed out even in our own history. Of two instances to which I shall allude, one has lately been published in the Life of Crabbe the Poet. When ten or eleven years of age, Crabbe was sent to a school at Bungay. "Soon after his arrival he had a very narrow escape. He and several of his schoolfellows were punished for playing at soldiers, by being put into a large dog-kennel, known by the terrible name of the 'Black Hole;'—George was the first that entered; and the place being crammed full with offenders, the atmosphere soon became pestilentially close. The poor boy in vain shrieked that he was about to be suffocated. At last in despair, he bit the lad next to him violently in the hand,—'Crabbe is dying—Crabbe is dying,' roared the sufferer; and the sentinel at length opened the door, and allowed the boys to rush out into the air. My father said, 'A minute more and I must have died.'"*

Another instance of a very similar kind is mentioned in Walpole's Letters. A parcel of *drunken* constables, he says, took it into their heads to arrest every body they met, and thrust them into St Martin's round-house. Five or six and twenty persons were thus shut up all night with closed doors and windows. In the morning, four were found suffocated from want of air, two died shortly after, and a dozen more were "in a shocking way."

In these deplorable examples of the miseries caused by ignorance of the simplest laws of the animal economy, the effects arising from the absence of a due proportion of oxygen in the air inhaled are portrayed in appalling colours. But those which are produced by breathing an atmosphere vitiated to a much smaller extent, although not so strikingly obvious, are by no means less real. God has decreed that a certain proportion of oxygen shall suffice for the aëration of only a fixed and determinate quantity of venous blood. If we adapt our circumstances to this law, we reap our reward in comfort and health. Whereas, if we transgress it and persevere in breathing an atmosphere containing less than the requisite quantity of oxygen, and more than the usual quantity of carbonic acid, we have no more right to expect to enjoy health, energy, and activity of mind and body, than to expect a fire to burn without air, or a fish to live out of the water. In domestic and social life, this

* Crabbe's Life, by his Son, p. 17.

important truth is habitually disregarded to an extent which will appear incredible when the practical benefits of physiology shall be more correctly appreciated, and its innumerable applications be made more extensively known as a part of the ordinary education of the young. To hasten the arrival of this period, so far as lies in my power, I shall, in the following chapter, direct attention to a few of the more prominent advantages to be obtained from the regular observance of the laws of respiration, not only in the prevention and cure of disease, but in promoting the moral and intellectual as well as physical well-being and happiness of the race.

CHAPTER X.

LAWS OF RESPIRATION.—CONDITIONS OF HEALTH OF THE LUNGS.

Extreme prevalence of diseases of respiratory organs.—Conditions of healthy respiration.—An abundant supply of pure air is required—also free inspiration—obstacles to obtaining these.—Compression of the chest and waist by tight lacing.—Hence more females than males die consumptive. Bad health of dressmakers, shoemakers, &c., explained.—Consumption prevails in trades carried on in confined air.—Influence of vitiated air in causing disease illustrated and explained.—Examples of typhus, consumption, and scrofula thence arising.—Effect of sedentary habits and inaction on respiration.—Diseases thus induced.—Depressing passions act in the same way.—The influence of vitiated air often slow and insidious, but only the more dangerous.—Conditions of health in the lungs.—The first is pure air.—Hence necessity of ventilation—this condition too much neglected.—Evils thence arising.—Preservative power of proper ventilation.—Free respiration indispensable—hence necessity of bodily activity and cheerfulness of mind.—Importance of a sound hereditary constitution—and of good diet.—Precautions to be observed in youth.

In the instructive and elaborate appendix by Mr Farr to the Registrar's Second Annual Report of Births, Marriages, and Deaths, it is stated that 27½ per cent. of the total deaths in England and Wales for 1838 were owing to diseases of the respiratory organs, and that of these no less than 59,025 arose from consumption alone. Of that number 31,090 were of females, and 27,935 of males, being in the proportion of 16.0 of males to 19.2 of females. Supposing the deaths from consumption in Scotland and Ireland to bear the same relation to the population as in England and Wales, the total number for the United Kingdom will fall little short of 90,000 annually. If any thing farther were required to excite an interest in the investigation of the causes and means of preventing this prodigious fatality, the fact that the young, the amiable, and the gifted are carried off in a far higher proportion by consumption than by any other disease, would be sufficient to arouse our solicitude. But I feel assured that the inherent importance of the inquiry will of itself be sufficient to enlist the attention of every reflecting reader.

From the general explanation already given of the structure and uses of the lungs, it will be obvious that several conditions, which it is our interest specially to know and observe, are essential to the healthy performance of respiration. *First* among those we may rank *an abundant supply of pure atmospheric air, containing its full proportion of twenty-one per cent. of oxygen, and not more than its due proportion of about one part in a thousand of carbonic acid.* Implied in this condition, or at least practically inseparable from it, is another, that nothing shall impede the full play and dilatation of the lungs, so that *at every inspiration a sufficient quantity of pure air shall be received into the air-cells to ensure the due and complete oxygenation of the whole venous blood subjected to its action.* Let us treat of these in succession.

If a mouse be confined under a large glass-jar, full of air, but so arranged that no fresh air can possibly enter, it will not for some time shew any appearance of inconvenience, because as yet the air which the jar contains will be tolerably pure. In proportion as the consumption of oxygen and the consequent exhalation of carbonic acid proceed, it will begin to shew symptoms of uneasiness analogous to those which are experienced by delicate persons in a close and crowded hall. In a little while longer it will be observed to pant in its breathing, and to dilate its lungs to their utmost limits, as if struggling for air, precisely as is described to have occurred with the wretched prisoners in the Black Hole of Calcutta, and the poet Crabbe. In a few hours more it will die convulsed, exactly as if drowned or suffocated. Precisely analogous results follow the deprivation of air in man, in fishes, and all other animated beings; and in hanging, death ensues, not from dislocation of the neck, as is often supposed, but simply from the want of air in the lungs to effect the necessary changes in the constitution of the venous blood.

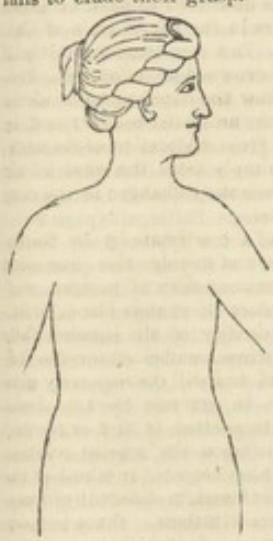
Assuming the accuracy of the estimate by Dr Southwood Smith, that in a person of average size, one pint of pure air, containing about one-fifth of oxygen, suffices to oxygenate eight ounces of venous blood, it follows that whenever the quantity of air inhaled falls short of one pint, it will prove insufficient for the formation of proper vital blood, and will consequently give rise to impaired health, or, in extreme cases, to death itself. It is perfectly unimportant to the argument whether Dr Smith has hit upon the precise relation which the air holds to the blood or not, or whether the proportion varies at different times, in different circumstances, and in different constitutions. Some proportion *does* exist which is better adapted than any other for the arterialization of the venous blood; and whatever that may be, the conclusion founded on its being observed or broken is equally applicable, whether one or twenty pints of air be required to oxygenate any given quantity of blood. For this reason I shall adopt Dr Smith's calculation as at least a probable one, although I am quite aware that the quantity of oxygen required varies with the state of the system and the constitution of the blood.

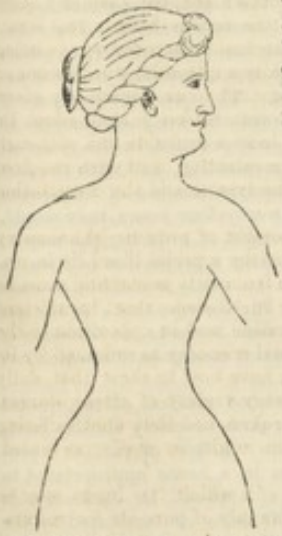
If, then, a certain proportion of pure air be necessary to convert venous into healthy arterial blood, it is manifest, that any departure from that proportion must be injurious, because it will be to that extent insufficient for the purposes of respiration, and in opposition to the express laws of the animal economy as ordained by its omniscient Creator. We have now to shew that, daily and hourly, and under every variety of circumstances, that proportion is often broken, and that much suffering and great mortality, which might be easily prevented, are thereby induced.

There are various ways in which the lungs may be deprived of the requisite supply of pure air for respiration. *First*, An obstacle may prevent the passage of the air through the windpipe. This sometimes happens in quinsy and in croup. It may also occur from foreign bodies choking up the throat, and from strangulation. In this state, no air can be admitted to the lungs, and death is the speedy result.

Secondly, The lungs may be deprived of their due proportion of air by any cause compressing the chest externally in such a way as to prevent the proper expansion of the lungs and air-cells. This is also a frequent occurrence, and when continued, is a very common source of bad health and diseased lungs. The most prevalent mode of compression of the chest consists in the use of tight waist-bands and corsets by young women, who are anxious to possess what they consider a fine figure. Compression to a hurtful extent is also met with in many trades in which a bent position is required. Shoemakers, for example, who, when at work, sit almost doubled up, suffer from compression of the chest, and can rarely take a full breath. But in all

such cases the principle is the same. The lungs are deprived of sufficient air to oxygenate the blood; and, as a consequence, the latter is deteriorated in quality, and affords imperfect sustenance to the organization. This result and its explanation are so obvious that I shall not dwell upon them, but only add two or three illustrations of the extent to which young women *voluntarily* injure themselves by compression of the chest, in the vain pursuit of an object which, thus aimed at, never fails to elude their grasp.





According to the natural formation of the lungs and chest, both are narrowest at the upper part, and become broader and broader till below the sixth or seventh rib. This will be apparent on inspecting the woodcut of the skeleton on page 47, and also the subjoined figures, the one copied from the outline of the Medicean Venus, and the other from a figure altered by compression.

That of the Venus is the natural form, and is recognised by artists and persons of a cultivated taste as the most beautiful which the female figure can assume. Accordingly, it is that aimed at in all the finest statues of ancient and modern times. Misled, however, by ignorance, and a false and most preposterous taste, women of fashion, and their countless thousands of imitators, down to even the lowest ranks of life, have gradually come to regard a narrow or spider-waist as an ornament worthy of attainment at any cost or sacrifice, and endeavoured, with a courage and perseverance worthy of martyrs, to reverse the proportions of nature, and produce the misshapen figure which appears above in contrast with that of the Venus, and which is, of course, the *beau ideal* of fashionable beauty! The simple inspection of these two figures will enable the reader to judge of the extent to which, under such compression, full respiration must be impeded, or rather be rendered impossible, and how certainly the blood must be deteriorated from the want of a sufficient supply of oxygen.

That such results are really experienced from compression, is proved by many facts. In the course of some experiments on the subject, Mr Thackrah found that, while the young men employed in a flax-mill could expel from the chest by a forced expiration from six to ten pints of air, the young women employed in the same mill, and consequently under similar circumstances, could expel only from two to four pints. In ten of these females, of about 18½ years of age, stated by Mr Thackrah to be "labouring under no disease," he found the average to be three and a half pints, while in the young men of the same age it amounted to six pints. Some allowance must of course be made for the naturally smaller size of the lungs in females; but Mr Thackrah seems to me to be correct in ascribing this great disparity "*chiefly* to the lacing of the chest."* I have seen one case in which the ribs were disfigured, and even the liver was deeply indented by the pressure of a very tight waistband, and in which long-continued bad health, and ultimately death were the results. In another case which I met with a few months ago, the liver was also indented, and its lower margin flattened by the pressure. In the report of the Glasgow Lunatic Asylum for 1838–9, another instructive case is mentioned. The patient was "a female pauper, aged fifty-two, who died of dropsy of the chest, connected with a singular displacement of the liver, lungs, and heart, in consequence of the very injurious practice of tight lacing, to which she had been addicted, with maniacal obstinacy, from early life." In all of these cases, the lower lobes of the lungs must have been so much compressed as to render their due dilatation impossible.

Estimating an ordinary inspiration in a healthy well-formed young woman to be twenty cubic inches of air, and supposing that, from excessive compression by corsets, or a tight waistband, the expansion of the lungs be reduced so far that only fifteen inches of air can be inhaled at each inspiration, it will not be difficult to understand the deleterious influence produced by it on the general health, and on the lungs themselves. The proportion of oxygen in twenty inches of pure air is as nearly as possible one-fifth or four inches. This, therefore, is the quantity which we assume to be required to aërate the eight ounces of blood subjected to its action. But if from tight lacing only fifteen inches of air can enter the lungs at each inspiration, it is as clear as noonday that the requisite proportion of oxygen to the blood will be diminished by *one-fourth*, or reduced from *four* to *three* inches. Hence the venous blood passing through the lungs will be imperfectly arterialized, and will be relatively unfit for the support of life and nutrition. I repeat, that I do not adduce these proportions as either mathematically correct or invariable, but merely as sufficient to illustrate *the principle* according to which compression acts; and that its effects are really as deleterious as the application of the principle would lead us to expect, I shall now attempt to shew by a reference to actual experience.

We have already seen from Mr Farr's Appendix to the Registrar-General's Second Report, that, in 1838, 27½ per cent., or 90,823 deaths, arose from diseases of the respiratory organs; and that of that number no less than 59,025 were ascribed to consumption alone. Considering the numerous active causes of disease to which males are subjected, and the comparative freedom from restraint which they enjoy at the most dangerous period of life, viz. during the effervescence of youth, one should expect to meet with a large majority of the victims among them rather than among females, who are so much less exposed. In reality, however, it is far otherwise. According to Mr Farr's calculations from the returns for 1838, only 3.8 in 1000 males died of consumption, whereas in females the proportion was so high as 4.1 in 1000, the actual numbers having been 27,935 to 31,090. "This higher mortality of English women by consumption," says Mr Farr, "may be ascribed partly to the in-door life they lead, and partly *to the compression, preventing the expansion of the chest, by costume. In both ways they are deprived of free draughts of vital air, and the altered blood deposits tuberculous matter with a fatal and unnatural facility. Thirty-one thousand and ninety* English women died in one year of the incurable malady! Will not this impressive fact induce persons of rank and influence to set their countrywomen right in the article of dress, and lead them to abandon a practice which *disfigures the body, strangles the chest*, produces nervous and other disorders, and has

* Thackrah on Employments as affecting Health and Longevity, p. 95.

an unquestionable tendency to implant an incurable hectic malady in the frame?"*

When to a diminished capacity of the lungs, caused by external compression, the breathing of an already vitiated air is added, the oxygen inhaled is still farther reduced in quantity, the blood is still more imperfectly aërated, and, as a necessary consequence, the health still more rapidly deteriorated. This combination of evils is nowhere seen in greater intensity than among the dressmakers of the metropolis. Deprived of that free exercise in the open air which is essential to the full expansion of the chest, they are confined in the vitiated air of a crowded workroom often for fourteen or sixteen hours a-day, and at some seasons even longer. From the tightness of their dress, and the stooping and motionless attitude in which they sit, the play of the lungs is still further impeded. In many other trades, the same fatal combination exists; and its effects are aggravated in proportion to the impurity of the air respired. In flax-mills and other factories where the vitiation of the air is carried to an extreme, scarcely any of the work-people are free from disease of the lungs. In the heckling department, according to Thackrah, a large proportion of the men die young. The same author mentions that, when conducting his experiments to ascertain the state of the lungs in the work-people employed in the flax-mills of Leeds, "the coughs of the persons waiting to be examined were so troublesome as continually to interrupt and confuse the exploration by the stethoscope."† These, it ought to be observed, were not patients selected for examination as such, but the ordinary workers from the mill.

From breathing a highly vitiated air in a constrained position, the people employed in some of the coal-mines where the seams are thin and the ventilation bad, are subject to a singular and fatal affection of the lungs, named *black spit*. In East Lothian it is very prevalent, and attacks the strongest as well as the feeblest of those exposed to its causes. It is accompanied by wasting and the copious expectoration of an intensely black matter in large quantity, which may continue for months, but is never cured. In such situations, few of the men arrive at the age of forty years; and if they do, they have already the appearance of old age. Is it wonderful that with such destructive machinery at work, disease and death should leave their traces in ill-ventilated workshops, factories, and mines, almost as distinctly as in the battle-field?

The *third* form in which the lungs are often deprived of the proportion of oxygen required to aërate the quantity of blood passing through them, is that of breathing an impure or vitiated air. If from any external cause, such as the crowding together of many people, the burning of many lamps, or the want of ventilation, the air be rendered so impure that the twenty inches required for each inspiration contain only *three* instead of *four* cubic inches of oxygen, and if the place of the absent quantity be supplied by one cubic inch of carbonic acid, it is obvious that the blood subjected to its action will be even more imperfectly oxygenated than if only fifteen cubic inches of *pure* air were admitted to the lungs. The presence of the additional inch of carbonic acid will add to the evil arising from the want of the oxygen by acting to that extent as a direct poison, and hence the bad health and ultimately fatal results which, as shewn in the preceding page, have so often been produced by the continued breathing of a vitiated air, especially when the vitiation is considerable in degree. And yet how very much is this important truth practically held in contempt, not only in the want of ventilation of our churches, hospitals, theatres, ball-rooms, and public assemblies, but even in our private dwellings! There is scarcely a day passes in which a well-employed medical man does not meet with some instance in which health has suffered, or recovery been retarded, by the thoughtless or ignorant disregard of the value of pure air to the well-being of the animal economy. This must be my apology for insisting, at so much length, on what may seem to many a trite and exhausted topic.

Begging the reader to bear in mind the evidence already submitted of the deadly influence of *extremely* vitiated air, as experienced in the Black Hole of Calcutta, in the round-house of St Martin's, and in the kennel into which Crabbe and his companions were thrust, and the examples of the injurious effects in workrooms, factories, and mines, of air vitiated only in a less degree, I shall now confine myself to shewing the powerful influence which the same cause often has in the production of specific forms of disease. The first illustration which I shall give exhibits incontestably the origin of *typhus fever* in the continued respiration of vitiated air, and is taken from the valuable Lectures on Military Surgery by Sir George Ballingall (page 28).

In the summer of 1811, a low typhus fever broke out in the fourth battalion of the Royals, then quartered in Stirling Castle. The season was the healthiest of the whole year, and the locality about the most salubrious in the country. On investigating the causes which could give rise to so much illness under circumstances apparently so favourable to health, the mystery was speedily solved. In one room, 21 feet by 18, SIXTY men had been placed; and in another of 31 feet by 21, SEVENTY-TWO men; or, in other words, a greater number of human beings had been crowded into one place than the air which it contained could by possibility keep alive! To prevent absolute suffocation, the windows were thrown open during the night, from which a cold air streamed in upon those nearest to them. The natural result of this crowding was typhus fever, to which inflammation of the lungs was superadded in those exposed to the cold draughts. The two together proved very fatal. Had the officers who assigned quarters to these unfortunate men been acquainted, in the remotest degree, with the laws of respiration, and with the fact that one pair of lungs requires the use of fifty-seven hogsheads of pure air in twenty-four hours, they would, I believe, as soon have thought of ordering the men to be shot, as of exposing so large a proportion of them to almost certain death from an easily avoidable disease. The simple fact added by Sir George, that "*in the less crowded apartments of the same barracks, no instances of fever occurred,*" is the severest condemnation which can be recorded against them.

Dr Jackson, a distinguished medical officer, quoted by Sir George Ballingall, gives precisely similar testimony. When insisting on "height of roof as a property of great importance in a house appropriated to the reception of the sick of armies," Dr Jackson adds as the reason, that "the air being contaminated by the breathing of a crowd of people in a confined space, disease is originated, and mortality is multiplied to an extraordinary extent. It was often proved in the history of the late war, that *more human life was destroyed by accumulating sick men in low and ill-ventilated apartments, than by leaving them exposed in severe and inclement weather, at the side of a hedge or common dike.*" The dreadful mortality from typhus fever in the British Legion in Spain a few years ago affords another striking confirmation of the same principle.

It would be very easy to detail additional proofs of the influence of confined and vitiated air in the production of typhus fever, because they abound in the writings of every author who has treated of the subject, in the Parliamentary Reports "on the Health of Towns," and in the Registrar-General's Reports. But as the fact is almost universally admitted, I need only refer to the death "from putrid fever" of most of the survivors of the Black Hole of Calcutta; to the fearful mortality from fever in slave-ships, more from vitiated air

* Registrar-General's Second Report, 8vo., edit. p. 73.
† Thackrah on the Effects of Employments on Health, p. 43.

than from any other single cause, and to the following example both of the extent to which atmospheric impurity operates, and the facility with which its deadly influence may be obviated by due attention to the simplest laws of the animal economy.

In the number of Chambers's Edinburgh Journal for 17th April 1841, in reference to the possibility of removing the causes of fever, it is said, "The chief causes assigned by medical inquirers are dense population, bad ventilation, and destitution. We shall here adduce strong reasons, to shew that however destitution or any other cause may operate remotely, the *immediate* cause is deficient ventilation. There is, in the suburbs of Anderston, a large house, called, from its mode of construction and the vast crowd of human beings who live in it, the *Barrack*. It is said that nearly five hundred persons, chiefly poor Irish, live in this building, each family having one, or at most two, little rooms. At one time, fever was never absent from the Barrack; *five had been seen ill at once in one room, and in the last two months of* 1831, *the cases in this single house were fifty-seven.* During the five years ending with 1839, there were 55,949 cases of fever in the whole city: consequently, it will be observed, this house with (say) 480 inhabitants, ought to have had, as its fair proportion, 112 cases, the population of the city being considered as, at a medium, 240,000. But how does the case really stand? Early in 1832, at the recommendation of an ingenious surgeon of the district (Mr Fleming), a simple tin tube, about two inches in diameter, had been led from the ceiling of each room of the Barrack into a general tube, the extremity of which was inserted into the chimney of a furnace connected with a neighbouring factory; by which means a perpetual draft was established upon the atmospheric contents of every room, and its inmates compelled, whether they would or not, to breathe pure air. The consequence—for we cannot but consider it as the consequence—was, that during the ensuing eight years fever was scarcely known in that house. Laying aside one year, during which Mr Fleming had not the charge of the apparatus, there were up to last December *only four cases.*" This remarkable exemption from fever in a building where it was formerly so prevalent is the more instructive, because the purification of the air is the only change which has been effected; and as fever was very prevalent in the whole city during the very time of this exemption, it is impossible not to ascribe the chief part of the protective power to the purer atmosphere now supplied to the inmates of the Barrack.

The same general results are afforded by the statistical returns of the Registrar-General; but I can make room for only one "Table, shewing the mean mortality in three groups of the Metropolitan Districts," extracted from the valuable appendix by Mr Farr, and designed to shew that, *cæteris paribus*, the mortality increases with the density of the population and the impurity of the air.

DISTRICTS.	Square Yards to one person.	Annual rate of mortality per 1000.	The epidemic class.	Typhus.	The Nervous System.	Phthisis.	Other classes.
1 to 10 (mean)	35	3.428	.994	.349	.518	.485	.831
11 to 20 ...	119	2.786	.679	.181	.440	.405	.716
21 to 30 ...	180	2.289	.539	.131	.374	.375	.584

From this table, it appears that .349 deaths from typhus occur in the most crowded districts of the metropolis, and only .131 in the more favourably situate; the proportions being nearly as *five* to *two*.

The influence of vitiated air in the production of *consumption* has been noticed and commented upon by many observers, but the evidence of Dr Lombard of Geneva is the most conclusive, because founded on an accurate inquiry into individual cases, in the course of which he extended his researches into "a total of 4300 deaths from phthisis, and 54,572 individuals exercising 220 different occupations, and found, by a comparison of all the professions carried on in the open air and in workshops, that the proportion of deaths from phthisis was *double* among the latter, and this proportion increased as the apartments were close, narrow, and imperfectly ventilated."* I need not add one word in support of this most convincing testimony, but only refer to another form of disease closely allied to consumption, and itself the cause of an immense mortality, viz. *scrofula*.

The three grand sources of scrofulous disease in those not strongly predisposed to it, are now universally admitted to be the habitual breathing of a vitiated atmosphere, an impoverished diet, and impaired nutrition. Of the active influence of the first, the rapid production of scrofula in animals previously healthy, by confining them for a time to the inspiration of an impure air, affords demonstrative proof. But, unfortunately, the fact may be witnessed at any time in the more confined dwellings of the poor in most of our large towns, and also in ill-situate and ill-ventilated workhouses or asylums for the young. Among the children in the Dublin House of Industry, for instance, scrofula prevailed very extensively about thirty years ago, and its ravages were not arrested till Mr Carmichael, the distinguished surgeon of that city, called attention to its chief cause in the extreme impurity of the air in the wards. In one ward of moderate height, 60 feet by 18, Mr Carmichael found *thirty-eight* beds, each containing *three* children, or more than one hundred in all! The matron told him, that "there is no enduring the air of this apartment when the doors are first thrown open in the morning; and that it is in vain to raise any of the windows, as those children who happen to be inconvenienced by the cold, close them as soon as they have an opportunity. The air they breathe in the day is little better: many are confined to the apartments they sleep in, or crowded to the number of several hundreds in the school-room."† Can any one read this account, and wonder at the prevalence of scrofula under such circumstances!

The *fourth* cause by which the necessary supply of oxygen to the lungs is frequently impeded and disease consequently produced, arises out of the sedentary habits of modern society, and the depression or monotony of mental condition which is apt to result from them. If ever a Divine law was legibly imprinted on any part of animated nature, it is that which declares *activity* to be the indispensable condition of human health and happiness. Every organ, from the highest to the lowest, in the structure of man is framed with a view to daily and habitual exercise, and this law holds equally with the lungs as with the muscles or brain. When we obey this condition of existence, and actively employ the body for some hours every day in the open air, the circulation is invigorated and equalized, the respiration is rendered free and deep, and a feeling of vivacity and enjoyment arises, which is the sure accompaniment of health and energy. These results are rendered very obvious in the process of *training*, during which *the wind*, as it is called, is known to become remarkably improved. Of this, I witnessed some years ago a very curious instance in a strong-built little Irishman, who, for a mere trifle, ran alongside of one of the Glasgow coaches for 32 miles in a very wet day and on a muddy road. The average speed was nine miles an hour, and yet the poor fellow did not seem at all distressed, and stopped only because he had arrived at his destination. In him this amazing strength and activity were obviously connected with the very complete oxygenation of the blood in a pair of capacious and well-exercised lungs.

The well-known salubrious influence of a gay and

* Penny Cyclop. Phthisis.

† Carmichael's Essay on the Nature of Scrofula. Dublin, 1810.

exhilarating mental stimulus and of cheerful and gratified moral emotions, and the sickening and destructive influence of despondency, grief, and other depressing passions, depend partly on the operation of the same principle. The exciting emotions stimulate the circulation, quicken respiration, and increase the vital powers, so that it becomes difficult to remain passive or quiescent. The depressing emotions, on the other hand, diminish the force of the circulation, render the breathing slow and feeble, and thereby withdraw the natural stimulus of life to an extent which leads directly to meditation or brooding *inaction*, and produces a positive aversion to bodily activity. Great depression of mind thus leads naturally to imperfect respiration, a more sluggish flow of blood, and the various diseases of diminished vitality; while great excitement induces full respiration, quickened circulation, and the various diseases of exalted vitality. It is then by diminishing inspiration, and thus depriving the lungs of the necessary oxygen, that the depressing passions and sedentary mode of life act so injuriously in predisposing to pulmonary consumption,—a fact which has been remarked from a very early period, and which ought never to be lost sight of by parents, teachers, or the young themselves. In modern society, thousands of both sexes unconsciously suffer in this way, without a suspicion being entertained that their mode of life is injurious. In female seminaries, especially, this error prevails to a lamentable extent, and is aggravated by the restraints so generally imposed upon the natural outpourings of the juvenile voice in sports and play.

Many writers have been at pains to point out the actual occurrence of the evils which sound physiology would lead us to anticipate, from the continued breathing of *impure* air, or from the imperfect breathing of *pure* air, owing to obstacles impeding the expansion of the lungs. But the principle according to which the injury is done has not been sufficiently explained or insisted upon, and hence the public at large remain unimpressed with the reality of the mischief such as I have endeavoured to set it before them. The bad effects, indeed, are often so gradual in their appearance, and apparently so disjoined from their true cause, that the latter is apt to be overlooked even when to an informed mind it is as obvious as the sun at noonday. But the influence of impure air or imperfect respiration is not the less positive or ultimately less subversive of health, from being slow and insidious in its progress. An individual possessing a strong constitution may indeed withstand the bad consequences of occasionally breathing an impure atmosphere, but even he will suffer for a time. He will not experience the same amount of mischief from it as the invalid, but will be perfectly conscious of a temporary feeling of discomfort, the very purpose of which is, like pain from a burn, to impel him to shun the danger, and seek relief in a purer air. The comparative harmlessness of a single exposure is the circumstance which blinds us to the magnitude of the ultimate result, and makes us fancy ourselves safe and prudent, when every day is surely, though imperceptibly, adding to the sum of the mischief. But let any one who doubts the importance of this condition of health watch the dyspeptic, the pulmonary, or the nervous invalid, through a season devoted to attendance on crowded parties and public amusements, and he will find the frequency of headachs, colds, and other fits of illness, increase in exact proportion to the accumulated exposure, till, at the end of spring, a general debility has been induced, which imperatively demands a cessation of festivity, and a change of scene and air. This debility is often erroneously ascribed wholly to the unwholesome influence of spring,—a season extolled by the poets, not as a cause of relaxation and feebleness, but as the dispenser of renovated life and vigour to all created beings.

It is in vain to warn such persons beforehand that Nature is always consistent, and that if bad air be really unfit for healthy respiration, it must be detrimental *to them*, and to all who breathe it; and that its ill effects are not less real because at first gradual and unperceived in their approach. They know too little of the animal economy and of Nature's laws, and are too much devoted to their own objects, to be impressed by cautions of this kind; and, in looking forward to the ball-room or crowded evening party, few of them will believe that any possible connection can exist between breathing its vitiated atmosphere, and the headachs, indigestion, and cutaneous eruptions which so frequently follow, and to be delivered from which they would sacrifice almost every other enjoyment.

If it be said that nobody will be troubled with all this trifling care, and that thousands who expose themselves in every way, nevertheless enjoy good health and a long life, I can only answer that this is partially true; but that an infinitely greater proportion pass through life as habitual invalids, and scarcely know from experience what a day of good health really is. The late discussions in parliament on the health of the poor and of large towns have demonstrated, by an unassailable mass of evidence, that many circumstances, rarely considered as injurious, because they have no immediate effect in suddenly destroying life by acute diseases, have nevertheless a marked influence in slowly undermining health and shortening human existence. There are trades, for example, at which workmen may labour for fifteen or twenty years, without having been a month confined by disease during all that time, and which are therefore said to be healthy trades; and yet, when the investigation is pursued a little farther, it is found that the general health is so steadily, although imperceptibly, encroached upon, that scarcely a single workman survives his fortieth or fiftieth year.

It is this insidious influence of impure air to which I am anxious to direct attention. So long as delicacy is the rule, and robust health the exception, especially among females, and so long as more than one-fourth of the annual deaths in Great Britain are caused by consumption alone, it will be difficult to persuade any rational and instructed mind that every cause of disease is already removed, and that farther care is superfluous. My own conviction on the contrary is, that, by proper care, and a stricter observance of the laws of the animal economy, on the part of the parents and guardians of the young, the development of the disease might be prevented in a large proportion of the number, and that even the robust would enjoy health in a higher degree and with increased security.

Having now made the reader acquainted with the nature and laws of *the function of respiration*, it will not be difficult for him to understand the principal conditions on which *the health of the lungs* or organs of respiration more immediately depends and the means by which they may, when feeble or predisposed to disease, be best protected and invigorated. Considering the yearly mortality from consumption, this part of our subject cannot fail to excite a deep interest in the mind of every rational parent.

If, as we have shewn, the habitual breathing of a pure air be essential to the proper constitution of vital blood, and to the general well-being of the system, there can be no doubt that the same condition will exercise a still more direct influence on the health of the lungs themselves. This is accordingly the case, and following the order of our previous exposition, it may be stated, that the *first* great requisite for the health of the lungs is *the habitual respiration of a pure air at a moderate degree of temperature, and of a moderate degree of humidity or dryness.*

There are only two ways by which we can obtain an unlimited command of pure air for respiration. The

first is by living in the open air; and the other is by making arrangements for the frequent and regular renewal of the air within our houses, workshops, churches, schools, and other places of public resort. The former is clearly impracticable in this climate, for however much we may benefit by a few hours spent every day in active exercise in the open air, no one will venture to affirm that we could safely spend the whole four and twenty under similar exposure. The only other way requiring consideration is, the regular renewal of the air in our houses and places of general resort.

Keeping in mind that every pair of lungs consumes on an average about two and a half hogsheads of air per hour, in the oxygenation of rather more than one hogshead of blood, and also the numerous other sources of impurity of air, such as fires, lights, and the cutaneous and pulmonary exhalations, there can be no difficulty in understanding how indispensable a regular supply of pure air must be to the health and comfort of every one who remains even for an hour within the four walls of a room, and especially of one crowded by other human beings. If we suppose, for example, that a thousand persons remain together in a church for one hour and a half, and that no provision be made to renew its contained air, what will be the results? A thousand pairs of lungs will, in that space of time, require for healthy respiration little short of *four thousand hogsheads of pure air* to oxygenate about *fifteen hundred* hogsheads of venous blood. But if no provision be made for the supply and equal diffusion of pure air, and for withdrawing that which has been vitiated, healthy respiration will become physically impossible. The vitiated air does not contain, and consequently cannot afford, the 21 per cent. of oxygen which the blood demands, and which pure air always contains. But in place of the deficient oxygen, the corrupted air contains a superabundance of carbonic acid, thereby directly adding to its deleterious effects.

So wholly, however, have considerations of this description been without influence on the public mind, and so complete and all-pervading has been the ignorance of physiology even among the best-educated classes, that in Edinburgh, and almost every large town, we have instances of large public rooms, capable of holding from 800 to 1000 persons, built within these few years, without any means of adequate ventilation being provided, and apparently without the subject having ever cost the architect a thought! When these rooms are crowded and the meeting lasts for some hours, especially if it be in winter, the consequences are sufficiently marked. Either such a multitude must be subjected to all the evils of a contaminated and unwholesome atmosphere, or they must be partially relieved by opening the windows, and allowing a continued stream of cold air to pour down upon the heated bodies of those who are near them, till the latter are thoroughly chilled, and perhaps, as in the case of the soldiers in Stirling Castle, fatal illness is induced; and unfortunately, even at such a price, the relief is only partial; for the windows being all on one side of the room, and not extending much above half-way to the ceiling, complete ventilation is impracticable. This neglect is glaringly the result of ignorance, and could never have happened had either the architects or their employers known the laws of the human constitution; and yet it is still doubted whether it be prudent or right to teach the intelligent portion of the community any knowledge of the structure and uses of their own organization.*

Striking, indeed, as these and innumerable other facts of a similar nature are, we still remain so blind to the instructions of experience, until we acquire a knowledge of the principles which give it value, that we go on, especially in towns, constructing our houses in utter defiance of scientific rules. The public rooms which can be easily ventilated at any time,—which are in fact ventilated by the constant opening and shutting of the door, and by the draught of the chimney,—and in which, therefore, large dimensions are less necessary for salubrity, are always the most spacious and airy. The bed-rooms, on the other hand, in which, from the doors being shut, and from there being no current of air in the whole seven or eight hours during which they are occupied, the vitiation of the air is the greatest, and in which, consequently, size is most required, are uniformly the smallest and most confined: and, as if this source of impurity were not sufficient, we still farther reduce the already too limited space, by surrounding the bed closely with curtains, for the express purpose of preventing ventilation, and keeping us enveloped in the same heated atmosphere. Can any thing be imagined more directly at variance than this with the fundamental laws of respiration? Or could such practices ever have been resorted to, had the nature of the human constitution been regarded before they were adopted? In this respect we are more humane towards the lower animals than towards our own species; for, notwithstanding all the refinements of civilization, we have not yet aggravated the want of ventilation in the stable or the cow-house, by adding curtains to the individual stalls of their inmates.

In dwelling-houses lighted by gas, the frequent renewal of the air acquires increased importance. A single gas-burner will consume more oxygen, and produce more carbonic acid to deteriorate the atmosphere of a room, than six or eight candles. If, therefore, where several burners are used, no provision be made for the escape of the corrupted air, and for the introduction of pure air from without, the health will necessarily suffer. A ventilator placed over the burners like an inverted funnel, and opening into the chimney, is an efficient and easy remedy for the former evil; and a small tube forming a communication between the external air and the room, would supply fresh air, where necessary. The tube might be made to pass, like a distiller's worm, through a vessel containing hot water, by which means the air might be heated in very cold weather, before being thrown into the room, and thus the danger arising from cold draughts and inequalities of temperature be avoided.

Many of our churches and schools are extremely ill ventilated; and accordingly it is observed, that fainting and hysterics occur in churches much more frequently in the afternoon than in the forenoon, because the air is then at its maximum of vitiation. Indeed, it is impossible to look around us in a crowded church, towards the close of the service, without perceiving the effects of deficient air in the expression of every one present. Either a relaxed sallow paleness of the surface, or the hectic flush of fever, is observable; and, as the necessary accompaniment, a sensation of mental and bodily lassitude is felt, which is immediately relieved by getting into the open air.

I have seen churches frequented by upwards of a thousand people, in which, during winter, not only no means of ventilation are employed during service, but even during the interval between the forenoon and afternoon services, the windows are kept as carefully closed as if deadly contagion lay outside, watching for an opportunity to enter by the first open chink—and where, consequently, the congregation must inhale, for two or three hours in the afternoon, an exceedingly corrupted air, and suffer the penalty in headachs, colds, and bilious and nervous attacks.

Most of our schools are also extremely defective in this respect. It is now several years since, on the occasion of a visit to one of the classes of a great public seminary, my attention was first strongly attracted to the injury resulting to the mental and bodily functions

* I rejoice to say, that, since the publication of the former editions of this work, the want of ventilation in the Assembly and Waterloo Rooms has been partially obviated. Their original construction scarcely admits of a complete remedy.

from the inhalation of impure air. About 150 boys were assembled in one large room, where they had been already confined nearly an hour and a half, when I entered. The windows were partly open; but, notwithstanding this, the change from the fresh atmosphere outside to the close contaminated air within, was exceedingly obvious, and most certainly was not without its effect on the mind itself, accompanied as it was with a sensation of fulness in the forehead, and slight headach. The boys, with every motive to activity that an excellent system and an enthusiastic teacher could bestow, presented an aspect of weariness and fatigue which the mental stimulus they were under could not overcome, and which recalled forcibly sensations long bygone, which I had experienced to a woful extent when seated on the benches of the same school.

These observations stirred up a train of reflections; and, when I called to mind the freshness and alacrity with which, when at school, our morning operations were carried on, the gradual approach to languor and yawning which took place as the day advanced, and the almost instant resuscitation of the whole energies of mind and body that ensued on our dismissal, I could not help thinking that, even after making every necessary deduction for the mental fatigue of the lessons and the inaction of body, a great deal of the comparative listlessness and indifference was owing to the continued inhalation of an air too much vitiated to be able to afford the requisite stimulus to the blood, on which last condition the efficiency of the brain so essentially depends. This became the more probable, on recollecting the pleasing excitement occasionally experienced for a few moments, from the rush of fresh air which took place when the door was opened to admit some casual visitor. Indeed, on referring to the symptoms induced by breathing carbonic acid gas or fixed air, it is impossible not to perceive that the headach, languor, and debility consequent on confinement in an ill-ventilated apartment, or in air vitiated by many people, are nothing but minor degrees of the same process of poisoning which ensues on immersion in fixed air. Of this latter state, "*great heaviness in the head, tingling in the ears, troubled sight, a great inclination to sleep, diminution of strength, and falling down*," are stated by Orfila as the chief symptoms, and every one knows how closely these resemble what is felt in crowded halls.

Another instance of the noxious influence of vitiated air, which made a very strong impression on my mind, was during a three hours' service in a crowded country church, in a warm Sunday of July. The windows were all shut, and in consequence the open door was of little use in purifying the atmosphere, which was unusually contaminated, not only by the respiration and animal effluvia proceeding from so many people, but by their very abundant perspiration, excited by the heat and confinement. Few of the lower classes, either in town or country, extend their cleanliness beyond the washing of the hands and face. Hence the cutaneous exudation, in such persons, is characterized by a strong and nauseous smell, which, when concentrated, as it was on this occasion, becomes absolutely overpowering. Accordingly, at the conclusion of the service, there was heard one general buzz of complaint of headach, sickness, and oppression; and the reality of the suffering was amply testified by the pale and wearied appearance even of the most robust.

One of the circumstances which greatly aggravates the bad effects of the vitiated air in most schools, is the very long hours during which the pupils are subjected to its influence. In winter, the whole day is generally spent in school, and exercise in the open air becomes impossible. In the summer, six or seven successive hours of confinement are common, in addition to which even the evenings are consumed in private preparation for the *tasks* of the morrow. Considering the structure and constitution of the human being, a more irrational and more injurious system of education could scarcely be invented. The mind and brain alone are exercised, and their exercise is carried to the degree of exhaustion; while the lungs, the muscles, and the bones, on the exercise of which the health even of the brain directly depends, are neglected and injured by disuse. The effects of breathing air vitiated by the lungs of so many companions for so many successive hours are apathy and exhaustion. The attention flags, the mind becomes indifferent to every thing except an intense longing for liberty and the open air, and the body itself becomes weary and restless.

Since the publication of the former editions of this volume, several intelligent teachers, who were struck with the truth of these remarks, and had the courage to act upon the dictates of a sound physiology by greatly abridging the hours of confinement, encouraging active play in the open air several times a-day, and ensuring the thorough ventilation of the school-rooms at all times, have expressed themselves delighted with the results, and declared that even the intellectual progress was greater with only one half of the confinement, while the health and power of sustained and vigorous attention were greatly improved. Similar testimony was repeatedly offered to Mr Combe by the teachers of the United States. "After the lecture," he says on one occasion, "the teacher of a distinguished private seminary mentioned to me, that, in consequence of the views which he had derived from my lectures on phrenology last year, he had ventilated his school, alternated the studies, and increased the hours of relaxation, and had found the health of himself and his scholars improved, their powers of application increased, and greater enjoyment imparted to them all."* In speaking of a new and thoroughly ventilated public school at Boston, Mr Combe again adds, "the teachers told me that since they have occupied this school-house, the vivacity and capacity of the scholars have obviously been raised, and their own health and energy increased." (P. 155.)

Of the direct influence thus produced on the health of the children, the following facts taken from among many others in the Honourable Horace Mann's Second Report to the Board of Education of Massachusetts, will be sufficient evidence. Of two school-houses situate near each other, the one was dry and *well-ventilated*, and the other damp, and so placed that *ventilation was impracticable*. "In the former," says Mr Mann, "during a period of 45 days, *five* scholars were absent from sickness, to the amount in the whole of twenty days. In the latter, during the same period of time, and for the same cause, *nineteen* children were absent to an amount in the whole of *one hundred and forty-five* days." "The appearances of the children thus detained by sickness indicated a marked difference in their condition as to health."

One of the evils of ignorance is, that we often sin and suffer the punishment, without being aware that we are sinning, and that it is in our power to escape the suffering by avoiding the sin. For many generations, mankind have experienced the evil results of deficient ventilation, especially in towns, and suffered the penalty of delicate health, headachs, fevers, consumptions, and cutaneous and nervous diseases; and yet, from ignorance of the true nature and importance of the function of respiration, and of the great consumption of air in its performance, architects have gone on planning and constructing edifices, without bestowing a thought on the means of supplying them with fresh air, although animal life cannot be carried on without it; and, while ingenuity and science have been taxed to the uttermost to secure a proper supply of water, the admission of pure air, though far more essential, has been left to steal in like a thief in the night, through any hole by which it can find an entrance. In constructing hospitals, indeed, ventilation has been thought of, because a notion is pre-

* Combe's Visit to the United States, vol. iii. p. 169.

valent that the *sick* require fresh air, and cannot recover without it; but it seems not to have been perceived, that what is indispensable for the recovery of the sick, may be not less advantageous in *preserving* from sickness those who are well. Were a general knowledge of the structure of man to constitute a regular part of a liberal education, such inconsistencies as this would soon disappear, and the scientific architect would speedily devise the best means of supplying our houses with pure air, as the engineer has already supplied them with pure water.

The truth of the preceding remarks is strongly confirmed by the recent experience of the highly respectable establishment by which this volume is printed. For years the workmen employed in it were exposed to the full influence of the vitiated air arising in printing-houses from the nature of the materials, the presence of many persons in the same room, and the numerous lights required, especially in winter, the whole of which combined formed an atmosphere sickening and oppressive to those unaccustomed to it, but of the true nature of which, those habitually exposed to it received a much fainter impression. On the attention of the partners being drawn to the importance of pure air to bodily health and mental activity, they became anxious to effect a thorough ventilation of their own premises. The plan resorted to was very simple, viz. opening a hole of six or eight inches square into a disused chimney at each end of the principal apartments, the upper edge of it being on a level with the ceiling. The warm vitiated air naturally ascends, and having the benefit of the draught through the chimney, is readily carried up, and a good ventilation thus established. The consequent improvement in the comfort and working power of the men is, I understand, not less remarkable than the difference in comfort and freshness to a stranger entering from the open air. The same simple plan has been adopted in the printing-office of the *Scotsman* newspaper; and I have been told by one of the proprietors, that there the workmen are now as little exhausted by two or three hours of extra labour, as they were before with their ordinary exertion. But in admitting an abundant supply of fresh air, especially into hospitals, care must be taken that it do not form currents which may be prejudicial to the persons within. A writer in the Lancet, of 29th December 1832, after narrating a case of a patient who was carried off by pleurisy, while under treatment of Dr Elliotson, in St Thomas's Hospital, for disease of the pylorus, gives his opinion, that the pleurisy "was most likely occasioned *by the extreme draughts of this ward*. There is a great current of air in the ward, and I have seen many persons in it suffer very much indeed." In a note it is added, "*The number of patients who are thus carried off yearly, forms a startling list to be laid before the eyes of the Governors of this Institution. Such results are shamefully frequent.*" I have already noticed the occurrence of pneumonic inflammation from the same causes in the garrison at Stirling Castle, and it is to be feared that there are many, both schools and hospitals, as much in need of improvement in this respect as St Thomas's.

It would serve only to encumber these pages needlessly, were I to adduce here in detail any farther evidence that the purity and due renovation of the air which we breathe is really influential in promoting the healthy and energetic activity of both mind and body. The proofs already given are amply sufficient to establish the fact. But, that no doubt may exist in the mind of even the most incredulous or inattentive reader, I shall refer shortly to one or two instances, in which, by the fulfilment of this law of the human constitution, health was extensively preserved, where, when the law was infringed, unusual sickness and mortality prevailed.

We have already seen that a free circulation of air in the sick-room is the most effectual means of preventing the spread of fever. Sir Walter Scott notices incidentally that it was equally efficacious in preventing the extension of plague to the inmates of the Old Tolbooth or Prison of Edinburgh, which he has rendered famous under the name of the "Heart of Mid-Lothian." "Gloomy and dismal as it was," says Sir Walter, "the situation in the centre of the High Street rendered it *so particularly well-aired, that when the plague laid waste the city in* 1645, *it affected none within these melancholy precincts*;"* and yet, in other respects, a jail was precisely the place where the plague might have been expected to prevail with the greatest virulence.

About a hundred years ago, when the pauper infants of London were brought up in the workhouses amidst impure air, crowding, and want of proper food, out of 2800 received into them annually, the frightful proportion of 2690 died within the year! When this murderous mortality at length attracted the notice of Parliament, an act was passed obliging the parish-officers to send the infants to nurse in the country. By this more humane treatment, the mortality speedily fell to 450, being a diminution of 2240 annually. In my *Treatise on the Management of Infancy*, I mention other facts of a similar nature which occurred in the island of St Kilda, and in the Dublin House of Industry, in both of which places the efficacy of ventilation in reducing the mortality among the young was strikingly illustrated, but it would lead to unnecessary repetition to give the particulars here.

In many trades, a great mortality is caused by breathing air rendered impure by dust, metallic fumes, or other irritating agents floating in it; but even in the worst of them, the fatality may be much diminished by attending, as far as possible, to due ventilation, and to the supply of a pure air. In Sir James Clark's excellent work on Consumption and Scrofula, we find an instructive instance of this fact. When treating of vitiated air as a cause of consumption among the fork-grinders of Sheffield, Sir James states, that those who reside in the country, in the enjoyment of a more free circulation of air, live, on an average, eight years longer than those resident in the town. In both, the irritating causes and the habits of life are the same, but the rooms in which the country workmen carry on their labours are much better ventilated, and they consequently live on an average about forty years, while among their town companions the average of life extends only to between *twenty-eight* and *thirty-two* years.

The greater prevalence of consumption among females and persons leading a sedentary life within doors, and its comparative unfrequency among males, and especially among those who live much in the open air, also afford strong evidence that the habitual breathing of pure air, when combined with ordinary prudence in other respects, is one of the surest protections we can have against pulmonary disease.

With regard to the *temperature* and *dryness* of the air which we breathe, some precautions are necessary, especially in winter. When in the enjoyment of a nourishing diet and frequent and active exercise in the open air, the young are not very susceptible of cold. But when confined to the house and deprived of active exertion, as happens during winter in many seminaries, they suffer severely from sitting or sleeping in cold rooms. In such circumstances, chilliness of the surface, coldness of the feet, and a feeble circulation, are commonly complained of, and loudly demand indulgence in ample exercise in the open air, and the provision of a temperate atmosphere within doors. If these remedies be denied, permanent bad health, retarded development of the bodily system, and consumption, will frequently ensue.

Since the introduction of Arnott's and other stoves into churches, sitting and bed rooms, it has become doubly necessary to attend to the degree of *dryness* in

* Heart of Mid-Lothian, vol. i. chap. 6, note.

the air we breathe. In its natural state, the air always contains more or less moisture, and the system is constituted with relation to that fact. When, however, a room is heated by a stove, the air which it contains is rendered far too dry for healthy respiration, and in that state, it acts injuriously both on the lining membrane of the air-cells and on the skin. On the Continent, where stoves are much used, a large vessel containing water is generally placed on the top of them to supply the necessary humidity by evaporation; and the plan answers very well, as the warmer the stove, the more rapid will also be the evaporation. Dr Arnott very properly insists strongly on some such precaution being combined with the use of his stoves in this country.

A very *moist* atmosphere is also injurious. It impedes exhalation from, and stimulates absorption by, the lungs and skin, so that any deleterious impurity, such as miasma or contagion, is much more likely to be received into the system when floating in a moist air. But as this condition admits of remedy only by a change of residence to a drier locality or by draining, it would be foreign to my present purpose to enlarge upon it here.

The next method for promoting the health of the lungs has a direct reference to the second condition of healthy respiration, and consists in the *perfectly free expansion of the chest, so that the pure air which has been provided may have easy and full access to the air-cells of the lungs.* This condition of health implies not only that all external restraints upon the expansion of the chest shall be removed, but that, as a general rule, the mode of life shall be sufficiently active to ensure that full and deep respiration, without which the aëration of the blood cannot be adequately effected.

At all periods of life this condition of health is very important, but in youth, and especially during the rapid developement of the organization, it may justly be said to be indispensable. The formation of a sound constitution will depend more upon its fulfilment than upon any other single condition; and yet, if we examine the prevailing methods of education and usages of society to ascertain how far it is acted upon, we shall find but little room for boasting, and much for disappointment. Instead of frequent intervals of varied and active exertion in the open air being made to divide the long periods of confinement and mental occupation to which the young are subjected, we find scarcely a moment left, or a change of position allowed, between one lesson and another. Even during the short time allotted for exercise, a formal monotonous walk, at a pace which leaves the breathing as limited and feeble as before, is often all the indulgence which is granted. In more mature life, the habit thus cultivated becomes confirmed, and many, especially females, spend their days in sedentary occupations and complete bodily inaction, which render freedom of respiration impossible. If, however, we regard the laws of the animal economy in their true light of clear expressions of the will of the all-wise Creator who instituted them, and not as mere emanations of the mind of man, we shall be much less likely to fall into errors of this kind, and far more anxious to carry the Divine intentions into practical effect. The common notion is, that physiological principles and hygienic laws are the mere inventions of man, and hence that they may be attended to or neglected with equal impunity as if they really were so. This is a fatal mistake.

Not only, however, is general exercise or bodily activity required to ensure the health of the lungs by the complete and effectual respiration which it necessitates, but the direct exercise of the lungs themselves is, when judiciously managed, one of the most efficacious means which we can employ for promoting their development and warding off their diseases. In this respect the organs of respiration closely resemble the muscles and all other organized parts. They are made to be used, and if they are left in habitual inactivity, their strength and health are unavoidably impaired; while, if their exercise be ill-timed or excessive, disease will also as certainly follow.

The lungs may be exercised *indirectly* by such kinds of bodily or muscular exertion as require quicker and deeper breathing; and *directly* by the employment of the voice in speaking, singing, reading aloud, or crying. In general both ought to be conjoined. But where the chief object is to improve the lungs, those kinds which have a tendency to expand the chest, and call the organs of respiration into play, ought to be especially preferred. Rowing a boat, fencing, quoits, cricket, shuttlecock, and the proper use of the skipping rope, dumbbells, and gymnastics, are of this description. All of them employ actively the muscles of the chest and trunk, and excite the lungs themselves to freer and fuller expansion. Climbing up hill is, for the same reason, an exercise of high utility in giving tone and freedom to the pulmonary functions.

Where, either from hereditary predisposition or accidental causes, the chest is unusually weak, every effort should be made, from infancy upwards, to favour the growth and strength of the lungs, by the habitual use of such of the above-mentioned exercises as can most easily be practised. The earlier they are resorted to, and the more steadily they are pursued, the more certainly will their beneficial results be experienced. In their employment, the principles explained in the chapter on the Muscles ought to be adhered to.

Habitual exercise in a hilly country, and the frequent ascent of acclivities, especially in pursuit of an object, are well known to have a powerful effect in *improving the wind* and strengthening the lungs; which is just another way of saying that they increase the capacity of the chest, promote free circulation through the pulmonary vessels, and lead to the more complete oxygenation of the blood. Hence the vigorous appetite, the increased muscular power, and the cheerfulness of mind so commonly felt by the invalid on his removal to the mountains, are not to be wondered at. I was myself sensible of advantage from this kind of exercise during a Highland excursion. The necessity of frequent and deep inspirations, and the stimulus thus given to the general and pulmonary circulation, had an obvious effect in increasing the capacity of the lungs and the power of bearing exertion without fatigue. Even when I was wearied, the fatigue went off much sooner than after a walk of equal length on a level road, and was unattended with the languor which generally accompanied the latter. In fact, the most agreeable feeling which I experienced during the whole time was while resting after undergoing, in the ascent of a hill, a degree of exertion sufficient to accelerate the breathing, and bring out free perspiration. A lightness and activity of mind, and freedom about the chest, which I never felt to the same extent at any other time, followed such excursions, and made the fatigue comparatively light.

Before such practices, however, can be resorted to with advantage, or even with safety, there must be nothing in the shape of active disease existing. If there be, the adoption of such exercise will, in all probability, occasion the most serious injury. This also I experienced in my own case, as, for many months at an earlier stage of convalescence, going up a stair, ascending the most gentle acclivity, or speaking aloud for a few minutes, was equally fatiguing and hurtful, and often brought on cough, and occasionally a slight spitting of blood. All that time, riding on horseback, which exercises the body without hurrying the breathing, was especially useful. The advantage of these exercises in giving tone and capacity to the lungs, where debility rather than disease is complained of, is shewn in their being uniformly resorted to in preparing for the race-course and for the field. The true sportsman puts himself in training as well as his dog or his horse,

and fits himself for the moors by regular excursions previous to the 12th of August. By so doing he improves his wind and increases his muscular strength to a remarkable extent in a very short time.

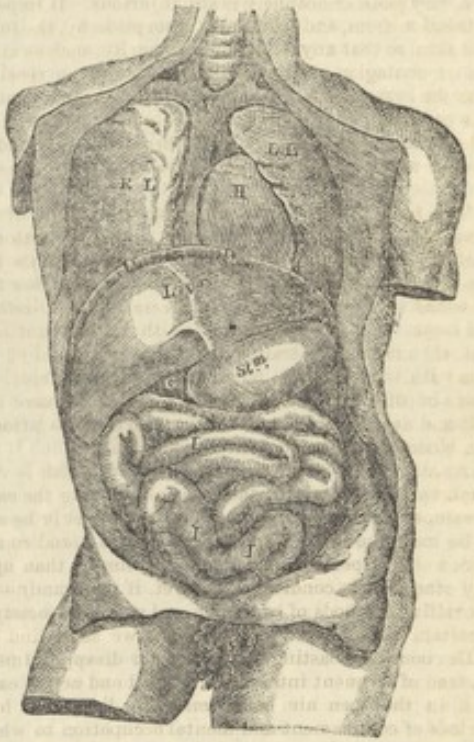
When no active pulmonary disease exists, these exercises may, with the best effects, be frequently carried so far as to induce free perspiration; only great care ought to be taken not to remain inactive, but immediately to rub the surface of the body thoroughly dry, and to change the dress. It is quite ascertained that, with these precautions, perspiration from exercise is the reverse of debilitating. It equalizes and gently stimulates the circulation, relieves the internal organs, improves digestion, and invigorates the skin. Jackson testifies strongly to these results, when he declares that the severe exercise undergone in training, not only improves the lungs, but always renders the skin "quite clear, *even though formerly subject to eruptions.*"* These assertions are, of course, to be received as the statements of a man partial to his own art; but they are in accordance with experience, and with the laws of the animal functions, so far as these are known. They, therefore, merit the consideration of professional men, and of those whose features are often disfigured by eruptions which they find it difficult to remove by any kind of medicine.

I need hardly repeat, that, when wishing to favour the development of the lungs, we ought to be scrupulous in avoiding such positions of the body as hinder their full expansion. Tailors, shoemakers, clerks at a writing-desk, and the like, are unfavourably situated in this respect, as their bent position constrains the chest, and impedes the breathing and circulation.

Direct exercise of the lungs in practising deep inspiration, speaking, reciting, singing, and playing on wind instruments, is very influential for good or for evil, according as it is indulged in with or without due reference to the constitution of the individual. If it is properly managed and persevered in, particularly before the frame has become consolidated, nothing tends more to expand the chest, and give tone and health to the important organs contanied in it; but if either ill-timed, or carried to excess, nothing can be more detrimental. In this respect, as well as morally, the introduction of singing into our common schools, as lately encouraged by Government, will prove an inestimable advantage; and I should rejoice to see it universally adopted as an essential element of physical, intellectual, and moral education, in all classes of society. To the poor especially, it will supply a means of enjoyment and refinement which will do much to improve their existence, and diminish the attractions of the ale-house. As a preventive of disease, Sir James Clark is in the habit of recommending the full expansion of the chest in the following manner: "We desire the young person, while standing, to throw his arms and shoulders back, and, while in this position, to inhale slowly as much air as he can, and repeat this exercise at short intervals, several times in succession; when this can be done in the open air, it is most desirable, a double advantage being thus obtained from the practice. Some exercise of this kind should be adopted daily by all young persons, more especially by those whose chests are narrow or deformed, and should be slowly and gradually increased."† In this recommendation I heartily concur.

On the same principle, even the crying and sobbing of children contribute to their future health, unless they are caused by disease, and carried to a very unusual extent. The loud laugh and noisy exclamations attending the sports of the young, have an evident relation to the same beneficial end; and ought therefore to be encouraged instead of being repressed, as they are often sought to be, by those who, forgetting that they themselves were once young, seek in childhood the gravity and decorum of more advanced age. I have already noticed at p. 35, an instance on a large scale, in which the inmates of an institution were, for the purpose of preserving their health, shut up within the limits of their hall for six months, and not allowed to indulge in any noisy and romping sports. The aim of the directors was undoubtedly the purest benevolence, but, from their want of knowledge, their object was defeated, and the arrangement itself became the instrument of evil.

Beneficial as the direct exercise of the lungs is thus shewn to be in strengthening the chest, its influence extends still farther. If we examine the position of the lungs as represented in the subjoined figure, we



shall see, that, when fully inflated, they must necessarily push downwards and flatten the moveable arch of the diaphragm D D, by which they are separated from the belly or abdomen. This alteration, however, cannot take place without the diaphragm in its turn pushing down the liver (Liv$^{r.}$), stomach (St$^{m.}$), and bowels (I. I.), which it accordingly does, causing them to project forwards and outwards. But no sooner are the lungs fully inflated, than the contained air is again thrown out. The lungs diminish in size, the diaphragm rises, and with it all the contents of the abdomen return to their former position. The whole digestive apparatus is thus subjected to a continual pressure and change of place; and the stimulus thence arising is in truth essential to the healthy performance of the digestive functions, and is one of the means arranged by the Creator for the purpose. Consequently, if the lungs be rarely called into active exercise, not only do *they* suffer, but an important aid to digestion being withdrawn, the *stomach* and *bowels* also become weakened, and indigestion and costiveness make their appearance. I have already alluded to this subject in the chapter on muscular exercise, and also considered it in detail in my work *On Digestion and Diet*; but the general principle will be sufficiently understood by the inspection of the above figure.

After this exposition I need hardly say that the loud and distinct speaking enforced in many public schools is productive of much good to the young, and that the lessons in singing now to be carried into effect in other institutions besides Infant Schools are much to be com-

* Sir John Sinclair's Code of Health, 5th edition. Appendix, p. 37.

† Clark on Consumption and Scrofula, p. 298.

mended. Let any one who doubts their efficacy as exercises of the lungs, attend to what passes in his own body on reading aloud a single paragraph, and he will find not only that deep inspirations and full expirations are encouraged, but that a considerable impulse is communicated to the bowels; affording a marked contrast to the slight breathing and quiescent posture of those whose voices never rise above a whisper.

Reading aloud, public speaking, and lecturing are excellent exercises for developing the lungs and the chest. But, as they require some exertion, they ought to be indulged in with prudence, and with constant reference to the constitution and health of the individual. The reviewer of a former edition of the present volume (himself a lecturer), in noticing this part of the book, adds the following testimony:—"We know ourselves, from personal experience, that, often when preparing to go to lecture, a languor has crept upon us, inducing an unwillingness to exert ourselves. We have gone,—the lecture has commenced,—the mind was called into action,—a perspiration broke forth on the brow,—the circulation was equalized,—and, at the conclusion of the lecture, the languor was gone." Hence he recommends "reading to one's family in the evening," "as an excellent practice, and one tending much to sweeten social life."* When early resorted to, and steadily persevered in, such exercises are very useful in warding off disease, and communicating strength to an important function. But when begun suddenly, and carried to excess by persons with weak lungs, they are more directly injurious than almost any other cause. It is not uncommon for young divines to make excessive exertions in preaching, without any preparation for the effort which it requires, and to experience, in consequence, pains in the chest, spitting of blood, and other dangerous forms of disease, which often extinguish their brightest prospects in the morning of life. Sacrifices of this kind are the more to be lamented, because it is probable that, by a well-planned system of gradual preparation, many who fall victims might find in their profession even a source of safety.

The late illustrious Cuvier, as was mentioned at page 45, is considered to have been saved from an early death, by his appointment to a professorship leading him to the moderate and regular exercise of his lungs in teaching—a practice which soon removed the delicacy of chest to which he was subject, and enabled him to pass uninjured through a long and active life. Other examples of the same kind might be mentioned. But it is important to observe that in all of them the exercise was, at all times, accurately proportioned to the existing state of the lungs. Had active disease existed, or the exertion required been beyond what the lungs were fully able to bear, the effect would have been, not to improve health, but to destroy life; and this condition of accurate relation between the amount of exercise and the state of the organization must never for a moment be overlooked. With a little care, however, the point at which direct exercise of the lungs ought to stop may easily be determined by observing its effects.

The same principle leads to another obvious rule: When disease of any kind exists in the chest, exercise of the lungs in speaking, reading, and singing, and also in ordinary muscular exertion, ought either to be entirely refrained from, or strictly regulated by professional advice. When a joint is sore or inflamed, we know that motion impedes its recovery. When the eye is affected, we, for a similar reason, shut out the light; and when the stomach is disordered, we have respect to its condition, and become more careful about diet. The lungs demand a treatment founded on the same general principle. If they are inflamed, they must be exercised as little as possible, otherwise mischief will ensue. Hence, in a common cold of any severity, silence, which is the absence of direct pulmonary exercise, ought to be preserved, and will, in truth, be its own reward. In severe cases, and in acute inflammations of the chest, this rule is of the greatest importance. It is common to meet with patients who cannot speak three words without exciting a fit of coughing, and who, notwithstanding, cannot be persuaded that speaking retards their recovery. In like manner, in spitting of blood, and in the early stage of tubercular consumption, when the breathing cannot be excited without direct mischief, it is often difficult to convince either the patient or his friends of the necessity of silence. He perhaps does not feel pain on attempting to speak, and says, that "it merely raises a short tickling cough, which is nothing." But if he persists, dearly bought experience will teach him his error, and dispose him to regret as did a lamented friend of the author, that a few weeks out of the years which he had dedicated to the study of the classics had not been devoted to the acquisition of some little knowledge of the structure and functions of his own body. In the instance alluded to, after spitting of blood had been induced by severe bodily labour, the patient continued talking almost the whole day to the visiters and inmates of a large public establishment, and believed himself all the time to be very careful, as he said he was no longer exerting his body. When the error was pointed out, and the mechanism of the lungs explained to him, he deeply bewailed the ignorance which had allowed him to act in a manner so pernicious.

All violent exercise ought, for similar reasons, to be refrained from, during at least the active stages of cold. Every thing which hurries the breathing, whether walking fast, ascending an acclivity, or reading aloud, has the same effect on the diseased lungs that motion of the bone has on an inflamed joint. It seems to me, that many people hurt themselves much more by the active exercise they take during a severe cold than by the mere exposure to the weather. It is well known that a person, when suffering from cold, may go out for a short time even in an open carriage more safely than on foot; and there is much reason to believe, that it is the absence of active exertion of the lungs in the former case, which makes the exposure less hurtful.

After all active disease has been subdued, or when nothing but delicacy remains, the adequate exercise of the lungs is one of the best means of promoting effectual recovery. Those parents, therefore, act most erroneously, who, in their apprehensive anxiety for the protection of their delicate children, scrupulously prohibit them from every kind of exercise which requires the least effort, and shut them up from the open air during winter, with the false hope of thereby warding off colds and protecting their lungs. I have seen the greatest delicacy of constitution thus engendered, especially where an undue quantity of warm clothing was at the same time employed. When tested by the principles above explained, such conduct is found to be as ill adapted as possible to the end in view, and utterly at variance with the laws of the animal economy.

Considering the delicacy and extent of the lining membrane of the lungs, and the ready access to it which the external air has, it cannot be a matter of surprise that sudden or great changes in its temperature or constitution should often operate injuriously on the lungs, and be the means of inducing not only colds but more serious disease. Hence, especially in delicate subjects, the obvious propriety of diminishing the risk of sudden transitions by breathing through several folds of woollen fabric or silk when obliged to pass from a warm room to the cold external air, or to breathe a cold or damp air for a length of time. The cold air becomes partially heated and deprived of its moisture in passing through such a medium, and the protection thus afforded is so marked, that few who have tried the precaution will ever afterwards neglect it. Since these remarks were first published, a very ingenious instrument has

* London Medical and Surgical Journal, No. 134, p. 107.

been contrived by Mr Jeffreys of London, for wearing over the mouth and preserving a uniform temperature in the air we breathe, even in passing from a warm drawing-room to a cold wintry atmosphere. From personal experience, as well as observation of its effects on others, I can speak very favourably of its usefulness for pulmonary invalids, and for persons who suffer from delicacy in any part of the air-passages. The instrument is called "Jeffreys' Respirator."

Perhaps the most important time in the life of a person born with a predisposition to consumption is that of puberty, comprising from the commencement of rapid growth to the full consolidation of the system about or after the twenty-fourth year. In most young people, the transition from adolescence to maturity is so rapid, that for two or three years all the animal powers are tasked to enable nutrition to keep pace with growth, and a corresponding debility of both body and mind is often observed to co-exist, indicating in the clearest manner the necessity of a temporary remission from such studies and occupations as require much mental exertion or confinement within doors. The development and health of the physical system ought then to be almost exclusively attended to; and when the body has acquired its solidity, the mental faculties will again become active. I have seen instances where a knowledge of the latter fact afforded substantial consolation to young men who, while their bodies were growing rapidly, were apt to become despondent, on account of the unusual sluggishness and inefficiency of their intellectual powers. In the course of a few years, when growth and consolidation were completed, the brain vigorously resumed its functions.

In such circumstances, relaxation from study, residence in the country, exercise in the open air, plenty of food, and freedom from care, will often do immense good, if sufficiently persisted in, and go far to protect the careful patient against the future invasion of consumption. Whereas, if, under the mistaken notion that such precautionary measures are a waste of time, a delicate growing youth is allowed to continue at his studies or his desk till disease has actually commenced, the disappointed parent may discover that it is too late to take alarm when health is gone.

I am desirous to draw the attention of parents to this subject, because a good deal of observation has satisfied me that too little attention is paid to the *preservation* of health at this critical period of life, and that, by proper management during the transition from adolescence to maturity, many might be saved who now fall victims. The statistical returns of large towns shew that in the male sex the period between seventeen and twenty-four years of age is really, as described by a late careful investigator of the laws of mortality, "one of restlessness, toil, and danger; the human faculties are then exercised to the utmost, and life is more freely expended than at any other season."* It appears, for example, from Count Chabrol's Statistical Researches of the City of Paris and Department of the Seine, that, in 1819, the total mortality was 22,445, of whom 10,865, were males, and 11,580 were females. Of this number there died—

	Males.	Females.
Between the ages of 10 and 15,	198	238
. . . . . 15 . . 20,	420	391
. . . . . 20 . . 25,	815	650
. . . . . 25 . . 30,	374	567

Shewing a remarkable increase in the number of deaths between 15 and 20 over those beween 10 and 15, and again another increase of nearly double in those between 20 and 25 over those between 25 and 30. In the females, from circumstances not now to be explained, the period of increased mortality extends to nearly 30 years of age. Similar results were obtained in the succeeding years.

These tables, confirmed by others drawn up with equal accuracy, place in a striking point of view the dangers of the state of transition from youth to manhood, especially amidst the temptations of a luxurious capital; and the necessity of attempting, by early instruction and timely prudence, to protect the young against the numerous causes of disease which then come into active and fatal operation. They ought also to serve as a warning to those who, in the spring-time of life, are inclined to trust implicitly for their safety to the strength of a good constitution, and to despise the prudence which dictates the avoidance of unnecessary exposure. The experience derived from the limited observation of one man may be set aside as undeserving of trust; but when the unvarying results exhibited to us are deduced from the changes in nearly a million of people, it is impossible to ascribe them to chance, or to deny their bearing on ourselves. Many invaluable practical truths will, ere long, be furnished to the world by the statistical researches now in progress.

The earlier maximum of mortality in the male sex, especially in cities, is explicable by the fact, that it is at the approach of manhood, when both mind and body are in a state of transition, that dissipation is most indulged in, and presses with its deadliest force. Many delicate youths are carried off, who would have escaped without injury, if they could have been persuaded to act with prudence during these two or three critical years. Many, I am constrained to say, first learn the means of their destruction in boarding-schools and places of public resort, and that often when no mischief is suspected by their respectable teachers. On this topic, however, the nonprofessional character of the present work precludes me from entering into details.

There is another requisite for the permanent health of the lungs, to which sufficient weight is far from being attached in society, and which I can scarcely urge too strongly upon the attention of parents and the guardians of the young, as well as of the young themselves. I allude to the influence of the original constitution of the lungs. No fact in medicine is better established than that which proves the hereditary transmission from parents to children of a constitutional liability to pulmonary disease, and especially to consumption; yet no condition is less attended to in forming matrimonial engagements. The children of scrofulous and consumptive parents are generally precocious, and their minds being early matured, they engage early in the business of life, and often enter the married state before their bodily frame has had time to consolidate. For a few years, every thing seems to go on prosperously, and a numerous family gathers around them. All at once, however, even while youth remains, their physical powers begin to give way, and they drop prematurely into the grave, exhausted by consumption, and leaving children behind them, destined in all probability either to be cut off as they approach maturity, or to run through the same delusive but fatal career as that of the parents from whom they derived their existence.

Many examples of this kind might be pointed out among the higher classes of society, who are not restrained from following their predominant inclinations by any necessity of seeking subsistence in professional pursuits. And many instances might be referred to, in which no regard was shewn to the manifest existence of the same disposition in the family of either parent, and in which, consequently, the married state was embittered either by barrenness, which is then the most favourable result, or by the prevalence of disease and delicacy in the progeny. It may not be easy to enforce upon the young and inexperienced the requisite degree of attention to these circumstances; but surely education, especially when backed by example, might do much, if the young were properly instructed at an early period in the lead-

* On the Natural and Mathematical Laws concerning Population, Vitality, and Mortality. By Francis Corbaux. P. 92.

ing facts and principles of the human constitution. Where hereditary precocity and delicacy of frame exist, marriage, instead of being hastened, ought invariably to be delayed at least till the fullest maturity and consolidation of the system; otherwise the consequences will be equally unhappy for the individual and for his progeny. During growth and for a considerable time afterwards, the constitution is still imperfect even in healthy subjects, and wants the enduring strength which it acquires in mature age, and the possession of which marks the period which nature has fixed for the exercise of the functions of reproduction. Many young people of both sexes fall sacrifices to early marriages, who might have withstood the ordinary risks of life, and lived together in happiness, if they had delayed their union for a few years, and allowed time for the consolidation of their constitutions.

I have urged this point strongly, because hereditary predisposition is, avowedly and beyond all doubt, a frequent source of the more serious forms of pulmonary disease, and it would be worse than folly to allow past and painful experience to go for nothing. Medical men have much in their power in preventing such violations of the laws of the Creator, at least where they are regarded, as they always ought to be, as the friends not less than the professional advisers of the family.

As connected with this subject, I may mention that Sir James Clark has the merit of having drawn attention to the important fact, that a state of impaired health in the parent, *whether constitutional or acquired*, and particularly if caused by imperfect digestion and assimilation, is as productive of a tendency to scrofula and consumption in the children as if it had descended by hereditary transmission. If parents in general were duly impressed with the truth and bearing of this fact, many of them might be induced, on account of their children, to take that rational care of their own health which they seem to be incapable of doing for its own sake.

The last requisite for the health of the lungs which I need mention here, is a due supply of rich and healthy blood. When, from defective food, or impaired digestion, the blood is impoverished in quality, and rendered unfit for adequate nutrition, the lungs speedily suffer, and that often to a fatal extent. So certain is this fact, that, in the lower animals, *tubercles* (the cause of incurable consumption) *can be produced in the lungs to almost any extent, by withholding a sufficiency of nourishing food, or by causing them to breathe a vitiated atmosphere.* The same circumstances operate to a lamentable extent among the poorly fed population of our manufacturing towns; whereas it is proverbial that butchers—a class of men who eat animal food twice or thrice a-day, and live much in the open air,—are almost exempt from pulmonary consumption. Among the higher classes, again, the blood is impoverished, and the lungs are injured, not from want of food, but *from want of the power of adequately digesting it*; and hence we find, in every treatise on consumption, a section devoted specially to "*dyspeptic phthisis*," as it is called, or simply "consumption from bad digestion." The late hours, heavy meals, and deficient exercise, which are so generally complained of, but still so regularly adhered to in society, are the chief sources of many of these evils.

Before quitting this important subject, I may add another word of advice, in regard to those who are predisposed to consumption or weakness of chest. As soon as active growth commences, permanent benefit may be derived from removal, for a few years, to a milder and less variable climate. Many who are sent abroad only to die painfully in a foreign land, in the noonday of life, might have lived for years in the enjoyment of health and usefulness, had they been sent abroad *before* the appearance of disease, instead of after its unequivocal commencement. The previous delicacy, whence the susceptibility to colds and pulmonary affections arises, ought to attract the earliest attention, and excite the most persevering efforts, for its removal. If it be allowed to make progress till consumption has commenced, medicine may come armed with its most powerful remedies, and directed by the most consummate skill; but it will too often come in vain. The rage which now prevails for mere intellectual education, and the utter neglect of the bodily health to which it leads, is too often carried so far as to be a curse rather than a blessing; and till its fury be moderated by an increase of good sense in the parents, great mischief must, I fear, continue to ensue.

I cannot dismiss this subject without again referring the reader to Sir James Clark's work on Consumption and Scrofula as affording, I may almost say for the first time, a comprehensive, philosophical, and practical view of the causes, nature, and treatment of consumption; the able author has not, it is true, greatly extended our power over that fatal disease in its most advanced periods; but he has done more to throw light upon its causes, to obviate its development, and to arrest it in its incipient stages, than any author with whose writings I am acquainted.

CHAPTER XI.

THE BRAIN AND NERVES CONSIDERED IN THEIR RELATION TO THE REST OF THE BODY AND TO THE MENTAL FACULTIES.

The whole organization subservient to the mind.—The mind acts through the medium of organs, and cannot act without them.—Necessity of attending to this fact.—The mind and its organs not identical.—The mind the true characteristic of the human being—the bodily features take their expression from it.—The brain alone necessary to the mind—the rest of the body may be mutilated without impairing the mind—example.—The connexion of brain and mind theoretically admitted, but practically neglected by educationists and others—consequences of this neglect.—The brain the organ of the internal mind—the muscles and bones its executive organs—the hand and limbs subservient to, not creative of, mental power.—Hence brain and bodily structure simple and rude where instincts and capacities few and limited—examples in the sheep, tiger, antelope, and oyster.—Relation of organs of nutrition to the mind.—Animal and organic or vegetative functions.—Summary of the constitution of the human body.—The brain described—the nerves, and their uses in connecting man with the external world.—The brain becomes complex in proportion as new powers are added—Necessity of observing and conforming to its laws of action.

THE more carefully we investigate the nature and objects of the human constitution, it becomes only the more demonstrable that THE MIND, which feels, and thinks, and directs, is, so to speak, the truly human or characteristic portion of our being, and that the whole corporeal frame is constructed with direct reference to its properties and wants; or, in other words, that *subservience to the purposes of the mind is the fundamental principle on which the bodily organization has been fashioned.*

Placed as we are in the midst of a material world, acted upon at every moment of our lives by material objects, and requiring to act upon them in return, a material organization is indispensable for the operations of mind. Accordingly, we know mind only as it exists and acts during life in combination with the living organization, and can no more form a conception of its abstract qualities as disjoined from the body than we can of the principle of gravitation as disjoined from matter.

Palpable and undeniable as this great truth is, and universally as it is admitted in the abstract, there is, and always has been, a strange tendency in mankind to shrink from its contemplation as a practical proposi-

tion, and from accepting its legitimate consequences. Not remembering that, if it be so, "the thing is of God," and therefore good, many have entertained an apprehension that if the mind be admitted to be under the influence of the organization during life, its eternal existence must be thereby rendered doubtful. But such a fear displays a lamentable distrust of the omnipotence and wisdom of God. If, in the first place, the evidence be sufficient to demonstrate the fact that, during life, the mind acts, and is acted upon, by material instruments, we have no choice but to believe it, and to make the most of it for our own advantage. To shut our eyes to its perception, or our understandings to its consequences, cannot alter the reality, or undo that which God has seen right to ordain. If, again, we reject the fact, on the ground that it implies the impossibility of continued existence in another world, our distrust becomes mixed up with the grossest presumption which a fallible creature can shew towards its infallible Creator. Reason tells us that the future destiny of the mind or soul depends wholly on the will or *fiat* of the Almighty, and not in the very least on its own nature or essence. Whether material or immaterial, it is equally capable of receiving at His hands an eternity of existence.

Individually, therefore, I attach no manner of importance to this long agitated question, but rely with unshaken constancy on God having given to the human being, in mind as in body, that constitution which He saw to be best fitted for him. But, for the sake of those who are influenced by such considerations, I may remark, that, although the mind acts through the medium of the organization, this is very far from implying that the mind and its organs are identical. The mind sees through the medium of the eye, and, in this world, cannot see without it; but it is not itself the eye. In like manner my mind now expresses its thoughts through the medium of the arm and hand which guide my pen; but will any one maintain that therefore my mind and arm are one and the same? When insensibility follows a severe blow on the head, are we to suppose that the immaterial mind is shattered by the shock? Or when fever racks the brain, and raving delirium ensues, are we to believe that it is the mind itself which is sick and in danger of death? On the contrary, we perceive at once that if the brain be the instrument by which the mind works, the destruction or disease of the instrument alone becomes sufficient to explain the disturbance of the mind, without the necessity of supposing the immaterial principle itself to be involved.

As, then, every faculty or quality, by which man is distinguished from the rest of the animal creation, is possessed, and acts, in immediate connexion with some corresponding peculiarity of organization, it follows that the structure of the human being must hold the same high relation to the less perfect structure of the lower animals which the elevated qualities of man hold to the instincts and limited capacities of the brutes. To ascertain how far this inference is well founded, let us shortly inquire what the qualities are by which man is characterized, and with what parts of the organization these qualities are more immediately connected?

For the elucidation of the first point, we have only to reflect upon what passes through the mind when we wish to form or to communicate a correct opinion of any historical personage or private friend whose worth and character we are anxious to see duly appreciated by others. Instinctively we fix at once upon the QUALITIES OF THE MIND—the peculiar combination of affections and moral and intellectual excellencies which we believe him to possess—as constituting the features which distinguish him from other men, and give him a claim to our regard. Knowing mind in this world only as it exists in connexion with the living organization, we, no doubt, always associate these mental endowments with some form of body and peculiarity of features; but in the very act of doing so, we are still perfectly conscious that it is the *stamp of mind* imprinted on them which constitutes their chief attraction, and which, more than any merely physical advantage, gives to man his acknowledged superiority over the rest of the animal kingdom. Accordingly, when we warmly recommend one friend to another, we never think of saying, Love him because he is six feet high, or because he has a Roman nose, a Grecian mouth, fine eyes, or a well turned limb. Allowing all these personal advantages (which in themselves are not to be despised) to make their own impression, we instinctively feel that they constitute a very sandy and unstable foundation for esteem and confidence, and rest our claims on his intelligence, prudence, benevolence, or integrity; certain that, if we succeed in establishing the *mental and moral excellence* of our friend, we shall serve him far more effectually than if we could prove him to possess the grace and symmetry of an Apollo or an Adonis.

The mind being thus the ruling principle or power for the use of which the whole bodily organization has been designed, it follows, that, whatever injury the body may sustain in other respects, so long as those parts of it which minister directly to the mental and moral faculties remain entire and in health, the human being will continue in undiminished possession of all the qualities for which we really value him, and by which he is distinguished from creatures of a lower grade. Thus a person may be born without arms or legs, be almost as incapable of locomotion, and even more incapable of supplying his own wants, than the oyster within its shell, and yet excel in every moral and intellectual attribute for which humanity is prized. In the same way a friend may lose one or more of his limbs, or his body be disfigured by accident or disease; but so long as his mind remains, with its affections as warm, its moral feelings as active and pure, and its intellectual powers as vigorous, as before, we recognise his identity, love him with the same ardour, rely upon him with the same unfaltering constancy, and rate his worth as highly, as when his form was distinguished for its symmetry, and every motion for its gracefulness and ease. Since this remark was written, a beautiful example of its truth has appeared in the newspapers, under the not inappropriate title of of an "*Exquisite Anecdote of Woman's Affection.*"—It is stated that "Sir Robert Barclay, who commanded the British squadron in the battle of Lake Erie, was horribly mutilated by the wounds he received in that action, having lost his right arm and one of his legs. Previously to his leaving England, he was engaged to a young lady, to whom he was most tenderly attached. Feeling acutely, on his return, that he was a mere wreck, he sent a friend to the lady, informing her of his mutilated condition, and generously offering to release her from her engagement. 'Tell him,' replied the noble girl, 'that *I will joyfully marry him, if he only has enough of body left to hold his soul!*'" The appositeness of this illustration is too obvious to require any comment.

If, then, the mind be the directing power for the use of which the bodily organization was originally designed by the omniscient Creator, and if the limbs which act as the executors of its will may be removed, and yet the powers and capacities of the mind itself remain unimpaired, it necessarily follows that these parts cannot be directly essential to its integrity, and that for the various purposes of perception, thought, and feeling, the mind must be in immediate connection with some other portion of the bodily organization, which not only remains entire amidst so much destruction, but also must be so placed and so constituted as to maintain a communication with, and exercise an influence upon, all other parts of the body. Such accordingly is the fact, and by universal consent THE BRAIN is now admitted to be the immediate organ of

the mind, and the seat of emotion, perception, and thought; and *the nerves* which connect it with the rest of the body are ascertained to be the means by which it maintains its communication with the external world, and exercises an influence over all the other functions. Hence the deep interest which attaches to the study of the brain and nervous system, and which renders an accurate acquaintance with their functions and laws of action so useful to every one engaged in the great work of human improvement.

To many of my readers it may seem needless to enforce, at so much length, a proposition which, in its abstract form, nobody thinks of denying; but unfortunately, there is a vital difference between admitting theoretically that the mental powers cannot act during life except through the medium of their appropriate organs and adopting the same great truth as a practical principle, to be applied in the daily conduct of life, and in the education and general treatment of the young. Turn where we will to the best authors on education, to the most highly gifted and experienced of our physicians and teachers, and to the purest and most sincere among the moral and religious guides of the young, we find each and all of them thinking and acting as if the minds under their charge were, even in this life, abstract and separate entities, entirely beyond the influence of the organization. They study the mind and try to discover its laws, altogether without regard to the properties of the living organization with which God has connected it. In so doing they proceed much in the same way as if, in physics, we were to investigate the nature and laws of caloric, without paying any regard to the properties and modifying influence of the bodies in combination with which alone caloric can come under the cognizance of our senses; and yet we are daily surrounded by the most conclusive and even startling evidence that the mental functions are as immediately affected by the condition of the organs which execute them as the action of caloric is by the properties of the objects with which it is combined.

If, then, we really wish to obtain consistent and useful results in the investigation of mind, this is not the way in which we ought to proceed. As we cannot alter the constitution which God has given us, it behoves us to study its nature and laws as He has presented it to us, combined with and influenced by a living organization,—in short, to follow the same course which has been so successfully pursued in our researches into other departments of science. It is long since Bacon demonstrated that the inductive method of inquiry is the only one which can avail us; and since mere speculation on mind has been tried for two thousand years, and tried in vain, why should we be longer deterred from entering upon the only path which can lead to success in the investigation of *mental*, as well as of *physical* nature?

In inquiring into the mutual relations of the mind and body, the great leading fact which ought never to to be lost sight of, is, that one part of the organization —namely, the *brain*—is directly appropriated to what may be called the *central* or *internal* operations of mind, such as perception, emotion, thought, and judgment; and that other parts—the muscles and bones, *or organs of voluntary motion*—are appropriated to what may be called its *external* operations, viz. executing the external commands of the will. Palpable as is the distinction between these two classes of operations, it has, strange to say, been often overlooked; and hence certain philosophers have gravely contended that man owes all his mental superiority to the perfection of his hands. The propounders of this most untenable doctrine overlook the fact, that the hands are useful only in proportion to the intelligence and skill of the mind which guides and directs them, and that the well formed hands of an idiot are of no advantage to him, and impart to him none of the mental power of which he stands so much in need. Accordingly, the more carefully we shall enquire, the more certain will it appear that it is not by any perfection of the merely secondary instruments of voluntary motion, but by the combined superiority of mind and brain, that man is peculiarly distinguished from all other animals. It is the mind which is the truly human portion of our being; and in man the mind is conjoined with a more perfect and complicated brain than we meet with in other animals, simply because he is remarkable above them all for the variety and extent of the faculties with which he is endowed. It is true that in his body and limbs he possesses executive instruments, also far superior to those of other creatures, but it is not to these he owes his high position in the scale of creation. They are given to him only to place him in harmony with his own elevated mind; and if the instruments which it employs to effect its purposes were not perfect in proportion, he would be constantly fretting under the conception of plans and designs which he had not the means of either fulfilling or communicating, and thus would form a singular exception to the wisdom and benevolence displayed in all the other works of God.

The same subservience of the organization to the capacities and instincts is observable throughout the whole animal kingdom. In proportion as the intelligence of an animal is limited and its instincts are few, its brain is observed to be simple and rude, and its executive instruments correspondingly few and imperfect. The brain and the four legs and cloven feet of the sheep, for example, are in exact accordance with its limited faculties and desires; whereas, had they been joined to reasoning powers and moral faculties like those of man, what a maddening incongruity would have been the result! Or even supposing the form of the sheep to have been conferred upon a creature possessing the brain and ferocious impulses of the tiger, speedy destruction must have been its inevitable end. In like manner, if the towering instincts of the eagle had been united to the long legs and small wings of the ostrich, how utterly incongruous would the gift have been! Throughout the whole animal creation, accordingly, we find the *bodily structure invariably fashioned according to the instincts* and kind of intelligence with which each species is endowed. If the antelope bounds over the plain with the speed of a race-horse, it is not merely because it has long legs; but it has long legs and great activity to enable it to obey and live in harmony with its own natural instincts. If along with its present form and activity it had possessed the instincts of the sloth and been doomed to remain upon a single tree till it had eaten up all its leaves, it would have been the most miserable of animals; and again, if the sloth, with its present form, were suddenly endowed with the instincts of the antelope, and impelled to scour the plain in search of food, it also would be a most wretched creature, because its claws and limbs are fashioned for climbing and holding fast, and not at all for running. Or, to pursue the parallel to an extreme, if the oyster, which has neither legs nor arms, because it has no sphere of action beyond its shell, and no faculties impelling it to change its place, were to become endowed with a human mind and feelings, in what a condition would it be placed! and on the other hand, if the human organization was animated only by the instincts of an oyster, what would become of all its admirable and complicated mechanism, and of man's happiness?

Having thus shewn that subservience to the purposes of the mind is the fundamental principle on which the bodily organization has been designed and constructed, it will be proper to add a few remarks concerning the only remaining group of organs required to complete the animal frame, and which are only *indirectly* essential to the mental functions. I allude to those by which nutrition is carried on, and the life of the whole body sustained. In one respect, these stand in much the same relation to the immediate organs of the mind that the

steam does to the executive machinery. The spinning-jenny is the *direct* producer of the thread; but without the animating though indirect aid of the steam to keep it in action, it would be utterly unavailing for any useful purpose. In like manner the brain is the immediate source of emotion and thought, but without the organs of nutrition to sustain it in life and activity, it would speedily become an inert and useless encumbrance.

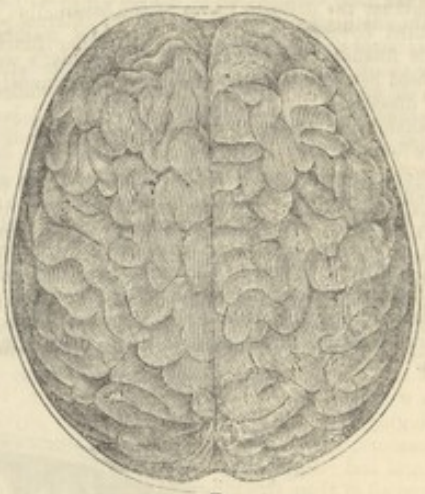
In accordance with this special difference of purpose, these two groupes of functions are appropriately enough termed the *animal* and the *organic* functions; because, while sensation, emotion, and thought, are peculiar to animals, nutrition and life are common to both animals and vegetables; whence, indeed, the latter are also not unfrequently termed the *vegetative* functions. So very distinct are they in nature, that even in man the latter may continue after all thought and consciousness are destroyed.

From this general analysis, the reader will now be aware that the human body consists of the following distinct groupes of organs, each charged with its own special functions:—1*st*, The brain, or immediate organ of the mind, or seat of sensation, perception, emotion, and thought; 2*dly*, The organs of the five senses, and certain nerves, serving to convey to the brain and mind the impressions made upon them by external objects; 3*dly*, The muscles, bones, ligaments, &c., which, along with the nerves of motion, constitute the limbs and the frame-work of the trunk, and serve to execute the behests of the mind, transmitted to them from the brain; and *lastly*, the organs of digestion, respiration, circulation, and nutrition, by means of which life is supported, and growth and decay are carried on. The first three are the organs of the *animal*, and the last, of the *organic* or *vegetative* functions. Having already treated of digestion and nutrition in another volume,* and of the organs of voluntary motion, circulation, and respiration, in the preceding chapters, I shall now confine myself to the consideration of the brain as the immediate organ of the mind.

The brain is that large organized mass which, along with its enveloping membranes, completely fills the cavity of the skull. It is, as we have seen, the seat of thought, of feeling, and of consciousness, and the centre towards which all impressions made on the nerves distributed over the body are conveyed, and from which the commands of the will are transmitted by other nerves to put the various parts in motion.

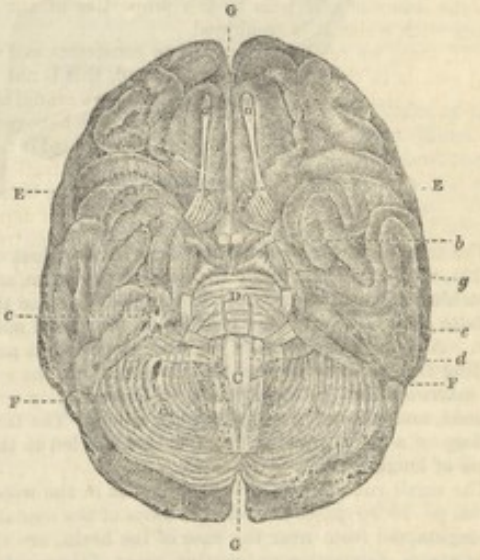
The structure of the brain is so complicated, that less is known of its true nature than of that of almost any other organ. It would therefore be entirely out of place to attempt to describe it here, farther than by stating generally its principal divisions. On sawing off the upper half of the skull horizontally, and removing the firm tough membrane called *dura mater* (hard mother), which adheres closely to its inner or concave surface, the *cerebrum* or *brain proper* presents itself, marked on the surface with a great variety of undulating windings or *convolutions*, and extending from the fore to the back part of the head somewhat in the form of an ellipse. In the annexed wood-cut, the convolutions are represented as seen on the upper surface of the brain.

In the middle line from A to B, there is a deep cleft separating the brain, in its whole length, into two halves or *hemispheres* as they are called. Into this cleft dips a tight stiff membrane, resembling a scythe in shape, and hence called the *falx* (scythe), or, sometimes, from its being a mere fold of the *dura mater*, the *falciform* (*scythe-like*) *process* of the *dura mater*. From its dipping down between the two halves of the brain, the chief purpose of this membrane seems to be, to relieve the one side from the pressure of the other, when the head is reclining to either side.



B

Each half or *hemisphere* of the brain is, in its turn, divided into three portions, called, from their situations, the *anterior*, *middle*, and *posterior lobes*, each occupying nearly a third of the whole length of the brain. These divisions are manifest only on the under surface of the brain, and in the subjoined wood-cut they are represented by the lines E E and F F. In their natural situation, the anterior lobe lying above the dotted line E E, occupies the forehead; the middle lobe, or that portion lying between the two transverse lines E E and F F, is situate above and a little in front of the ears; and the posterior lobe lying below the transverse line F F, corresponds to the back part of the head.



Beneath the posterior lobe, a strong fold of the dura mater, called the *tentorium*, is extended horizontally to support it and separate it from the *cerebellum* or little brain A A lying below it. The cerebellum forms the last great division of the contents of the skull. Its surface is marked by convolutions, differing, however, in size and appearance from those observed in the brain.

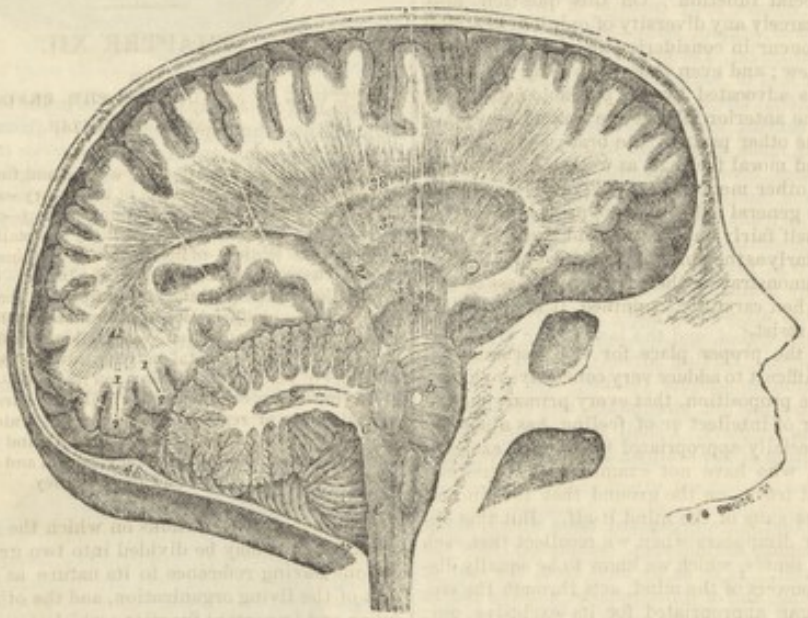
Adhering to the surface of the convolutions, and consequently dipping down into and lining the *sulci* or furrows between them, another membrane of a finer texture and greater vascularity, called *pia mater*, is found. The bloodvessels going to the brain branch out so extensively on the pia mater, that, when a little inflamed, it seems to constitute a perfect vascular net-

* On Digestion and Diet.

work. This minute subdivision is probably of use in preventing the blood from being impelled with too great force against the delicate tissue of the brain.

A third covering called the *arachnoid* membrane, from its fineness resembling that of a spider's web, is interposed between the other two, and is frequently the seat of disease.

On examining the convolutions in different brains, they are found to vary a good deal in number, size, depth, and general appearance. In the various regions of the same brain they are also different, but preserve the same general aspect. Thus, they are always small and numerous in the anterior lobe, larger and deeper in the middle, and still larger in the posterior. The depth to which they penetrate may be judged of from their appearance in the subjoined figure, representing a vertical section of the brain, cerebellum, and medulla oblongata.



The thick cord *b c c c* (marked C in the woodcut on p. 75), seen springing from the base of the brain, and stretching downwards towards the spine, is named the *medulla oblongata*, or oblong portion of the spinal marrow. At one time the brain has been regarded as proceeding from, and at another as giving rise to, the spinal marrow; but, in reality, the two are merely continuous, and neither grows from the other. The false analogy of a stem growing from a root has led to this abuse of language.

The small round filaments or cords seen in the woodcut on p. 75 to proceed from the sides of the medulla oblongata, and from near the base of the brain, are various *nerves* of sensation and motion, some of them going to the organs of sense, and others to the skin and muscles of the face, head, and other more distant parts. The long flat looking nerve *a a*, lying on the lower surface of the anterior lobe, is the *olfactory nerve*, or nerve of smell, going to the nose. The round thick nerve 4 4, near the roots of the former, is the *optic nerve*, or nerve of vision, going to the eye. That marked *b* is the *motor nerve*, which supplies the muscles of the eyeball. A little farther back the fifth pair *c*, is seen to issue apparently from the arch D, called *Pons Varolii*, or *bridge of Varolius*. It is a large compound nerve, and divides into three branches, which are ramified on almost all the parts connected with the head and face, and the upper and under jaw. It comprehends nerves of both sensation and motion, and one branch of it ramified on the tongue is the nerve of taste. Other branches supply and give sensibility to the teeth, glands and skin. The seventh or *auditory* nerve *e*, is distributed on the internal ear, and serves for hearing. The eighth or *pneumogastric* nerve *d*, sends filaments to the windpipe, lungs, heart, and stomach, and is one of great importance in the production of the voice and respiration. It also influences the action of the heart, and the process of digestion.

Before quitting this part of the subject it may be useful to the reader to state generally, that *the nerves of animal life* serve chiefly to place the mind and its organ the brain in communication with the external world; and that their importance may be best understood by imagining what man would be without them. Suppose, for example, that any one were suddenly deprived of the services of the nerves of sight, hearing, sensation, touch, and smell, and that, retaining all his *internal* powers of emotion and thought unimpaired, he were, from the destruction of his muscular nerves, also to lose the power of regulating his own movements, what would be the result, and how long could he exist? Is it not clear that he would be left in the midst of creation in a darkness, silence, and death, compared with which the awful solitude of "the last man" would be a pleasurable and social crowd? Without nerves to convey to the brain the impressions derived from external objects, no interchange whatever of thought or feeling could take place between man and man, and no image from without ever reach the mind. Unless the nerves of sight and hearing announce to our consciousness the entrance of our friend, we must remain unmoved and unaffected by his presence; and unless the muscular nerves were ready to obey the commands of the will, we could no more extend a hand to welcome him or give expression to our joy, than if we lay in a swoon powerless at his feet. In this way the mind and body are equally dependent on each other. Without a brain to think, and nerves, muscles, and bones to execute, the mind would be, so far as we are concerned, powerless and useless. And these organs, on the other hand, without mind to guide and direct them in their exercise, would be, like the paralyzed limb, an unmeaning and motionless encumbrance.

Such, then, is a brief outline of the relative uses of

the brain and nerves. The study of the functions of the nerves abounds in interest and attractions for every intelligent mind; but as their minute investigation would lead me too far from the objects more immediately in view, I must, for the present, pass them over in silence, and return to the consideration of the brain, which, as the organ by which all the mental operations are carried on and continually influenced, possesses claims upon our attention which it is impossible to overrate.

As already remarked, all physiologists are agreed that the brain is the organ of the mind, and that during life its co-operation is as indispensable to the active manifestations of the mental faculties as the eye is to the sense of sight, or the ear to that of hearing. But for practical purposes, it is extremely important to go a step farther than this general fact, and ascertain whether, in manifesting the mind, the brain acts as a single organ in *every* mental operation, or whether it is really an aggregate of different parts, each appropriated to the exercise of a distinct power of the mind, in the same way as each of the organs of the external senses is appropriated to its special function. On this question, also, there is now scarcely any diversity of opinion, as almost all observers concur in considering the latter to be the only correct view; and even those who deny the minuter subdivisions advocated by the phrenologists, agree in regarding the anterior lobe as the immediate seat of *intellect*, and the other parts of the brain as the seat of the passions and moral feelings, as well as of consciousness and every other mental act. There are so few exceptions to the general belief of these propositions, that I consider myself fairly entitled to hold them as established; particularly as the phrenologists have of late years succeeded in demonstrating their truth by a mass of evidence which, when carefully examined, it is impossible successfully to resist.

If this were the proper place for the discussion, it would not be difficult to adduce very conclusive evidence in favour of the proposition, that every primary mental power, whether of intellect or of feeling, has a portion of the brain specially appropriated for its own exercise. Many, indeed, who have not examined the question, deny this great truth, on the ground that it is incompatible with the *unity* of the mind itself. But this objection entirely disappears when we recollect that each of the external senses, which we know to be equally distinct primary powers of the mind, acts through the medium of an organ appropriated for its exclusive use; and yet, in this unquestionable fact, no one sees anything in the least incompatible with the unity of the mind. When we come to treat of the applications of the physiology of the brain and nervous system to the purposes of human improvement, we shall perceive the importance of keeping the above principle in view as a practical guide. But at present I shall merely remark, that the simple axiom now recognised in comparative anatomy,—that no single organ can execute more than one distinct function,—is of itself sufficient to prove that one organ cannot serve for the operation of all the mental powers. Accordingly, even the Edinburgh Review, which, in more than one instance, has evinced great hostility to some of the above views, as included among those of the phrenologists, has another time powerfully inculcated them as acknowledged physiological truths. Undeterred by the statement in one volume, that we have no evidence for believing that the brain is at all concerned in any mental acts except those connected with the external senses, a reviewer expressly and truly asserts in another, that, exactly in proportion as we ascend in the scale of creation, and the animal acquires a sense, a power, or an instinct, do its nerves multiply, and "its brain improve in structure and augment in volume; *each addition being marked by some addition to, or amplification of, the powers of the animal, until in man we behold it possessing some parts of which animals are destitute, and wanting none which they possess*;" so that "*we are enabled to associate every faculty which gives superiority with some addition to the nervous mass, even from the smallest indications of sensation and will, up to the highest degree of sensibility, judgment, and expression.*"* It is thus that while many animals possess individual senses or instincts in greater perfection than man, there is not one which can be compared with him in the number and range of its faculties; and, concurrently with this, there is not one which approaches him in the development and perfection of its nervous system.

The mind and brain being thus so closely associated during life, that the former acts in strict obedience to the laws which regulate the latter, it becomes an object of primary importance in education to discover what these laws are, in order that we may yield them willing obedience, and escape the numerous evils consequent on their violation. To this inquiry I shall devote the following chapter, and begin with those which apply to the brain considered as a whole.

CHAPTER XII.

CONDITIONS OF HEALTH OF THE BRAIN—LAWS OF MENTAL EXERCISE.

Conditions of cerebral health, organic and functional.—Organic conditions. Influence of hereditary constitution—of the state of the mother during pregnancy—of a due supply of well-constituted blood—of diet, especially in early life—of errors in diet—of insufficient nourishment.—Influence of the quantity of blood upon the brain.—Connexion between the activity of the circulation and that of the brain—examples in illustration.—Functional conditions of health and their mode of action.—Physiological laws of exercise.—Cerebral and mental activity always coincident.—Influence of inactivity of brain upon its health—shewn in persons in solitary confinement or living in retirement.—Beneficial effects of regular exercise of the brain and mind.—Influence of excessive mental activity and excitement of brain—examples of it in infancy, youth, and old age—Cases of Sir H. Davy, Scott, and Lord Dudley.

The principal conditions on which the health of the brain depends may be divided into two great classes,—the one having reference to its nature as a constituent part of the living organization, and the other to the peculiar and important functions which it performs. Under the first head may be included every thing which directly affects the nutrition and physical well-being of the brain: while under the latter may be comprehended whatever affects the brain indirectly or through the medium of the mind. In ordinary language, the former may be designated as the *physical or organic*, and the latter as the *mental* or *functional* conditions of cerebral health. In a strictly logical sense, however, both may be termed organic, since mental causes produce disease only by inducing changes in the brain itself; but as the distinction will be useful in practice, I shall not hesitate to adopt it.

If we inquire attentively by what peculiarities those individuals have been distinguished who have enjoyed a high degree of mental and bodily health, throughout a long and active life, we shall find that, with scarcely an exception, they have all inherited from their progenitors a sound constitution of both mind and body. The reflecting reader, therefore, will not be surprised that, among the *organic conditions* by which the health of the brain is most directly secured, I should name first, the possession of a *sound hereditary constitution*. Experience shews, indeed, that the importance of this condition, as a preservative, can scarcely be overrated. Where it is possessed, and where no unusual susceptibility of disease has been generated by mismanagement

* Edinburgh Review, No. xciv. p. 442-3.

in early infancy, it constitutes by far the most efficient safeguard which any human being can obtain of future cerebral and mental health under whatever circumstances of trial and anxiety he may be afterwards placed. Where, on the other hand, it is wanting, and where an individual has the misfortune to be sent into the world with a brain and nervous system on which the peculiarities of insane, eccentric, or highly excitable parents are strongly imprinted, and especially where injudicious treatment in childhood has aggravated the original defect, the most careful and rational management in after life will often fail to prevent the invasion of nervous misery or mental derangement, from causes to which those more soundly constituted may be habitually exposed, without injury to either mind or body. Let it never be forgotten, then, that the transmission of a *hereditary* tendency from parents to children, producing in the latter an unusual liability to the maladies under which the parents have laboured, is one of the most powerful causes which *predispose* to cerebral and mental disease.

Even where the original defect in the parent is merely some peculiarity of disposition or temper, amounting perhaps to eccentricity, it is astonishing how clearly its influence on some one or other of the progeny may often be traced, and how completely a constitutional bias of this description may interfere with a man's happiness or success in life. I have seen instances in which it pervaded every member of a family, and others in which it affected only one or two. When the original eccentricity is on the mother's side, and she is gifted with much force of character, the evil extends more widely among the children than when it is on the father's side. Where both parents are descended from tainted families, the progeny is, of course, more deeply affected than where one of them is from a pure stock; and, seemingly for this reason, hereditary predisposition is a more usual cause of nervous disease in the higher classes, who intermarry much with each other, than in the lower, who have a wider choice.

Unhappily, it is not merely as a cause of disease that this predisposition is to be dreaded. The obstacles which it throws in the way of permanent recovery, are even more formidable, and can never be entirely removed; and hence the direct interest we have in avoiding the perpetuation of the mischief by imprudent intermarriages. If two persons, each naturally of an excitable and delicate nervous temperament, choose to unite for life, and especially if they marry at a very early age, when the natural excitability of the system is at the highest, it will be almost impossible to prevent the concentrated influence of these peculiarities from destroying the health of their offspring, and subjecting them to all the miseries of nervous disease, madness, or melancholy.

Even where no hereditary defect exists, the state of the mother during pregnancy has an influence on the mental character and health of the offspring of which few parents have any adequate conception, but with which every mother ought to be familiar. In my work on Mental Derangement, I referred in proof of this fact, to the testimony of the late M. Esquirol, whose talent, general accuracy, and extensive experience, give great weight to all his well-considered opinions. It is often, he says, in the maternal womb that we are to look for the true cause, not only of imbecility, but also of the different kinds of mania. During the agitated periods of the French revolution, many women then pregnant, and whose minds were kept constantly on the stretch by the anxiety and alarm inseparable from the epoch at which they lived, and whose nervous systems were thereby rendered irritable in the highest degree compatible with sanity, were afterwards delivered of infants whose brains and nervous systems had been affected to such a degree by the state of their parent, that in future life, as children they were subject to spasms, convulsions, and other nervous affections, and in youth to imbecility or dementia, almost without any exciting cause. The extent to which the temporary state of the mother during gestation may influence the whole future life of the child, may be conceived from a single fact recorded by the same author. A pregnant woman, otherwise healthy, was greatly alarmed and terrified by the threats of her husband, when in a state of intoxication. She was afterwards delivered, at the usual time, of a very delicate child. The child had, however, been so much affected by its mother's agitation, that, up to the age of eighteen, it continued subject to panic terrors, and then became completely maniacal. The nervous timidity of James VI., so ludicrously exhibited by Sir Walter Scott in the Fortunes of Nigel, is said to have had a similar origin. I have myself seen several instances of the same kind, and among others one of a young lady, whose extreme nervous sensibility was partly attributable to prolonged excitement and alarm in her mother, who, when pregnant with her, spent several days half immersed in water during a storm at sea, and in hourly expectation of shipwreck and death. But as, in my work *On the Management of Infancy*, I have dedicated a chapter to the consideration of the influence of the mother upon the health of the child, I need not continue the subject here.

The next of the organic conditions by which the health of the brain is directly affected, is a due supply of well-constituted blood. The effects of slight differences in the quality of the blood are not easily recognised, but, when extreme, they are too obvious to be overlooked. If the stimulus of arterial blood be altogether withdrawn, the brain ceases to act, and sensibility and consciousness become extinct. Thus, when fixed air is inhaled, the blood circulating through the lungs does not undergo that process of oxygenation which is essential to life; and as it is in this state unfit to support the action of the brain, the mental functions become impaired, and death speedily closes the scene. If, on the other hand, the blood be too highly oxygenated, as by breathing oxygen gas instead of common air, the brain is too much stimulated, and an intensity of action bordering on inflammation takes place, which also soon terminates in death.

Such are the consequences of the two extremes; but the slighter variations in the state of the blood have equally sure, although less palpable, effects. If its vitality be impaired by breathing an atmosphere so much vitiated as to be insufficient to produce the proper degree of oxygenation, the blood then affords an imperfect stimulus to the brain; and, as a necessary consequence, languor and inactivity of the mental and nervous functions ensue, and a tendency to headach, syncope, or hysteria, makes its appearance. This is seen every day in the listlessness and apathy prevalent in crowded and ill-ventilated schools; and in the headaehs and liability to fainting which are so sure to attack persons of a delicate habit in the contaminated atmospheres of crowded theatres, churches, and assemblies. It is seen less strikingly, but more permanently, in the irritable and sensitive condition of the inmates of cotton-manufactories and public hospitals. In these instances, the operation of the principle cannot be disputed, for the languor and nervous debility consequent on confinement in ill-ventilated apartments, or in air vitiated by the breath of many people, are neither more nor less than minor degrees of the same process of poisoning to which I have formerly alluded. It is not real debility which produces them; for, unless the exposure has been very long, egress to the open air almost instantly restores activity and vigour to both mind and body. In cases of disease, also, the influence of pure air upon the action of the brain is not less remarkable. Dr A. T. Thomson, in his late work on the *Management of the Sick-Room*, mentions having "seen patients labouring under high delirium in a close ill-ventilated room, be-

come rapidly collected by merely lowering the heat of the apartment twelve or fifteen degrees," (p. 117.) Other testimony to the same effect might easily be produced.

But impure air is not the only medium through which the brain is deprived of a proper supply of well-constituted and nutritious blood. Want of wholesome food, and defective powers of digestion, are equally influential in impairing the vital properties of that fluid; and hence, at all periods of life, but especially in childhood and youth, when the brain, in common with other organs, is in a state of great activity and rapid development, the proper management of diet is a subject of the greatest practical importance. In my other works,* I have already fully explained the mode in which defective nourishment impairs the powers of the mind by weakening the brain, and unfolded the principles by which diet ought to be regulated at different periods of life, so as to secure the highest bodily and mental health of which the constitution is capable. But there are still one or two circumstances to which, from their practical importance, and from their being often overlooked in the dietetic arrangements for the young, I must again solicit the attention of the reader.

In my work *on Diet*, I have shewn that, in conformity with the great activity of growth and nutrition in early youth, the craving for food returns much sooner than in mature age, and that to sustain the healthy vigour of the system, a wholesome and substantial dinner ought to follow within at most five hours after breakfast. When, as often happens from a bad arrangement of the school hours, dinner is postponed much beyond this interval, and only some slight refreshment is allowed in the forenoon, the inevitable result of the want of due sustenance is, that the system becomes proportionally exhausted, and the mind itself impaired in energy and activity. Where much constitutional delicacy exists at the same time, the health also suffers slowly but certainly. In boarding schools, such results are not unfrequently observed, especially in winter, when the teacher is sometimes induced, by the shortness of the day, to omit muscular exercise altogether, and to postpone dinner to a late hour, with a view to having all the lessons over before darkness comes on. I have known this arrangement adopted at the solicitation of the pupils themselves, who were too ignorant to perceive the evils which it entailed upon them, and who ought never to have been indulged in a way so prejudicial to their own welfare. In one instance in which continued bad health was thus induced, it resisted all the curative efforts of the physician and the parents, so long as the cause was left in operation; but recovery began from the moment that a more rational plan was adopted, at my suggestion. By a simple change of hours, and allowing a long interval at mid-day for an early dinner, the boy was enabled to continue his education without interruption, although matters had gone so far, that the parents had made up their minds to remove him from school and send him to the country, as the only probable means of saving his life.

Another form in which the brain, in common with the rest of the body, often suffers from defective nutrition in early life, consists in neglect of sufficient relaxation during, and for some time after, eating. In many schools and families, books are taken up, lessons resumed, or tasks begun, almost immediately after meals, instead of an interval of relaxation being allowed to facilitate digestion and give the system the benefit of the food. Strong healthy children resist this cause of impaired health more or less successfully; but it often injures very seriously the more delicately constituted, and helps to ruin both the stomach and the nervous system. But it would lead me too far from the proper object of this work to go more minutely into its consideration here.

Those who have never reflected on the influence of a well-arranged diet and sound digestion on the health of the brain and mental functions, may obtain some idea of its reality from the examination of extreme cases. Starvation, for example, is well known to affect the brain so much as often to produce ferocious delirium. This result was painfully exemplified not many years ago, after the wreck of the Medusa French frigate on the coast of Africa, when scenes of cruelty and horror took place under the influence of hunger, which it is impossible to read of without shuddering. In the Milanese, also, a species of insanity arising from defective nourishment is very prevalent, and is easily cured by the nourishing diet provided in the hospitals to which the patients are sent. I have seen the mental functions weakened, and the brain disordered, by the same cause —inadequate nutrition—at the period of rapid growth. This defective nutrition, however, it must be observed, does not always depend on want of proper food. On the contrary, it is often the result, among the higher classes, of too much or too stimulating food over-exciting, and ultimately impairing, the digestive powers. The proneness to morbid excitement in the brain, induced by insufficient food, is one cause why, in times of public distress, the suffering poor are so apt to resort to violence to remove the sources of their discontent.

But important as is the *quality* of the blood to the healthy action of the brain, the *quantity* and regularity of its supply are of scarcely inferior consequence. If, as often happens from accidental wounds, and during blood-letting, the quantity of blood circulating through the brain be suddenly diminished, the effect may be so great as entirely to arrest its action and destroy consciousness. Even where the loss of blood, although considerable, is not sufficient to produce this result, it will, nevertheless, impair the vitality of the brain, and often lower the mental vigour so much as to unfit the individual for a time for active or energetic thinking. When, on the contrary, the circulation of the blood through the brain is accelerated within certain limits, increased action and its accompaniment increased mental activity, are the certain results. In this respect the brain is situated precisely as is every other organ of the body. When not stimulated by a full supply of well-constituted blood, it acts feebly and imperfectly; and when a full supply is afforded, it becomes proportionally excited to higher activity, till, if this condition be carried to excess, the excitement may end in violent delirium or maniacal furor.

The law, in virtue of which excitement of function and activity of circulation in the organ performing it, are always coincident, being thus as applicable to the brain as to all other organs, common prudence requires, that, in conducting both physical and mental education, we should take the fact into account, and regulate our management so as to prevent either deficiency or excess in the cerebral circulation, and to preserve it as far as possible in that equable state which is so manifestly conducive to the health of both mind and brain. But as few unprofessional readers are at all aware of the necessary relation which really subsists between organic and mental activity, I shall adduce two or three illustrative facts before attempting to explain the physiological law which connects them together and which is calculated to afford us much assistance as a practical guide.

In some parts of the body the increased circulation which always accompanies excitement of function may be made the direct subject of experiment. When, for instance, we use the eye too long, or in too bright a light, it is soon observed to become bloodshot, and the increased action of its vessels and nerves gives rise to a sensation of fatigue and pain requiring us to desist. If we turn away the eye, the irritation gradually subsides,

* On Digestion and Diet, third edition. On the Physiology and Moral Management of Infancy, third edition.

and the healthy state returns; but if we continue to look intently, or resume our employment before the eye has regained its natural state by repose, the irritation at last becomes permanent, and disease, followed by weakness of sight or even blindness, may ensue; as often happens to glass-blowers, smiths, and others, who are obliged to work in an intense light.

Precisely analogous phenomena occur when, from intense mental excitement, the brain is kept long in a state of excessive activity. The only difference is, that we can always see what happens in the eye, but rarely what takes place in the brain. Occasionally, however, cases of fracture of the skull occur, in which, from part of the bone being removed, we *can see* the quickened circulation in the vessels of the brain as easily as in those of the eye. Sir Astley Cooper had a young gentleman brought to him who had lost a portion of his skull just above the eyebrow. "On examining the head," says Sir Astley, "I distinctly saw the pulsation of the brain was regular and slow; but at this time he was agitated by some opposition to his wishes, and directly *the blood was sent with increased force to the brain, the pulsation became frequent and violent; if, therefore*," continues Sir Astley, "*you omit to keep the mind free from agitation, your other means will be unavailing*" in the treatment of injuries of the brain.* A still more remarkable case is mentioned by Dr Caldwell, as having occurred to Dr Pierquin in the hospital of Montpellier in 1821. "The subject of it was a female at the age of twenty-six, who had lost a large portion of her scalp, skull-bone, and dura mater, in a neglected attack of lues venerea. A corresponding portion of her brain was consequently bare, and subject to inspection. When she was in a *dreamless sleep* her brain was *motionless*, and *lay within* the cranium. When her sleep was *imperfect* and she was agitated by dreams, her brain *moved* and *protruded without* the cranium, forming *cerebral hernia*. In *vivid* dreams, reported as such by herself, the protrusion was considerable; and when she was perfectly awake, especially if engaged in active thought or sprightly conversation, it was still greater."† This protrusion arose, of course, from the greater quantity of blood sent to the brain during its activity, than when it was quiet: and if the case be accurately reported, it is certainly one of the most interesting on record.

To these cases, as published in the former editions, I may now add another which has lately appeared in Mr Combe's "Notes on the United States" (vol. ii. p. 279). The patient, a daughter of Mr Mapes of New York, fell from a window when about four years of age, and had her skull so severely fractured, that portions of it, to the extent, in all of about three inches square, were removed near the crown of the head. The brain was of course uncovered to the same extent, and in the region of the organs of Self-Esteem and Love of Approbation. At the time of Mr Combe's visit, the girl was eight years old. The skin over the wound was thin and covered with fine hair; on applying the hand over it a curious leech-like motion was felt in the brain, accompanied with a prominence and pulsation in the part whenever the corresponding feelings were excited. When the feelings were at rest, and her intellect alone was active, as when intent on solving an arithmetical question, only the gentle and equal pulsation of the arterial system was perceptible. In all of these cases, mental activity, and increased circulation, were found invariably to accompany each other.

The well known impulse given to thought and feeling by wine and other stimulants, which act chiefly by increasing the flow of blood to the brain, is but another example of the operation of the same general law, and goes far to justify the opinion of Dr Caldwell, that, if it were "possible, without doing an injury to other parts, to augment the constant afflux of healthy arterial blood to the brain, the mental operations would be invigorated by it. I state," says he, "this opinion confidently, because we often witness its verification. When a public speaker is flushed and heated in debate, his mind works more freely and powerfully than at any other time. Why? Because his brain is in better tune. What has thus suddenly improved its condition? An increased current of blood into it, produced by the excitement of its own increased action. That the blood does, on such occasions, flow more copiously into the brain, no one can doubt who is at all acquainted with the cerebral sensations which the orator himself experiences at the time, or who witnesses the unusual fulness and flush of his countenance, the dewiness, flashing, and protrusion of his eye, and the throbbing of his temporal and carotid arteries. It is well known that, while intensely engaged in a memorable debate last winter in Washington, a distinguished senator became so giddy, by the inordinate rushing of blood into his brain, that he was obliged to sit down, and the senate adjourned to give him time to recover. And, more recently, a new member in the House of Representatives fell while speaking, and suddenly expired from the same cause. A member of the law class of Transylvania, moreover, experienced, a few weeks ago, a convulsive affection from a congestion of blood in the head, induced by excessive excitement of the brain in the ardour of debate,"* In many instances, indeed, the increased circulation in the brain attendant on high mental excitement, reveals itself by its effects when least expected, and leaves traces after death which are but too legible. How many public men, like Whitbread, Romilly, Castlereagh, and Canning, urged on by ambition or natural eagerness of mind, have been suddenly arrested in their career, by the inordinate action of the brain induced by incessant toil! And how many more have had their mental power for ever impaired by similar excess! When tasked beyond its strength, the eye becomes insensible to light, and no longer conveys any impressions to the mind. In like manner, the brain, when much exhausted, becomes incapable of thought, and consciousness is almost lost in a feeling of utter confusion.

In delicate persons and in invalids recovering from severe illness, the influence of the quantity of blood upon the action of the brain is often very marked; a mere change from the horizontal to the sitting position will often be sufficient to induce fainting, simply from the want of sufficient blood in the brain to sustain its action. By the same cause, mental power may be impaired without being actually extinguished. A case of this kind was lately communicated to me by an experienced teacher in England, in which the effect of change of position on the brain was so great that the boy seemed to be of "two different characters" when sitting up and lying down. In the former attitude, when the brain was scantily supplied with blood, he was inactive and looked apathetic and sullen; whereas, when he lay down and the circulation was assisted by the natural gravity of the blood, his real powers of mind became manifest, and he was "animated, talkative, and highly intelligent." This case deserves attention, both because it is in itself of a striking nature, and because it was not communicated as an illustration of the point under discussion, but merely in reference to the general discipline of the institution.

Such are the principal *organic* conditions on which the health of the brain depends. We come now to the consideration of its *functional* or *mental* conditions.

When treating of the laws of exercise (see pages 42 and 50), and explaining the changes which take place in every organ of the body when it is called into activity or in other words when its function is exercised, I took some pains to shew, 1*st*, That when an organ is left too long inactive, the circulation of blood through its vessels becomes feeble and imperfect, and the organ itself im-

* See Sir A. Cooper's Lect. on Surg. by Tyrrel, vol. i. p. 276.
† Annals of Phrenology, No. i. p. 37.—Boston, 1833.

* Caldwell's Thoughts on Physical Education, p. 114.

paired in tone, and unfit to act with ease or energy; 2*dly*, That when an organ is regularly and duly exercised, it receives a proportionably copious supply of blood, and acquires a healthy and vigorous tone, with a corresponding aptitude for free and ready action; and, lastly, that when functional exercise is carried to excess, or is repeated without sufficient intervals of repose, the circulation through the organ becomes unduly accelerated, and that, as a consequence, the function becomes excited, and is carried on with an energy and activity which are apt to exceed the limits of health, and to induce either disease or exhaustion. From these fundamental principles I deduced the practical rule, that, in our management of ourselves and others, the second degree of exercise is that at which we ought to aim with a stedfast eye, and from which alone we can expect beneficial results. I have now to shew that this practical inference applies with equal force to the brain as to other organs, and that, in endeavouring to promote its health, we must either regulate the exercise of all its functions by the ordinary laws of physiology, or forfeit the advantages which their fulfilment is destined to confer upon us.

Having already shewn not only that increased activity of brain, and an increased flow of blood through its vessels, are inseparably connected, but that within certain limits the one is always proportioned to the other, it follows that, as the function of the brain is to manifest the various powers of the mind, *activity of mind* necessarily implies a corresponding *activity of brain*, and is attended with all its physiological results. Or, in other words, activity of mind is as much the mode of exercise of the brain as walking is of the muscles, or vision of the eye; and it is only by keeping this fact steadily in view that we can see our way clearly through the inconsistencies of different educational theories, and arrive at principles sufficient for our own guidance. Let us now see how far the ordinary laws of physiology apply to the exercise of the cerebral functions.

That *inactivity of the brain* impairs its healthy energy, and, as a necessary consequence, diminishes mental power, is amply proved by daily and hourly experience. Nor will this truth surprise any reflecting person who keeps in mind that, by disuse, muscles become emaciated and weakened, bloodvessels and nerves obliterated, and bone itself softened and altered in structure; and who considers that, as a part of the same animal system, the brain is nourished by the same blood, and subjected to the same vital laws, as the muscles, bones, and nerves. For direct proof, however, I need only refer the reader to the well known influence of solitary confinement upon the bodily and mental condition of even the most energetic and robust. Solitary confinement impairs and destroys mental vigour solely by the forced inaction into which it throws the brain, and unless relieved by occupation and the occasional visits of the attendants, it becomes the most destructive punishment which can be inflicted upon any human being. By its unmitigated infliction, the strong minded man lapses in a few days into the feebleness of childhood, and the sternest resolution yields like the willow to the gentlest breeze.

It is from a similar cause that men accustomed for years to a busy and bustling life, almost inevitably become hypochondriacal, melancholy, and enfeebled in mind and resolution, on retiring from business, or from active public service to the quiet of the country, without any pursuit to occupy their attention. The brain and mind, being left in inaction, soon lose their healthy tone, and indolence and ennui appear where calm enjoyment was confidently, but most unreasonably, looked for. It is the same cause which renders that seclusion from society into which invalids are apt to fall, so injurious to both bodily and mental soundness, and which often renders the situation of governesses one of misery and bad health, even where every kindness is meant to be shewn towards them. In many families, especially in the higher ranks, the governess lives so secluded, that she is as much out of society as if she were placed in solitary confinement. For the same reason, those who are cut off from social converse by any bodily infirmity, often become discontented and morose in spite of every resolution to the contrary. The feelings and faculties of the mind, which had formerly full play in their intercourse with their fellow-creatures, have no longer scope for sufficient exercise; and the almost inevitable result is irritability and weakness in the corresponding parts of the brain.

This fact is particularly observed among the deaf and blind, in whom, from their being precluded from a full participation in the same sources of interest as are accessible to their more favoured brethren, irritability, weakness of mind, and idiocy, are known to be much more prevalent than among other classes of people. In the *Dictionnaire de Médécine* (vol. xx. p. 87), Andral gives a description of the deaf and dumb, every word of which bears a direct reference to the above principle; and a similar account has been lately given of the blind by an equally intelligent observer. "The deaf-mute," says Andral, "presents, in his intelligence, his character, and the development of his passions, certain modifications which depend on his state of isolation in the midst of society. He remains habitually in a state of half childishness, is very credulous, but, like the savage, remains free from many of the prejudices acquired in society. In him the tender feelings are not deep; he appears susceptible neither of strong attachment nor of lively gratitude; pity moves him feebly; he has little emulation, few enjoyments, and few desires. This is what is commonly observed in the deaf and dumb, but the picture is far from being of universal application; some, more happily endowed, are remarkable for the great development of their intellectual and moral nature, but others, on the contrary, remain immersed in complete idiocy." Andral adds, that we must not infer from this, that the deaf and dumb are therefore constitutionally inferior in mind to other men. "*Their powers are not developed, because they live isolated from society: place them, by some means or other, in relation with their fellow-men, and they will become their equals.*" This is the cause of the rapid brightening up of both mind and features, which is so often observed in blind or deaf children, when transferred from home to public institutions, and there taught the means of converse with their fellows. In these instructive instances, the whole change is from a state of inactivity of the mind and brain to that of their wholesome and regular exercise.

Our next proposition was, that when all the mental powers are duly and regularly exercised, the brain receives a proportionably copious supply of blood, acquires a healthy and vigorous tone, and becomes fitted for the prompt, free, and energetic action of all the functions appertaining to the mind. In support of this proposition, I shall enter into no details. Besides its being almost self-evident, proofs of its accuracy are of easy access, and abound everywhere in society to such an extent, that it would be a waste of time to reproduce them here. I shall, therefore, pass at once to the principle implied in the third proposition, namely, that when mental exercise is carried to excess, either in duration or in frequency, the circulation through the vessels of the brain becomes excited in a corresponding degree, and ultimately induces a state of disease, which it is not always easy to remove.

When the eye has been intently exercised for a length of time without sufficient intervals of repose, it is observed, as I have said, to become blood-shot and unusually sensitive to the light; and if the exercise be persevered in, inflammation and loss of sight may be the ultimate results.

Precisely analogous consequences ensue when the mind is employed to excess. The vessels of the brain become distended, and its action becomes excited, till

it borders upon, or actually passes into, disease. At any time of life, accordingly, excessive and continued mental exertion is hurtful; but in infancy and early youth, when the structure of the brain is still immature and delicate, permanent mischief is more easily inflicted by injudicious treatment than at any subsequent period; and, in this respect, the analogy is complete between the brain and the other parts of the body, as we have already seen exemplified in the injurious effects of premature exercise of the bones and muscles. Scrofulous and rickety children are the most usual sufferers in this way. They are generally remarkable for large heads, great precocity of understanding, and small delicate bodies. But, in such instances, the great size of the brain and the acuteness of mind are the results of morbid growth; and, even with the best management, the child passes the first years of its life constantly on the brink of active disease. Instead, however, of trying to repress its mental activity, the fond parents, misled by the early promise of genius, too often excite it still farther, by unceasing cultivation and the never-failing stimulus of emulation and praise; and finding its progress, for a time, equal to their warmest wishes, they look forward with ecstasy to the day when its talent will break forth and shed a lustre on its name. But in exact proportion as the picture becomes brighter to their fancy, the probability of its being realized becomes less; for the brain, worn out by premature exertion, either becomes diseased or loses its tone, leaving the mental powers slow and depressed for the remainder of life. The expected prodigy is thus ultimately and easily out-stripped in the social race by many whose dull outset promised him an easy victory.

In speaking of children of this description, Dr Brigham, in an excellent little work on the influence of mental excitement on health, published a few years ago in America, says: "Dangerous forms of scrofulous disease among children have repeatedly fallen under my observation, for which I could not account in any other way, than by supposing that the brain had been exercised at the expense of other parts of the system, and at a time of life when nature is endeavouring to perfect all the organs of the body; and after the disease commenced, I have seen with grief the influence of the same cause in retarding or preventing recovery. I have seen several affecting and melancholy instances of children five or six years of age lingering awhile with diseases from which those less gifted readily recover, and at last dying, notwithstanding the utmost efforts to restore them. During their sickness they constantly manifested a passion for books and mental excitement, and were admired for the maturity of their minds. The chance for the recovery of such precocious children is, in my opinion, small, when attacked by disease; and several medical men have informed me, that their own observations had led them to form the same opinion, and have remarked, that in two cases of sickness, if one of the patients was a child of superior and highly cultivated mental powers, and the other one equally sick, but whose mind had not been excited by study, they should feel less confident of the recovery of the former than of the latter. This mental precocity results from an unnatural development of one organ of the body at the expense of the constitution." (P. 45.)*

Dr Brigham justly remarks, that it is ignorance in the parents which leads to the too early and excessive cultivation of the minds of children, especially those who are precocious and delicate; but from the examples which he gives, and the general bearing of his admonitions, the error of commencing systematic education too soon, and stimulating the infant mind too highly, seems to be decidedly more prevalent in the United States than in this country. Among the "children's books" in the United States, many are announced as purposely prepared "for children from *two* to *three* years old!" and among others are "INFANT Manuals" for Botany, Geometry, and Astronomy!! That mode of teaching is considered the best which forces on the infant mind at the most rapid rate, without regard to health or any other consideration. In this country, children are not generally sent to school so early; but education is still too much restricted to the exclusive exercise of the mental powers, to the neglect of the physical; and, in the instance of delicate children, is pushed on too rapidly. I lately witnessed the fate of one of these early prodigies, and the circumstances were exactly such as those above described. The prematurely developed intellect was admired, and constantly stimulated by injudicious praise, and by daily exhibition to every visiter who chanced to call. Entertaining books were thrown in the way; reading by the fireside encouraged; play and exercise neglected; the diet allowed to be full and heating, and the appetite pampered by every delicacy. The results were the speedy deterioration of a weak constitution, a high degree of nervous sensibility, deranged digestion, disordered bowels, defective nutrition, and, lastly, *death*, at the very time when the interest excited by the mental precocity was at its height.

Such, however, is the ignorance of parents on all physiological subjects, that when one of these infant prodigies dies from erroneous treatment, it is not unusual to publish a memoir of his life, that other parents may see by what means such transcendent qualities were called forth. Dr Brigham refers to a memoir of this kind, in which the history of John Mooney Mead, aged four years and eleven months, is narrated as approved of by "several judicious persons—ministers and others, all of whom united in the request that it might be published, and all agreed in the opinion, that *a knowledge of the manner in which the child was treated, together with the results, would be profitable both to parents and children, and a benefit to the cause of Education.*" This infantile philosopher was "taught hymns before he could speak plainly;" "reasoned with" and constantly instructed until his last illness, which, "*without any assignable cause,*" put on a violent and unexpected form, and carried him off. As a WARNING not to force education too soon or too fast, this case may be truly "profitable both to parents and children;" but, as an example to be followed, it assuredly cannot be too strongly or loudly condemned. Infant Schools, however, in which physical health and moral training are duly attended to, are excellent institutions. Such are those established and regulated on the plan of the benevolent Wilderspin, whose exertions have gone so far to demonstrate the importance of early infant training. But I regret to say that many schools lately opened under the same name have scarcely any one sound principle in action, and threaten to do more injury to the children by forced and injudicious intellectual cultivation and close confinement, than will be easily remedied even by the best management in after-life. I know some schools consisting of a single small apartment without any play-ground, and with very imperfect means of ventilation, where upwards of 150 children are crowded together for four or five hours a-day, with no free access to the open air,—no adequate muscular or pulmonary exercise,—no mental recreation worthy of the name,—no systematic cultivation of the moral and social feelings in actual intercourse with each other,—and where, with a few intervals of rest, an occasional march round the room, and a frequent change of subject, the time is consumed in intellectual tasks, to the almost complete exclusion of every thing else. Schools of this description cannot be too strongly denounced as fraught with mischief to the young, and as flagrant abuses of a most valuable principle. But in thus censuring what is radically wrong, we must be careful not to go to the other extreme, and, like Cobbett, condemn as bad that which is so only in its abuses. A

* Remarks on the Influence of Mental Cultivation and Mental Excitement upon Health. By Amariah Brigham, M.D. Boston, 1833.

well-regulated Infant School is an instrument of great power in improving and humanizing mankind.*

In youth, too, much mischief is done by the long daily periods of attendance at school, by the want of adequate sustenance at an early period of the day, and by the continued application of mind, which the ordinary system of education requires. The law of exercise, that long-sustained action exhausts the vital powers of an organ, applies, I cannot too often repeat, as well to the brain as to the muscles; and hence the necessity of varying the occupations of the young, and allowing frequent intervals of active exercise in the open air, instead of enforcing the continued confinement now so common. This exclusive attention to mental culture fails, as might be expected, even in its essential object; for experience shews, that, with a rational distribution of employment and exercise, a child will make greater progress than in double the time employed in continuous mental exertion. If the human being were made up of nothing but a brain and nervous system, it would be very well to content ourselves with sedentary pursuits, and to confine ourselves entirely to the mind. But when observation tells us that we have numerous other important organs of motion, sanguification, digestion, circulation, and nutrition, all demanding exercise in the open air as essential both to their own health and to that of the nervous system, it is worse than folly to shut our eyes to the truth, and to act as if we could, by denying it, alter the constitution of nature, and thereby escape the consequences of our misconduct.

Reason and experience being thus set at nought by both parents and teachers in the management of children, young people naturally grow up with the notion that no such influences as the laws of organization exist, and that they may follow any course of life which inclination leads them to prefer, without injury to health, provided they avoid what is called dissipation. It is owing to this ignorance, that we find young men of a studious or literary habit enter heedlessly upon an amount of mental exertion unalleviated by bodily exercise or intervals of repose, which is quite incompatible with the continued enjoyment of a sound mind in a sound body. Such, however, is the effect of the total neglect of all instruction in the laws of the organic frame during early education, that it becomes almost impossible to warn an ardent student against the dangers to which he is exposing himself, and nothing but actual experience will convince him of the truth. I have lately seen several instances of insanity, and also of total incapacity for future useful exertion, brought on by long protracted and severe study, in subjects whose talents, under a better system of cultivation, would have raised them to that eminence, the injudicious pursuit of which had defeated their own object, and ruined their general health. Pope was a remarkable example of this truth. By excessive application, he had reduced his health to such a deplorable state, that he at last gave way to it and prepared to die. "He fell into that state of exhaustion, which Smollett, too, once experienced for half a year, a *coma vigil*—an affection of the brain, when the principle of life is so reduced that all external objects appear as if passing in a dream,—a sort of torpid indistinct existence." Dr Radcliffe heard of his condition, ordered him to give up study, and to ride on horseback. Pope fortunately followed the advice, and regained comparative health. In two cases of a similar description which came under my own notice, the sufferers made the remark, that early instruction in the structure and laws of the animal economy, such as that which I am now attempting to communicate, might have saved them. Both meant well, and erred from ignorance more than headstrong zeal.

In the first number of the "American Annals of Education," the reader will find an instructive article, which strikingly illustrates the objects of the preceding exposition. "For twenty years and more," says the writer, in reference to what had taken place in an American seminary, "the unnatural union of sedentary with studious habits, contracted by the monastic system, has been killing in the middle age. The Register of Education shews, in one year, 120 deaths. Examine into the particular cases, and these will be found the undoubted effects of sedentary habits. Look at one name there. He had valuable gifts, perfected by two years' academic, four years' collegiate, and three years' theological studies. *He preached, gave much promise, and then died of a stomach disease. He contracted it when a student.* He did not alternate bodily with mental labour, or he had lived and been a blessing to the church. *When he entered on his studies, he was growing into full size and strength. He sat down till his muscles dwindled, his digestion became disordered, his chest contracted, his lungs congested, and his head liable to periodical pains.* He sat four years in College, and three years in theological application. *Look at him now.* He has gained much useful knowledge, and has improved his talents; he has lost his health. The duties of his mind and heart were done, and faithfully so; but those of his body were left undone. *Three hundred and seventy-five muscles, organs of motion, have been robbed of their appropriate action for nine or ten years, and now they have become, alike with the rest of his frame, the prey of near one hundred and fifty diseased and irritable nerves.*"—"Look at another case. Exposure incident to the parson or missionary has developed the disease in his chest, planted there while fitting himself for usefulness. He contracted a sedentary, while he was gaining a studious habit. That which he sows that also shall he reap. The east winds give him colds; a pulpit effort causes hoarseness and cough, oppression and pain. He becomes alarmed and nervous. His views of usefulness begin to be limited. *He must now go by direction, and not so much to labour where otherwise he would have been most wanted, as to nurse his broken constitution.* He soon adds to the number of *mysterious providences*,—to the number of innocent victims, rather, of cultivating the mind and heart, at the unnecessary and sinful expense of the body,—to the number of loud calls to alternate mental and corporeal action daily, for the reciprocal sanity and vigour of both body and mind."

In early and middle life, fever, with an unusual degree of cerebral disorder, is a common consequence of the excessive and continued excitement of the brain, which is brought on by severe study, unremitted mental exertion, anxiety, and watching. Some very marked cases of this kind have come under my observation; but that of Sir Humphrey Davy is so strikingly illustrative of the dangers alluded to, that I cannot do better than lay it before the reader. In November 1807, Sir Humphrey Davy was seized with very severe fever, in consequence of the excitement and fatigue which he underwent when engaged in the researches which led to his splendid discovery of the alkaline metals. "The laboratory of the Institution was crowded with persons of every rank and description, and Davy, as may be readily supposed, was kept in a continued state of excitement throughout the day. This circumstance, co-operating with the effects of the fatigue he had previously undergone, produced a most severe fit of illness, which, for a time, caused an awful pause in his researches, broke the thread of his pursuits, and turned his reflections into different channels. Davy ascribed his illness to contagion caught in experimenting on the fumigation of hospitals." "Upon conversing, however, with Dr Babington, who, with Dr Frank, attended

* Many of my readers will be glad to learn that Dr Brigham's little work has been reprinted in this country in a very cheap form, with notes by the late Dr Macnish of Glasgow. Dr Caldwell's "Thoughts on Physical Education" have also been republished, with notes by Mr Robert Cox. Both works contain facts and principles of great interest to every parent and teacher, and are calculated to be highly useful in advancing the cause of rational education.

Davy throughout this illness, he assured me that there was not the slightest ground for this opinion, and that the fever was evidently the effect of *fatigue and an over-excited brain.* The reader will not feel much hesitation in believing this statement, when he is made acquainted with the habits of Davy at this period. *His intellectual exertions were of the most injurious kind*, and yet, unlike the philosophers of old, he sought not to fortify himself by habits of temperance." "Such was his great celebrity at this period of his career, that persons of the highest rank contended for the honour of his company at dinner, and he did not possess sufficient resolution to resist the gratification thus afforded, although it generally happened that *his pursuits in the laboratory were not suspended until the appointed dinner hour had passed. On his return in the evening, he resumed his chemical labours, and commonly continued them till three or four o'clock in the morning, and yet the servants of the establishment not unfrequently found that he had risen before them.*" Such was the alarming state of his health, that for many weeks his physician regularly visited him four times in the day; and the housekeeper, Mrs Greenwood, never retired to bed except one night during eleven weeks. In the latter part of his illness "he was reduced to the extreme of weakness, and his mind participated in the debility of his body."*

Instances sometimes occur of persons, exhausted by anxiety and long attendance on others, being themselves attacked by fever, and dying, more from the unfavourable state to which previous exhaustion had reduced them, than from the intensity of the fever itself.

Nervous disease from excessive mental labour and exaltation of feeling, sometimes shews itself in another form. From the want of proper intervals of rest, the vascular excitement of the brain, which always accompanies activity of mind, has never time to subside, and a restless irritability of temper and disposition comes on, attended with sleeplessness and anxiety, for which no external cause can be assigned. The symptoms gradually become aggravated, the digestive functions give way, nutrition is impaired, and a sense of wretchedness is constantly present, which often leads to attempts at suicide. While all this is going on, however, the patient will talk or transact business with perfect propriety and accuracy, and no stranger could tell that any thing ails him. But in his intercourse with his intimate friends or physician, the havoc made upon the mind becomes apparent; and, if not speedily arrested, it soon terminates according to the constitution and circumstances of the individual case, in derangement, palsy, apoplexy, fever, suicide, or permanent weakness.

As age advances, moderation in mental exertion becomes still more necessary than in early or mature years. Scipion Pinel, in adverting to the evil consequences of excessive moral or intellectual excitement, acutely remarks, that although in youth and manhood the wear of the brain thus induced may be repaired, no such salutary result follows over-exertion in the decline of life; "*what is lost then is lost for ever.* At that period, we must learn to wait for what the brain is willing to give, and allow it to work at its own time: *to attempt to force it is to weaken it to no purpose*; it becomes excited and quickly exhausted when forced to vigorous thinking."—"Men of exalted intellect perish by their brains, and such is the noble end of those whose genius procures for them that immortality which so many ardently desire."†

Who can peruse these lines without the fate of Scott instantly occurring to his mind as a practical illustration of their truth? In the vigour of manhood, few ever wrote so much, or with greater ease. But when, on the verge of old age, adversity forced him to unparalleled exertion, the organic waste could no longer be repaired, and perseverance only "weakened the brain to no purpose," till morbid irritability became the substitute of healthy power, and he perished by that brain which had served him so faithfully and so efficiently, but which could no longer perform with safety the gigantic efforts which he continued to demand from it.

It is well remarked by Tissot, that the disorders produced by the efforts of the mind fall soonest upon such as are incessantly engaged in the contemplation of the same object. In this case, he adds, there is *only one part of the sensorium* (brain) *acted upon, and that is kept always on the stretch: it is not relieved by the action of the other parts, and therefore is sooner fatigued and injured*; the same rule holding with the brain as with the muscles, that the exercise, which, if divided among the different parts of which it is composed, will strengthen them, will, if confined to a few, exhaust and impair them. Boerhaave himself, after a long period of intense thinking, suffered for six weeks from excitement of the brain, bordering on madness, and characterized by that want of sleep, irritability, and indifference to ordinary interests, which so often appear as the harbingers of insanity.

The number of literary and public men, students and persons in business, who do themselves irreparable injury in this way, is so great, that few of my readers who have had experience of the world will be at a loss for examples even among their own acquaintances. In addition to Davy, Scott, and others, already mentioned, Sir Isaac Newton may be referred to, as it is now certain that his mind was for a time disordered by excessive application, and there is much reason to believe that he never altogether recovered from the shock. The more limited the sphere of talent, the greater the danger of the brain being over-exercised, particularly where the temperament is quick and irritable; and hence the frequency of nervous affections in musicians, and others of susceptible minds, who dedicate their lives to the exclusive cultivation of their arts. It is said that Gretry not only ruined his own health, but lost three highly gifted and beautiful daughters in succession, from over-excitement of the nervous system thus induced; and there can be no doubt that the melancholy fate of Weber was greatly hastened by intense application. He continued deeply engaged in musical composition long after his health was undermined; and even when the hand of death was almost upon him, his avocations pressed so heavily that he could not help exclaiming, "*Would that I were a tailor, for then I should have a Sunday's holiday!*" The philanthropic physician will rather be inclined to exclaim, "Would that mankind would study their bodily structure and functions, and thus learn to preserve longer the health and existence of those whose genius is the source of so many pleasures to the world at large!"

So little, however, is this close connexion of the mind with the brain practically understood, even among educated people, that instances are constantly occurring of the health of the nervous system being ruined by excessive application of mind, without the sufferer in the least suspecting the true cause of his ailments. This fact is well exemplified in the biography of the late Lord Dudley, which presents so many instructive particulars in a physiological point of view, that I regret being unable to notice it at greater length. The following extracts from the Quarterly Review are, however, so appropriate in themselves, and express so clearly the value of the principles which I have been expounding, that I cannot resist laying them before the reader. After mentioning that Lord Dudley was brought up from his earliest years in a state of entire isolation, the reviewer adds, that "the solitary boy, without brothers, sisters, or playfellows of his own age, became a man in habits while yet a child." "Deprived of out-of-door pastimes congenial to youth, he was driven to his books alone for solace and companionship. The lurking hereditary malady was strengthened by his own overstudious and sedentary habits. The irritable susceptibility of the brain was stimulated at the expense of bodily power and health, without which pleasure itself ceases to be *pleasure*. Dear, indeed, is knowledge purchased at the expense of happiness. His foolish

* Paris's Life of Sir H. Davy, p. 183.
† Physiologie de l'Homme Aliéné, p. 177.

tutors took a pride in his precocious progress, which they ought to have kept back. They watered the forced plant with the blood of life; they encouraged the violation of Nature's laws, which are not to be broken in vain; they infringed the condition of conjoint moral and physical existence; they imprisoned him in a vicious circle, where the over-worked brain injured the stomach, which re-acted to the injury of the brain. *They watched the slightest deviation from the rules of logic, and neglected those of dietetics, to which the former are a farce. They thought* of no exercises but in Latin,—they gave him a gradus instead of a cricket-bat, until his mind became too keen for its mortal coil; and the foundation was laid for ill health, derangement of stomach, moral pusillanimity, irresolution, lowness of spirits, and all the Protean miseries of nervous disorders by which his after-life was haunted, and which are sadly depicted in every letter now before us."

"One, indeed, of the boy's many instructors observed the silent operation of these morbid causes; and having learned Latin to some purpose, pursued the golden rule of education, *Mens sana in corpore sano*. This was a wise man after the manner of Anaxagoras, that respectable ancient, who requested on his deathbed that all the schoolboys might have a month's holidays. He accordingly locked the study-door, threw logic to the dogs, turned his pupil out to grass, and set him to work at the unscholastic pursuit of foxes. He opined that it was bodily exertion and mental inaction which generates the rude health—the '*dura ilia*' of country squires and haymakers, who never fatigue their sensoriums, nor fritter away their nervous energy: nor rob their gastric juices from a mistaken regard to their pia maters. The new instructor, therefore, took the Aristotelian method in this decided case of perversion—he bent the twig in the contrary direction, in the hope of ultimately bringing it to the perpendicular. But, unfortunately, the news of this prodigious idling ere long reached the ear of the father, who, never interfering except injudiciously, dismissed the tutor who might have saved his pupil, and people of the old stamp continued in function until the *toga quasi virilis* (of undergraduateship) was assumed."

"The very first lines of Lord Dudley's in the volume before us reveal the sad consequences of this system, already fixed and chronic at the early age of nineteen. Affixed to the portrait is this postscript—'The verses go on *miserably*; YET I neither drink, hunt, shoot, or fish.' On a smaller peg than this Tissot or Combe would hang a quarto treatise; and truly might Lord Dudley point the moral of their tale, the sure effect of the organic laws of physiology." . . . "Lord Dudley 'writes *because he is unable to sleep*.' Well would it have been had the killing 'yet' of the 'postscript' been corrected into *because*." (*Quart. Rev.* No. 133, p. 85.)

Such is the instructive and melancholy case of Lord Dudley, and such are many more, the details of which are never given to the world. In justice to the reviewer's sagacity, however, I am bound to confess that, as I read his interesting narrative, I had resolved to "point a moral" with it before I came to the expression of his own opinion that it was truly fitted for the purpose.

CHAPTER XIII.

APPLICATION OF THE PRECEDING PRINCIPLES TO THE HEALTH OF THE BRAIN AND NERVOUS SYSTEM, AND TO GENERAL EDUCATION.

Mental or functional conditions of cerebral health.—Manner in which abuse of its functions affects the brain.—Physiological relation between mental power and cerebral organ.—Advantages from acting in accordance with it.—Evils from neglecting it.—Its importance in intellectual and moral education—in the sick-room and in the treatment of the insane.—Every mental faculty and cerebral organ to be exercised for itself.—This principle acted upon in other things, even in savage life—examples—its importance in education—moral as well as intellectual.—Judicious repetition of mental act is the next requisite—examples.—Mental exertion to be avoided after meals.—Bad health from neglecting this.—Best time for study and activity of mind.—Periodicity of action in the nervous system—hence regularity indispensable.—Necessity of distinguishing between mode of cultivation and subjects to be taught.—Consequences of confounding these.—Uses of phrenology in education.

In the present chapter I need not enlarge farther upon the means of fulfilling the *organic* conditions of cerebral and nervous health. These have been already sufficiently explained; but a few additional remarks will be required concerning those conditions which, having a direct reference to the manner in which the mind is exercised, may be correctly designated as *mental or functional*.

It may be stated as a general fact, confirmed by the widest experience, that functional causes, or those which operate by impairing, exciting, or perverting functional activity, are the most efficient of all in inducing organic disease: and as a corollary from this proposition, that the well-regulated exercise of the function is one of the best preservatives of organic health. In the case of the eye, for example, the insufficient or excessive exercise of its function, in straining over minute objects, or in exposing the eye to a very bright light, rarely fails, if continued, to induce disease: while the regulated exercise of vision on a variety of objects in an appropriate light, and at appropriate intervals, tends greatly to strengthen and preserve the eye. In like manner, vitiation of the digestive function from aberrations in diet is the most direct cause of disease in the stomach; while its proper exercise in the use of a well-regulated diet in harmony with the constitution and mode of life, is the best safeguard of its health. The same principle applies to the lungs, the liver, and the heart, in all of which, disease is excited by abuse of their respective functions, more readily perhaps than by any other cause.

In this respect, as shewn in the preceding chapter, the brain, considered as a whole and serving for the operation of all the powers of the mind, constitutes no exception to the general rule: and, accordingly, its health suffers most frequently from causes which disturb its *mode of action*, and is best promoted or restored by the proper regulation of the mental functions. The same rule applies of course to the individual parts of which the brain is composed, each considered as the special organ of an individual mental faculty. Here, consequently, the real importance of the question, Whether the brain is a single or compound organ? becomes more and more apparent. If, as I have endeavoured to shew (see p. 77), the brain is not a single organ serving equally for the manifestation of the whole mind, but an aggregate of many individual parts, each serving for the operation of an individual mental faculty, in the same way as the eye, the ear, and the nose, serve for vision, hearing, and smelling, it follows that each may be exercised independently, and that to provide for the health of *the whole* brain, we must secure the direct and adequate exercise of the whole of its component organs by the corresponding exercise of *all* the moral and intellectual faculties specially connected with them. This may seem a very simple and natural proposition; but the evils which flow from its practical neglect are nevertheless very numerous. If, as phrenology proves, and as most physiologists admit, the moral faculties have their seat in one region of the brain, the intellectual powers in another, and the affections and appetites in a third, it is clear that any one of these groups of faculties, and their corresponding cerebral organs, may be exercised singly without the slightest beneficial influence thence necessarily result,

ing to the other two. By the well-regulated employment of the intellectual faculties, for instance, we may impart strength and readiness of action to the anterior lobe of the brain; and yet, by neglecting the due exercise of the affections and moral sentiments, allow the middle and posterior lobes to become enfeebled by inaction, and, as a consequence, these powers themselves to be impaired in health and vigour. Physiologically speaking, it would be as unreasonable to expect the moral feelings to be strengthened by a cultivation thus restricted to intellect alone, as to expect any improvement in hearing from the exclusive exercise of vision. For the same reason, it would be absurd to expect the improvement of *all* the moral feelings, or of *all* the intellectual powers, from exercise restricted to any one or only a few of their number. As all of them are capable of independent action, it is clear that each must be cultivated individually when we wish to promote its development. The sense of justice may be roused into activity at the same time as the feeling of compassion; but they may also act separately, and the activity of the one is far from necessarily implying that of the other. Pity may even be carried so far as for the moment to weaken and impede the operation of conscience, and the reverse. Hence it is a mere delusion to imagine that we take the surest way to invigorate our moral nature, when we simply inculcate intellectually the duty of being honest, kind, and pious. We must be *trained to the habitual practice* of integrity, benevolence, and veneration in our daily life, and see them made the daily standards of conduct of all around us, before these sentiments can acquire the predominant sway which the Creator manifestly designed them to exercise.

I venture thus earnestly to insist upon the necessity of keeping constantly in view the true relation in which each faculty of the mind stands to its individual cerebral organ, because ignorance or neglect of it has been the source, not only of much suffering and bad health, but of most of the errors which have long impaired the practical efficiency of education as a means of human improvement. Hence, instead of the moral faculties being invigorated, and the social affections cherished by their generous and well-regulated exercise upon their appropriate objects, systematic cultivation is still in a great measure restricted to one or two of our inferior propensities,—emulation and the love of gain,—and to such of the intellectual faculties as seem most likely to minister to their gratification. The necessary result is, that neither morally nor intellectually has education yielded the rich fruits which might be obtained from it under a better system of cultivation.

As regards health, also, the frequent consequence of this error has been, that, from limiting mental activity to the excessive exercise of only a few faculties, these few have, under the powerful stimulus of competition and personal ambition, been roused to inordinate action, and occasionally become diseased, while the others, which might have guided or controlled them, have been rendered, by inaction, comparatively powerless. This is the real explanation of Tissot's remark in a former chapter, that the health of the mind and brain is most apt to give way where the former is intently occupied on a very limited range of objects; for what is this but saying in other words that the health of the mind gives way most readily where a few only of its powers are in constant and excessive activity? On the same principle, the experienced insufficiency of mere intellectual education to improve the moral condition of man is easily explained; for where intellect alone is exercised and the moral powers are left uncultivated, what else can be rationally expected but that the latter and their organs should become weakened by inaction?

In the sickroom, too, many evils have arisen from overlooking the intimate relation subsisting between cerebral and mental activity. In fevers in which nervous sensibility is much excited, and tranquillity and repose of mind are almost indispensable to recovery, it is no uncommon thing to find the attendants indulging in open or whispered conversations, every word of which is calculated to stir up some waking faculty, or give rise to some false impression upon the senses, which may be painfully and hurtfully brooded over in silence by the patient, till the excitement of mind breaks forth in irrepressible delirium, or in wandering thoughts having no relation to the scene or circumstances in which he is placed. This error is thoughtlessly committed by the friends or attendants, under the mistaken belief that so long as no great noise is made, and the conversation is not addressed to the patient himself, and he is not allowed to take any part in it, no harm can result, because he makes no active exertion. But a more correct acquaintance with the connexion subsisting between the mind and its corporeal organs would at once reveal the hidden danger, and prevent even the most inconsiderate from acting in a way so likely to defeat the best efforts of the physician. From the same mistaken view, it is a common practice with many people to admit visiters into the presence of the sick, even where tranquillity has been most strictly enjoined. The intruders are warned, perhaps "not to speak, but only to look," and no suspicion is entertained that the mere presentment of an object, connected with the patient, it may be, by many old associations, is sure to excite to activity, not only the senses and powers of preception, but many of our strongest feelings and habits of thought. I have seen mischief done in this way by those who would willingly have made any sacrifice for the relief of the sufferer, and who were themselves most distressed on being made aware how much their conduct was really opposed to the fulfilment of their dearest wishes.

From the same disregard of the dependence of the health of the nervous system upon the due exercise of all the powers of the mind, emotional and social as well as intellectual, it was long but most erroneously considered sufficient in the treatment of the insane, to place them in secure confinement, without any provision whatever being made for their occupation or amusement, for the gratification of their affections and moral feelings, or for strengthening their reason by friendly intercourse. And when, in such unnatural circumstances —circumstances often sufficient in themselves to shake the healthiest minds—recoveries were few and far between, the unfortunate result was ignorantly ascribed entirely to the mysterious and intractable nature of the disease, and no effort was made to amend it. At last, however, a brighter day has dawned, and it is beginning to be generally understood, that, in insanity, as in other diseases, the laws which preside over the vital functions continue to operate, and that, during derangement as well as when the mind is sound, the regulated activity of every bodily organ exercises a great influence upon its health. As a consequence of this admission, efforts are now made to provide for the insane the means not only of bodily exercise and occupation in the open air, but also of intellectual, moral, and social enjoyment. Severity and neglect are happily laid aside as inconsistent with this purpose, and the unhappy lunatic, formerly controlled by brute force, now finds himself the object of a systematic kindness, and intelligent and active sympathy, the tendency of which is to contribute powerfully towards his recovery, by at once soothing the morbid irritability of his troubled spirit, and securing for him all the enjoyment which he can derive from gratified feelings and affections.

Keeping in view, then, the independent action of the different faculties, and the relation of each to its own cerebral organ, the first of the *functional* conditions of the health of the brain and nervous system, to which it concerns us to direct our attention, is that which points to *the direct exercise of every faculty and its cerebral organ* as indispensable to its free development and vigorous

action. But as this principle is of the highest practical importance, and is habitually lost sight of in moral education and in social life, I cannot refrain from enlarging somewhat further upon it, even at the risk of being tedious.

The principle on which I insist is indeed so much in accordance with the dictates of common sense, that it has long been acted upon in some departments of education, not so much from its importance being recognised, as from an almost instinctive perception of its propriety. When we wish, for example, to train the muscles to the graceful and rapid evolutions of fencing, we do not content ourselves with merely giving directions; but our chief attention is employed in making the *muscles themselves* go through the evolutions, till, by frequent repetition and correction, they acquire the requisite quickness and precision of action. In like manner, when we wish to teach music, we do not merely address the understanding and explain the qualities of sounds, but we train the ear to their attentive discrimination, and the hand to the reproduction of the motions which call them into existence. We follow this plan, because the laws of organization require direct practice, and we feel instinctively that we can succeed only by obeying them. Now, the purely mental faculties being connected during life with material organs, are subjected to precisely the same law; and, therefore, if we wish to improve the reasoning powers, we must exercise them regularly in tracing the causes and relations of things. And, on the same principle, if our aim be to develope the sentiments of Attachment, Benevolence, Justice or Respect, we must exercise each of them directly and for its own sake, and not content ourselves with teaching precepts, which address themselves to the understanding alone; and which, therefore, may be learned with the greatest accuracy, without necessarily imparting even a shadow of increased vigour to any one of the moral emotions just named.

Such being the constitution which God has given us, it ought never to be forgotten, that in education it is the brain, or organ of mind, and not the abstract immaterial principle, which requires cultivation, and that hence *education operates invariably in subjection to the laws of organization.* In improving the *external* senses, we admit this principle readily enough; but whenever we come to the *internal* faculties of thought and feeling, it is either denied or neglected. With gross inconsistency, we admit that the superior quickness of touch, sight, and hearing, consequent upon judicious exercise, is always referrible to increased facility of action in their appropriate organs; but when we explain, on the same principle, the superior development of the reasoning powers, or the greater warmth of feeling produced by similar exercise in the social or moral feelings and other internal faculties, few are inclined to listen to our proposition, or allow to it half the weight or attention which its importance requires, although every fact in philosophy and experience concurs in supporting it. We observe the mental powers of feeling and of thought unfold themselves in infancy and youth, in exact accordance with the progress of the organization; we see them perverted or suspended by the sudden inroad of disease, and as suddenly restored; nay, we sometimes observe every previous acquirement obliterated from the adult mind by fever or by accident, leaving education to be commenced anew, as if it had never been; and yet with all these evidences of the organic influence, it is still a novelty in education to propose that the established laws of physiology, as applied to the brain, should be considered as our best and surest guide; and scarcely a volume can be pointed out in which it is even hinted that these laws have the slightest influence over mental or moral improvement.

Were a general acquaintance with the laws of organization to be held as an indispensable part of a liberal education, we should then be able to inculcate, with tenfold force and success, the necessity of actively exercising every faculty, whether of thought, feeling, or motion, directly *on its own objects*, and at once to explode the mistake of supposing that any organ or function may be efficiently exercised through the medium of another, and that, to produce high moral feeling, it is sufficient to address ourselves to the intellect alone. The merest savage, following the footsteps of Nature, would pity the philosopher who should seriously assure him that, to cultivate acuteness of hearing or of vision, it was sufficient to be told how to listen or to look. The savage goes more directly and surely to work. If he wants physical strength, agility, and swiftness of foot, he sets himself to develope the muscular system of his child by ample muscular exercise, by constant repetition of the movements and acts he wishes him to perform, and by causing him to run, to leap, or to swim; and he rests in the well-founded hope of accomplishing his purpose. Following the same rule when he seeks acuteness of hearing, he does not merely tell his child how to listen, but he lays him with his ear to the ground, and teaches him, by practice, to distinguish the qualities of sounds. If he wishes him to excel in hunting, in fishing, in lying in ambush, or in scenting the approach of an enemy, he expects to be successful only in proportion as he finds occasion to employ him in the practice of these pursuits. If he wishes to inculcate courage in battle, contempt of pain, endurance of fatigue, obedience to chiefs, or revenge upon enemies, he does not satisfy himself with mere precept, but resorts at once to *practice*, and by subjecting his child to hardship and privations, exposing him to danger, and exacting from him unhesitating submission to authority, he succeeds in eliciting all the qualities essential for the circumstances under which he lives, and without the possession of which he would neither be safe from his enemies nor respected by his friends.

With this experience before our eyes, then, let us, who pretend to superior wisdom and civilization, shew ourselves also consistent, and ready to receive instruction from whatever quarter it may come. As God has given us bones, and muscles, and bloodvessels, and nerves, for the purpose of being used, let us not despise the gift, but consent at once to turn them to account, and to reap health and vigour as the reward which He has associated with moderate labour. As He has given us lungs to breathe with, and blood to circulate, let us abandon the folly of shutting ourselves up with so little intermission, engaged in motionless study and sedentary occupations,—and consent to inhale copiously and freely that wholesome atmosphere which His benevolence has spread around us. As He has given us appetites and organs of digestion, let us profit by His bounty, and earn their enjoyment by healthful exercise. As He has given us a moral and a social nature, which is invigorated by activity, and impaired by solitude and restraint, let us cultivate good feeling, and act towards each other on principles of kindness, justice, forbearance, and mutual assistance; and as He has given us intellect, let us exercise it in seeking a knowledge of His works and of His laws, and in tracing out the relation in which we stand towards him, towards our fellow-men, and towards the various objects of the external world: and, in perfect faith and sincerity, let us rely upon His promise, that, in so doing, we shall have a rich reward—a reward a thousand times more pure, more permanent, and more delightful, than we can ever hope to experience in following our own blind devices, regardless of His will and intentions towards us.*

* Those of my readers who wish to pursue the inquiry, and to trace the relations in which Man stands to his Creator, to his fellow-creatures, to himself, and to the external world, will find a clear and comprehensive guide, in a small volume, entitled "The Constitution of Man, considered in relation to External Objects. By George Combe." In this work, of which upwards of 50,000 copies have got into circulation

So little, however, are even educated men familiar with the influence and laws of the organization, that, even in our best directed establishments, as well as in private families, cultivation is still in a great measure confined to intellect alone; and the *direct* exercise and training of the moral and religious sentiments and affections are rarely thought of as essential to their full and vigorous development. Moral precepts are, no doubt, offered in abundance; but these, as we have seen, address themselves chiefly to the intellect. We must not be satisfied with merely exclaiming, "Be kind, just, and affectionate," when perhaps at the very moment we are counteracting the effect of the advice by our own opposite conduct. "*She told me not to lie*," said Guy Rivers, in speaking of his mother, "*and she set me the example herself by frequently deceiving my father and teaching me to disobey and deceive him.*" Conduct like this is more common in real life than is supposed, although generally less flagrant in degree. Parents, indeed, too often forget that the sentiments *feel* and *do not reason*, and that, consequently, even a stupid child may, by the instinctive operation of its moral nature, at once detect and revolt at the immorality of practices, the true character of which its *reason* is unable to penetrate or expose. It is one of the most effectual methods of cultivating and exciting the moral sentiments in children, to set before them the manifestations of these in our habitual conduct, and we should be most careful never to practise before them that which we do not wish them to imitate. If we first chide a child for seeking to indulge its sense of taste, and attempt to impress it with the impropriety of cultivating the animal appetites by devouring sweetmeats and delicacies, and, on sitting down to dinner the next moment, begin to expatiate with delight on the excellence, richness, and flavour of the dishes of which we are partaking, what is the child to think or to do? Seeing practice and precept thus set in opposition, what weight can it possibly attach to the mere verbal injunction? Again, what improving influence can that parent exert over the moral conduct of his child who, verbally recommending kindness, openness, and justice, *tricks* the child into the confession of faults, and then basely punishes it, having previously promised forgiveness? And how is openness best encouraged—by practising it in conduct, or by neglecting it in practice but praising it in words? Is it to be cultivated by thrusting suspicions in the face of honest intentions? Or what kind of moral education is that which says, *Do as I bid you, and I will give you sweetmeats or money, or I will tell your mamma how good you were*; holding out the lowest and most selfish propensities as the motives to moral conduct! Did space permit I might indeed pursue the whole round of moral and religious duties, and ask similar questions at each. But it is needless. These examples will suffice; and I give them not as generally applicable, but simply as individual instances which have come within the sphere of my own knowledge, and which bear directly upon the principle under discussion.

In the practical training of the young, it is of consequence to keep in mind that the moral sentiments, in common with the intellect, are dependent on organization for their means of activity during life, and consequently are more successfully cultivated by being habitually employed in regulating the every-day affairs of life, than by waiting for great occasions on which they may be exercised with unusual vigour. Benevolence, no doubt, is vividly excited by the aspect of great misery and unhappiness, and impels strongly to the relief of the suffering object; but this is not its most common or its most useful field. In ordinary life, it finds ample scope in charity to our neighbours, and in contributing to the happiness of our family circle, and of our associates and dependents. Benevolence is much better occupied in adding a gleam of enjoyment, in removing little sources of irritation, in promoting concord among relatives, and in other kind offices of a similar nature, than in giving alms indiscriminately to all who demand them, or even in relieving occasional distress, where this is held, as it too often is, to dispense with all obligation to habitual forbearance and Christian good-will in the private relations of life. But how little is this most important faculty directly attended to or cultivated, in the way we see done with the faculties necessary for the practice of drawing or music, which, by incessant exercise, procured at a great sacrifice of time, money, and labour, are brought into such a state of activity as ever after to enable their possessors to derive delight from their exercise, where the talents are possessed in any considerable degree! And what might we not expect from the systematic training of the higher sentiments on a similar plan, in improving society and exalting the happiness of the race? But it is evident that the objects of Benevolence are our fellow-creatures; and consequently, if we restrict our intercourse and our sympathies to the limits of our own drawing-rooms, and take no interest in the progress of the race or of the individuals composing it, we leave our best faculties in abeyance, and reap the reward of bodily debility, weariness, and monotony of mind.

Conscientiousness is another moral faculty that requires direct cultivation, and that rarely receives it. It holds the balance between man and man, and is excited by the presentment of any difference of right between individuals, of any injustice, or of any temptation offered by the other faculties, which may lead us to encroach on the rights of other men. It gives a strong sense of duty, with which it is agreeable to act in conformity, but which it is painful and injurious to oppose. It gives weight and force to the impulses of the other sentiments, and, joined with intellect and the feeling of devotion, gives that faith in the beneficence and equity of the Deity, and in the immutablity of all His laws, that forms the strongest encouragement to virtuous conduct and temporary self-denial. But seclusion and privacy afford no scope for such an exercise of conscientiousness; and hence an additional proof that Providence intended every one to live in society, engage in the active duties of life, and act justly amidst the conflicting interests of others!

I need not follow out this exposition in detail. The preceding illustrations will suffice to explain the *principle*; and to exceed this limit would withdraw attention too much from the matters more directly before us.

For the same reason that every faculty ought to be exercised directly upon its own objects, the exclusive use of book-education as a means of conveying instruction is manifestly unnatural as well as inefficient. If allowed to handle and examine a new object, a child will pursue the investigation with pleasure, and in five minutes will acquire a more correct knowledge than by a whole hour's reading about its qualities without seeing it. In the one instance, its perceptive powers are stimulated by the direct presence of the qualities of which they are destined to take cognizance; while, in the other, they are roused only through the imperfect medium of artificial language, and the child has to *create* the object in its own mind before he can take notice of its qualities. When we recollect the different ideas which the same written language suggests to different *mature* minds, we may form some conception of the impossibility of a child making progress in this way, and of the weariness and ennui which the thankless effort must always induce; and yet at the present day, in nineteen out of twenty schools, all the knowledge that is

within the last few years, a general view is taken of the human constitution, and of the laws which regulate the organic, moral, and intellectual nature of man. The sources of most of the evils which afflict the human family are successfully traced to violations of those laws, and shewn to be, to a great extent, within our own control; so that practical usefulness, and not mere speculation, is the characteristic of the volume.

offered is through the medium of books and language alone!

It is well remarked by M. Duppa, in his excellent little work on the education of the peasantry in England, that "it is the habit of accurately observing the actual nature of objects, as perceivable by the senses, and distinctly marking their differences, which in after-life renders a man intelligent and judicious. There are few whose natural faculties are so dull as to be unable to perceive a distinction when pointed out to them, or when their notice is directed towards it,—for instance, that one thing is long, another short; that one is round, another flat, one green and another black. But how few are there who, when minutely questioned, can give a clear or circumstantial description of any object they have been conversant with, or in what particular that object differs from another! And why is this? Because they have not the habit of accurate observation of things; and they have not that habit, *because in modern education a child's observation at the moment when all is new and observation most active, is wilfully drawn away from things to the signs of things; and the boy who might easily have been made to distinguish the nature and properties of the different objects around him, has only learned to distinguish one letter from another.*" (P. 27.)

It is but another proof of the harmony of design in all the works of the Creator, that this method of directly cultivating the observing powers cannot be adequately fulfilled without a certain amount of muscular exertion and of daily exposure to the open air, in going about to collect and examine the varied objects of interest with which creation abounds. In other words, we cannot benefit the perceptive faculties, without at the same time benefitting the muscular system and the organs of respiration, circulation, and digestion; and this grand recommendation in the eye of reason,—pursuing study in the field of nature, instead of in books alone,—is actually, though not avowedly, the circumstance which retards its adoption in ordinary education. To take the scholar out of the school-room to look at the works of God is thought to be encouraging idleness and a love of pleasure, and therefore it is denied!

What, therefore, is wanted is a system of education which shall not only give full play to the intellectual faculties, but also make ample provision for the direct exercise of the physical and moral powers and domestic affections. While we cultivate the intellect, let us never forget that our moral nature is of still greater importance in fitting us for the duties of life. And while we cherish both the intellectual and moral faculties, let us also bear in mind that both act by means of a physical organization, the well-being of which is indispensable to their health and soundness, and to our happiness; and that, therefore, due provision must be made for its active employment either in useful labour or in daily exercise. The details of such a system do not fall under the scope of a treatise like this; and I must, for the present, content myself with the exposition of the general principle.*

During infirm health, a serious obstacle to entering upon the regular exertion here recommended is often present, and arises from a feeling in the patient, against which he cannot be too much on his guard. Where the nervous system is weak, and where it, of course, requires most to be strengthened, there is often a retiring sensitiveness of disposition, leading its possessor rather to avoid than to seek intercourse with society. Feeling the irksomeness of present exertion, the nervous invalid is apt to form the secret resolution to live in solitude *till the mind shall become stronger*, and then to seek society when it will no longer be a burden. Unhappily, however, this feeling leads only to delusion, and the wished-for result becomes every day more distant the longer retirement and indolence are persevered in. It is by activity, and not by repose, that strength is to be acquired. We do not expect to increase bodily strength by lying in bed, but by stirring about; and, in like manner, we shall never succeed in strengthening the nervous system by indulging in solitude and mental indolence. Many are led astray by the false expectation of acquiring strength without using the natural means from which alone strength can be procured.

Another practical principle immediately connected with the proper exercise of the mental faculties and their cerebral organs, and the influence of which has not been sufficiently appreciated in educational management, is that which inculcates judicious *repetition* as indispensable to obtaining *durable* results. The manner in which the repetition of a functional act operates in improving the condition of the organ, may be understood from the explanation formerly given of the influence of exercise upon nutrition (see p. 41). At present it will be sufficient to remark, that to induce strength and facility of action in the organs of the mind, *practice*, or the repetition of the effort, is as essential as it is in the organs of motion. The idea or feeling must not only be communicated, but it must be reproduced and represented in different forms, till all the faculties concerned in understanding it come to work efficiently together in the conception of it, and till a sufficient impression be made upon the organ of mind for the latter to retain it. This is, in truth, the reason why in some parts of this exposition I have ventured upon an extent of repetition, which I should have been the first to condemn and avoid had the subject been less important, or more familiar to the reader. From overlooking this necessity of repetition, we often blame servants for not doing a thing every day, because they were *once* told to do so. The organic laws, however, teach us that we are presumptuous in expecting the formation of a habit from a single act, and that we must reproduce the associated activity of the requisite faculties many times before the result will certainly follow, just as we must repeat the movement in dancing or skating many times before we become master of it. In like manner, we find, on turning to a new subject, that however well we may understand it by one perusal, we do not fully master it, except by dwelling upon it again and again. Repetition is, in fact, the principle by which the division of labour, so well understood in England, leads to such admirable perfection of work, where practical skill, neatness of hand, or high finish, is required; and in the rapid solution of complicated arithmetical questions in many of our common schools, we witness its effects in the operations of mind, quite as remarkably as in those belonging to the mechanical arts.

Repetition is thus necessary to make a durable impression on the brain; and, according to this principle, it follows, that, in learning a language or science, six successive months of application will be more effectual in fixing it in the mind, and making it a part of its furniture, than double or triple the time, if the lessons are interrupted by long intervals. Hence it is a great error to begin any study, and then break off to *finish* at a later period. The *ennui* is thus doubled, and the success greatly diminished. The best way is to begin at the proper age, and to persevere till the end is attained. This accustoms the mind to sound exertion, and not to

* In the *Reports on the Training of Pauper Children*, submitted to the Secretary of State by the Poor Law Commissioners in 1841, the reader will find a vast amount of evidence, of the most instructive kind, illustrative of the principles inculcated in these pages. The whole of it being derived from actual and extensive experience in intellectual and moral training, it possesses a force and value which no unprejudiced and intelligent mind can resist. As regards the prevention of crime, and the general improvement of the poor and working classes in character and social comfort, I consider these Reports to be the most important contribution which the public has received for many years. In Mr Simpson's able work on National Education, the reader will also find an eloquent exposition of the general subject of popular education.

fits of attention. Hence the mischief of long vacations, and hence the evil of beginning studies before the age at which they can be understood, as in teaching the abstract rules of grammar to children; to succeed in which implies in them a power of thinking, and an amount of general knowledge, which they cannot possess.

In physical education, we are quite alive to the advantages of repetition and practice. We know that if practice in dancing, fencing, skating, and riding, be persevered in for a sufficient length of time to give the muscles the requisite promptitude and harmony of action, the power will be ever afterwards retained, although little called into use; whereas, if we stop short of this point, we may reiterate practice by fits and starts, without any proportional advancement. The same principle applies equally to the moral and intellectual powers, because these operate by means of material organs.

The necessity of being in private what we wish to appear in public, springs from the same rule. If we wish to be polite, just, kind, and sociable, we must habitually act under the influence of the corresponding sentiments in the domestic circle and in every-day life, as well as in the company of strangers and on great occasions. It is the daily practice which gives ready activity to the sentiments, and marks the character. If we indulge in vulgarities of speech and behaviour at home, and put on politeness merely for the reception of strangers, the former will shine through the mask which is intended to hide them; because the habitual association to which the organs and faculties have been accustomed, cannot thus be controlled. As well may we hope to excel in elegant and graceful dancing, by the daily practice of every awkward attitude. In the one case, as in the other, the organs must not only be associated in action by the command of the will, but also be habituated to the association by the frequency of the practice; a fact which exposes the ignorant folly of those parents who habitually act with rudeness and caprice towards their children, and then chide the latter for unpolite behaviour towards strangers.

The same principle, of repetition being necessary to make a durable impression on the brain and constitute a mental habit, also explains the manner in which natural endowments are modified by external situation. Taking the average of mankind, the limits to which this modification may be carried are not narrow. Place a child, for example, of *average* propensities, sentiments, and intellect, among a class of people—thieves—in whom the selfish faculties are exclusively exercised; by whom gain is worshipped as the end of life, and cunning and cheating as the means; and among whom is never heard one word of disapprobation or moral indignation against either crime or selfishness; and its lower faculties will be exclusively exercised and increased in strength, while the higher will be left unemployed and become weak. A child so situate will consequently not only act as those around him do, but insensibly grow up resembling them in disposition and character; because, by the law of repetition, the organs of the selfish qualities will have acquired proportionally greater aptitude and vigour, just as do the muscles of the fencer or dancer. But suppose the same individual placed *from infancy* in the society of a superiorly endowed moral and intellectual circle; the moral faculties will then be habitually excited, and their organs invigorated by repetition, till a greater aptitude, or, in other words, a higher moral character, will be formed. There are, of course, limits set to this modification by the natural endowments of the individual; but where the original dispositions are not strongly marked, the range is still a wide one.

In carrying repetition into effect, the times and circumstances under which it ought to be practised also deserve the most serious consideration. On these I shall accordingly offer a few remarks.

It seems to be a law of the animal economy, that two classes of functions cannot be called into vigorous action at the same time, without one or other, or both, sooner or later sustaining injury. Hence the important rule, *never to enter upon continued mental exertion, or to rouse deep feeling, immediately after a full meal*, as the activity of the brain is sure to interfere with that of the stomach, and disorder its functions. Even in a perfectly healthy person, unwelcome news, sudden anxiety, or mental excitement, occurring after eating, will put an entire stop to digestion, and cause the stomach to loathe at the sight of food. In accordance with this, we learn by experience, that the worst forms of indigestion and nervous depression are those which arise from excessive application of mind or turmoil of feeling, conjoined with unrestrained indulgence in the pleasures of the table. In such circumstances, the stomach and brain react upon and disturb each other, till all the horrors of nervous disease make their unwelcome appearance, and render life miserable. Literary men and hard students know this fact from sad experience; but, as they are not aware of the incompatibility of the two processes, of active thinking and active digestion going on at the same time, it is extremely difficult to give them a sense of their danger, and to convince them that an hour or an hour and a half after a meal is more profitably spent in easy relaxation than in the labour of composition. As regards the lower animals, indeed, we are careful enough to observe this organic law; for we do not allow our horses or dogs to be actively exercised till digestion is in some degree completed.

It may be said that mechanics, labourers, and others, hurry away to work immediately after meals without any apparent injury; and that, in the United States, the practice of hastily swallowing dinner and instantly returning to business is almost universal. My answer to this objection is simply, that experience proves the fact, that digestion goes on better when exertion is refrained from and repose is enjoyed; and that the tendency to sleep and inactivity which besets most animals after a full meal shews repose to be, in such circumstances, the intention of nature. It must be observed, also, that the bad effects of immediate exertion are not among those which ensue instantly, or are felt from day to day. They may shew themselves only at the end of months or years, when the influence has, as it were, accumulated by repetition. Although, therefore, the system possesses a certain power of resistance, and many persons seem to escape even for years, it cannot be doubted that opposition to the law of nature will eventually prove injurious. The extreme prevalence of dyspeptic complaints and of insanity among the Americans, is doubtless partly owing to the very practice which is supposed by some to be harmless to them. Dr Caldwell of Lexington, who has devoted much time and talent to the diffusion of sound knowledge and the improvement of the race, and whose opportunities of observation have been very extensive, expressly states, that "dyspepsia and madness prevail more extensively in the United States than among the people of any other nation. Of the amount of our dyspeptics," he says, "no estimate can be formed; but IT IS IMMENSE. Whether we inquire into cities, towns, villages, or country places, among the rich, the poor, or those in moderate circumstances, we find dyspepsia more or less prevalent throughout the land."* It is clear from this testimony, which is confirmed by many other observers, that the people of the United States form no exception to the general law of Nature, and that they *do* suffer for their hurried eating and neglect of repose after meals.

The time best adapted for mental exertion falls next to be considered. Nature has allotted the darkness of night for repose, and for the restoration, by sleep, of the exhausted energies of mind and body. If study or composition be ardently engaged in towards that period of the day, the increased action in the brain which al-

* Caldwell's Discourse on Physical Education, p. 87.

ways accompanies activity of mind requires a long time to subside; and, if the individual be at all of an irritable habit of body, he will be sleepless for hours after going to bed, or perhaps be tormented by unpleasant dreams. If, notwithstanding, the practice be continued the want of refreshing repose will ultimately induce a state of morbid irritability of the nervous system, not far distant from insanity. It is, therefore, of great advantage to engage in severer studies early in the day, and devote two or three of the hours which precede bed-time, to lighter reading, music, or amusing conversation. The vascular excitement previously induced in the head by study has then time to subside, and sound refreshing sleep is much more certainly obtained. This rule is of great consequence to those who are obliged to undergo much mental labour, and it will be found that many of our most prolific writers,—of those especially who write much and yet preserve their health,—are among those who have, either from knowledge or from inclination, devoted their mornings to study and their evenings to relaxation, and who also indulge in ample exercise. Such was Sir Walter Scott's distribution of his time, and such I know to be that of one of our ablest living writers.

There are, no doubt, individuals so happily constituted, and whose natural sphere is so essentially that of activity, that they are able to think and work early and late, for years in succession, with very little sleep, and with little regard to diet and regimen; but they are so obviously exceptions to the general rule, that we cannot for a moment hold them up as models for imitation; and even they would enjoy their astonishing gifts with greater security, were they to conform more completely to the laws of their organization.

Periodicity, or the tendency to resume the same mode of action at stated times, is peculiarly the characteristic of the nervous system; and on this account *regularity* is of great consequence in exercising the moral and intellectual powers. All nervous diseases have a marked tendency to observe regular periods, and the natural inclination to sleep at the approach of night is but another instance of the same fact. It is this principle of our nature which promotes the formation of what are called habits. If we repeat any kind of mental effort every day at the same hour, we at last find ourselves entering upon it, without premeditation, when the time approaches; and, in like manner, if we arrange our studies in accordance with this law, and take up each regularly in the same order, a natural aptitude is soon produced, which renders application more easy than by taking up the subjects as accident may direct. Nay, the tendency to periodical and associated activity occasionally becomes in the course of time so great, that the faculties seem to go through their operations almost without conscious effort, while their facility of action becomes so prodigiously increased as to give unerring certainty where at first great difficulty was experienced.*

In thus acquiring readiness and forming habits, we merely turn to account that organic law which associates increased aptitude, animation, and vigour, with regular exercise. It is not the soul or abstract principle of mind which is thus changed, but simply the organic medium through which it is destined to act: and when we compare the rapid and easy eloquence of the practised orator with the slow and embarrassed utterance which distinguished him at the outset of his career, we have merely a counterpart, in the organ of mind, of what is effected in the organs of motion, when the easy and graceful movements of the practised dancer, writer, or pianoforte player, take the place of his earliest and rudest attempts.

The reader will now be prepared to understand the difference between *the manner* in which, and *the subjects* on which, the various faculties of the mind ought to be exercised. In ordinary education, the former has been, in a great measure, left to the determination of chance or caprice, although it is, in reality, of even greater importance, as concerns the results, than the right selection of the subjects to be taught. The exposition which I have given of the physiological conditions under which the different mental powers act, will, however, tend to prevent the continuance of this error, and lend considerable aid towards a choice of subjects more in accordance with the moral and intellectual nature of man. Hitherto, reading, writing, and arithmetic, have been almost the only branches taught to the working classes; and even the more comprehensive scheme of Mechanics' Institutions embraces the education of the perceptive faculties only, and makes no direct provision for the training of the higher intellectual and moral powers, which, nevertheless, are intended to be the guides of our conduct, and the sources of our happiness.

It would require a separate volume to discuss satisfactorily the whole subject of education, and to decide upon the relative importance of different branches of knowledge for different ages, sexes, professions, and classes of society. I must therefore wholly abstain, at present, from the consideration of the latter branch of the inquiry, and content myself with remarking, that in every case, without exception, whatever the kind of education to be given, it is still of the utmost practical consequence, that in *the manner of communicating it* we should act in accordance with the physiological laws which preside over the operations of the mind. Whatever we attempt to teach, whether merely reading and writing, or the higher truths of intellectual and moral science, our success will depend, in a great measure, on the extent to which we act in obedience to the laws of physiology *in our mode of teaching*; and for this simple reason, I cannot regard any teacher or parent as fully and conscientiously qualified for his duties, unless he has made himself acquainted with the nature and general laws of the animal economy, and with the direct relation in which these stand to the principles of education. But having already greatly exceeded my limits, I must leave the further consideration of this part of the subject to some future opportunity.

It may be remarked, that in the preceding pages I have made scarcely any allusion to the doctrines of phrenology. My reasons are simply, that, for the object I had in view, a special reference to them was not necessary, and that, in a work written for the general reader and for practical purposes, I was naturally anxious to avoid every contested point. Accordingly, in limiting myself to the statement that different parts of the brain perform different functions, without specifying those connected with any particular part, farther than that they are all concerned in the mental operations, I am not venturing beyond what most eminent anatomists and physiologists, in the past or present times, have taught before me. My own sentiments on the subject have been long before the public, and I am bound to say that every day's experience increases my conviction of the truth of phrenology, and deepens my sense of its practical value. Every real improvement made in education serves to bring the public a step nearer a just appreciation of both the truth and extreme importance of phrenology to the parent and educationist, as well as to the physician and philosopher. Phrenology being true, every real improvement in intellectual teaching and in moral training must rest on a phrenological basis, whether that basis be recognised or not. Hence some

* These remarks are curiously confirmed by an anecdote of Silvio Pellico, which I read in the Foreign Quarterly Review (No. xxii. p. 478), when this sheet was first passing through the press. When first imprisoned, Pellico was "allowed the use of a copy of Dante and the Bible. Of the former, he used to commit a canto to memory every day, till at last the exercise *became so mechanical that it ceased to afford any interruption to the train of melancholy thought.*" I need scarcely point out the coincidence between this and the remarks in the text.

of the most remarkable advances lately made by practical and reflecting educationists as the results of their experience, prove to be merely excellent illustrations of principles long since established by the phrenologists. I therefore speak advisedly when I repeat, that every step made in advance by purely practical men, will serve to render the truth and merits of phrenology more plain and acceptable to the public mind. Already hostile prejudices are rapidly disappearing, and ere many years they will have become a matter of history, and phrenology take that place which, as the true philosophy of mind and of man, it is entitled to occupy. The dislike with which it is still regarded by many intelligent persons who remain unacquainted with its doctrines, arises in a great measure from its being supposed by them to be opposed to *all* their previously acquired facts and opinions. This, however, is a great and pernicious mistake; for whatever is true in human nature is also true in phrenology; and consequently the facts gathered from life by the shrewd observer of mankind are either identical or in absolute harmony with the facts of phrenology. The chief difference is, that while common observation leaves its results so unconnected and confused as to deprive them of much of their practical value, phrenology affords principles of arrangement by which its facts naturally assume a systematic form, and become highly available for use.

CHAPTER XIV.

INFLUENCE OF THE NERVOUS SYSTEM UPON THE GENERAL HEALTH.

Remarks on the ganglionic system of nerves—their influence on the functions of organic life—their action involuntary—but may be influenced by the state of the mind.—The nature of the nervous energy and its influence on health—obscurity on some points of the subject.—Proofs of the reality of this influence on the healthy action of the functions—its influence in disturbing digestion—on sickness during a campaign—and on the health of recruits.—Curative influence of cheerfulness and confidence—curious case of this by Sir H. Davy.—Influence of mind on health shewn in the American delegates.—Preservative effects of cheerful activity of mind in expeditions to the northern regions.—Its influence on discipline, efficiency, and happiness in the navy amusingly illustrated by Captain Hall.

Having now examined the relation subsisting between the nervous system and the functions of animal life, and shewn how far the health of the brain depends upon the well regulated exercise of the mental faculties, I shall next advert to the influence of the nervous system upon the general health. But before doing so, it will be proper, for the sake of greater clearness, to subjoin a few remarks on the nature and uses of the *involuntary or ganglionic* system of nerves, as distinguished from those of the *cerebral and spinal* system.

The ganglionic nerves, unlike those of animal life, have no direct connexion with the brain, medulla oblongata, or spinal marrow, but arise from a number of distinct nervous masses or *ganglions* of a round, oval, or irregular form, situated in the neck, chest, and abdomen, in front of the vertebral column, and connected with each other by means of small nervous filaments. Other filaments connect the ganglionic nerves with those of animal life, but their principal branches are distributed to the heart, the lungs, the digestive and abdominal organs, the glands, and other parts concerned in nutrition and the support of life.

The action of the ganglionic nerves is entirely involuntary, and in this respect differs from that of the cerebral and spinal nerves. By means of the latter, we can at pleasure excite, direct, or arrest the motions of the ordinary muscles. But we have no such control over the muscles placed under the influence of the ganglionic nerves. The heart, for instance, continues to beat whether we wish it or not, and its action goes on during sleep, when our senses are buried in oblivion, with the same regularity as when we are wide awake. In like manner, when digestion is going on, the muscular coat of the stomach and intestines contracts, not only without the will being able to prevent or accelerate it, but without our being in the least conscious of either its contraction or relaxation.

In the healthy state, the ganglionic nerves also differ from those of the cerebro-spinal system in being devoid of sensation; and hence we have no consciousness of the action of any of the organs to which they are distributed. We are not only not aware of what is going on in the heart, the liver, the stomach, or the lungs, but we have no perception even of their existence, and the heart itself has been wounded without any consciousness of the fact on the part of the individual. In disease, however, when the ganglionic nerves become morbidly irritable, sensations of a disagreeable kind are apt to arise, and sometimes of such a nature as to convey to the mind a dim consciousness of the existence of the affected organ. I have myself experienced something of this kind for several weeks in an unpleasant consciousness of the different action of the two sides of the heart.

Even the mere explanation of the names by which the two portions of the nervous system are designated, marks out sufficiently for our present purpose the principal points of difference betwixt them. Thus the one set of nerves is called *cerebral* and *spinal*, from its origin in the brain and spinal marrow. The other is called *ganglionic*, from taking its rise from ganglions. The one is called the *animal* system, from its connection with functions peculiar to animals alone. The other is called *organic* or *vegetative*, from its presiding over the functions of respiration, circulation, and nutrition, which are common to both animals and vegetables. The one is called the *voluntary* system, from its subservience to the commands of the will, and consequently being suspended during sleep. The other is spoken of as the *involuntary* system, because its action cannot be controlled by the will, and it goes on whether we are asleep or awake. In addition to all these designations, the latter is also frequently termed the *sympathetic* system of nerves, from its being supposed to be the medium through which all the important organs of the body affect, or sympathize with, each other.

But although the will has no direct power over the nerves of organic life, experience shews that the state of the mind exercises no small indirect influence over them and the organs on which they are ramified. Of this we have demonstrative proof in the sudden quickening of the action of the heart on a joyful surprise; in the excessive palpitations excited by alarm and anxiety; in the sobbing and sighing and disturbed respiration attendant on grief and affliction; and in the sickness of stomach, loathing, faintness and swooning, so often seen to follow violent mental emotion.

As, then, the fact is undeniable, that both the animal and the organic portions of the nervous system exercise a powerful influence on the action of all our bodily organs, it becomes a matter of some importance to ascertain in what manner that influence operates, and under what conditions it may be rendered beneficial to health, and consequently to the increase of our happiness. The subject has not yet been examined with all the care which its importance requires, but a general notice of it will give the reader some idea of its real interest.

The nervous energy is considered by many to be identical with electricity, and this opinion is countenanced to some extent by the fact, that muscular contraction and other results arising from nervous action can also be produced by means of electricity. But in reality the subject is still involved in great obscurity, and our researches must be greatly extended before we shall be able to determine positively in what manner the ner-

vous system produces its effects on the living functions, or what is the exact nature of the influence which it exerts. Instead, therefore, of attempting to use language apparently logical and scientific, but in reality still indeterminate and apt to mislead, I shall adopt the popular form of expression, and speak of the nervous energy as if it were known to be, what many suppose, a fluid or influence of a peculiar nature, conveyed from the brain towards all parts of the body by means of the nerves, as blood is from the heart, by means of the bloodvessels. For all practical purposes, this language will be more generally intelligible than any other, and all risk of error may be avoided if the reader will bear in mind, that, in using it, I do not profess to explain either what the nervous energy really is, what conditions are indispensable for its production, or in what precise way it produces the results which are observed to follow its action. All that is essential for our purpose is to be aware, *first*, that an active influence of some kind is brought into operation by the nervous system, and, *secondly*, that the effects produced by it upon the different organs and functions of the body vary according to the mode in which, and extent to which, that influence is exerted. Both of these points may be examined and turned to practical account, whatever theory we may adopt to explain them.

All, then, that need be said here of the nature of the nervous energy is, that it is an influence of a peculiar kind, originating in and conveyed by nervous matter, and that, like the blood, it is essential to the vital action of every animal organ. When I move the hand in writing, the muscles of the arm are called into play by an influence transmitted to them from the brain, by means of the nerves. This stimulus is so indispensable, that, if the communication between the brain and the muscles be cut off, by dividing or tying the nerve, no effort of the mind will longer suffice to excite them to action. In like manner, if the nerves of the lungs and stomach be cut through, so as to interrupt the flow of nervous influence, respiration and digestion will cease, although in every other respect their respective organs remain uninjured.

Changes in the quality or amount of the nervous influence transmitted from the brain to any organ have thus a direct power of modifying its function. If, from the peculiar state of the brain accompanying mental distress, for example, the nervous influence sent to the stomach be impaired, the tone of that organ will be also impaired, and digestion become imperfect; whereas if, in consequence of pleasing excitement, the nervous stimulus be increased, a corresponding activity will be communicated to the stomach, and digestion will be facilitated, as is experienced after a dinner in pleasant society. But if, by a violent burst of passion, or grief, the brain be inordinately and disagreeably excited, so as to send forth a stimulus vitiated in quality, the stomach which receives it will partake in the disorder. Hence the sudden loathing and sickness so often induced by unexpected bad news, vexation, or alarm.

Something analogous to this is still more visibly exhibited in the case of the muscles. If the mind be active and decided, the muscles, receiving a strong stimulus, move with readiness and force; but if the cerebral activity be impaired by bilious depression, muscular action becomes slow, infirm, and indolent; whereas if the brain be excited by strong passion, and the stimulus be impetuous, the movements instantly become energetic and decided; and if the excitement be carried still farther, the regulated muscular contraction passes the limits of health, and becomes involuntary and convulsive.

As the kind of nervous influence depends on the condition of the brain, that which springs from a brain of which all the parts are in sound and vigorous action is the most salubrious. Mental indolence and high mental excitement are alike inimical to bodily health; and consequently our great aim ought to be to secure for every mental power, moral as well as intellectual, that equal and regular exercise from which alone the proper nervous stimulus can spring.

It is indeed interesting to observe the various effects of the nervous influence, according to the faculties in predominant action at the time it is produced. If the higher feelings have the ascendancy, and the more selfish propensities be merely active enough to give force to the character, without setting the mind at war with itself, the nervous influence is the most grateful and efficient which can be imagined for sustaining the healthy co-operation of the whole body. This result follows, because the Creator evidently designed such a state of mind to be the best and happiest for man himself, and therefore took care to surround him with every motive to induce him to enter into it.

If, however, the lower feelings be in great activity, and filled with designs and emotions repulsive to the moral sentiments, so that the faculties are ranked in opposition to each other; or if the mind be oppressed with grief, anxiety, or remorse; the stimulus which it communicates will be far from beneficial, because no longer in accordance with the conditions designed by the Creator. It is in such circumstances, accordingly, that bad health is so often seen to arise from the state of the mind, and that suffering is produced which no art can relieve till the primary cause has ceased to exist.

Similar results follow over-exercise of intellect and inactivity of the feelings. From the concentration of vital action in the brain, the stomach and other organs are unprovided with the requisite nervous stimulus, and become impaired in their functions; and hence the dyspeptic and hypochondriacal symptoms which so often render life a burden to literary men. Persons so situate, when advised to attend to diet, often answer that it is in vain, and that, while at some times nothing can be digested, at other times, perhaps within a few hours or days, nothing comes amiss—the power of digestion varying thus quickly, according to their mental condition. Whereas, when indigestion arises from a primary affection of the stomach, the least deviation in the way of indulgence proves injurious. In both instances, attention to diet is beneficial; but in the one it is less rigidly important than in the other.

The influence of the brain on the digestive organs is so direct, that sickness and vomiting are among the earliest symptoms of many affections of the head, and of wounds and injuries of the brain; while violent emotions, intense grief, or sudden bad news, sometimes arrest at once the process of digestion, and produce squeamishness or loathing of food, although, an instant before, the appetite was keen. Narcotics, the direct action of which is on the brain, have a similar effect on the stomach.

The influence of the mind and brain over the action of the heart and lungs is familiar to every one. The sighing, palpitation, and fainting, so often witnessed as consequences of emotions of the mind, are evidences which nobody can resist. Death itself is not a rare result of such excitement in delicately organized persons.

This law of our constitution, whereby the regulated activity of both intellect and feeling is made essential to sound bodily health, seems to me one of the most beautiful arrangements of an all-wise and beneficent Creator.

If we shun the society of our fellow-creatures, and shrink from taking a share in the active duties of life, mental indolence and physical debility beset our path. But if, by engaging in the business of life, and taking an active interest in the advancement of society, we duly exercise our various powers of perception, thought, and feeling, we promote the health of the whole corporeal system, invigorate the mind itself, and at the same time experience the highest mental gratification of which a human being is susceptible,—that of having fulfilled the end and object of our existence, in the

active discharge of our duties to God, to our fellow-men, and to ourselves. If we neglect the exercise of our faculties, or deprive them of their objects, we weaken the organization, give rise to distressing diseases, and at the same time experience the bitterest feelings that can afflict human nature —ennui and melancholy. The harmony thus shewn to exist between the moral and physical world, is but another example of the numerous inducements to that right conduct and activity, in pursuing which the Creator has evidently destined us to find terrestrial happiness.

The reader will now understand why the state of the mind is so influential in the production and progress of disease. In the army this principle has often been exemplified in a very striking manner, and on so large a scale as to put its influence beyond a doubt. Sir George Ballingall mentions, in his lectures on Military Surgery, that the proportion of sick in garrison in a healthy country, and under favourable circumstances, is about five per cent.; but that, during a campaign, the usual average is nearer ten per cent. So marked, however, are the preservative effects of cheerfulness and the excitement of success, that, according to Vaidy, the French army cantoned in Bavaria, after the battle of Austerlitz, had only 100 sick in a division of 8000 men, being little more than *one* in the hundred. When, on the other hand, an army is subjected to privations, or "*is discouraged by defeat or want of confidence in its chiefs*," the proportion of sick is "*often fearfully increased*."*

The same principle explains why it is so important for the physician to carry the feelings of the patient along with him in his curative measures. It is well known, for example, that those who live in constant apprehension of fever, cholera, or any other ailment, are generally among its first victims when exposed to its causes. The reason is obvious. The depressing nervous influence resulting from the painful activity of the selfish feelings, affects all the organs of the body, and places them on the brink of disease, even before any external cause is in operation; and hence the easy inroad which the latter makes when it comes into play.

The influence of the state of the mind on health is well exemplified in recruits for the army. According to Mr Henry Marshall, regret for having enlisted, and separation from friends, make them brood over the inconveniences attending their new mode of life, and their health suffers in consequence. These causes, combined with the fatigue of drill and the restraints of discipline, have so much influence, that "growing lads" frequently falls victims to them. The recruit, if not very robust, "loses that active fortitude which is required to fit him to bear up against difficulties, and falls into a gloomy state of mind, that is soon followed by deteriorated bodily health; he loses his appetite, becomes emaciated, a slight cough supervenes, and, after frequent admission into hospital, he at last dies of diseased lungs. This is an outline of the history of many a young lad who enlists in the army."† In France, where the conscription is compulsory, and many are of course serving against their will, the agency of depression of mind is still more marked and fatal. In the seven years extending from 1820 to 1826, both inclusive, it appears from the returns that the French army lost ninety-seven men from pure nostalgia or home-sickness, an affection which is rarely fatal in this country.

So efficacious, on the other hand, is a more cheerful state of mind, from the more healthful nervous influence which it diffuses through the frame, that surprising recoveries occasionally happen, which can be ascribed to no other cause but this. A singular but instructive instance fell under the observation of Sir Humphrey Davy, when, early in life, he was assisting Dr Beddoes in his experiments on the inhalation of nitrous oxide. Dr Beddoes having inferred that the oxide must be a specific for palsy, a patient was selected for trial, and placed under the care of Davy. Previously to administering the gas, Davy inserted a small thermometer under the tongue of the patient to ascertain the temperature. The paralytic man, wholly ignorant of the process to which he was to submit, but deeply impressed by Dr Beddoes with the certainty of its success, no sooner felt the thermometer between his teeth than he concluded the talisman was in operation, and, in a burst of enthusiasm declared that he already experienced the effects of its benign influence throughout his whole body. The opportunity was too tempting to be lost. Davy did nothing more, but desired his patient to return on the following day. The same ceremony was repeated; the same result followed; and at *the end of a fortnight he was dismissed cured*,—no remedy of any kind except the thermometer having ever been used.* Quacks profit largely by taking advantage of this principle of our nature: and regular practitioners would do well to bestow more pains than they do in assisting their treatment by well-directed moral influence. Baglivi was deeply impressed with this sentiment when he said, "I can scarcely express how much the conversation of the physician influences even the life of his patient, and modifies his complaints; for a physician powerful in speech, and skilled in addressing the feelings of a patient, adds so much to the power of his remedies, and excites so much confidence in his treatment, as frequently to overcome dangerous diseases with very feeble remedies, which more learned doctors, languid and indifferent in speech, could not have cured with the best remedies that man could produce."

Another remarkable instance occurred during the siege of Breda in 1625. When the garrison was on the point of surrendering from the ravages of scurvy, a few phials of sham-medicine introduced by the Prince of Orange's orders, as the most valuable and infallible specific, and, given in drops as such, produced astonishing effects: "*Such as had not moved their limbs for months before, were seen walking in the streets, sound, straight, and whole*; and many who declared they had been rendered worse by all former remedies, recovered in a few days, to their inexpressible joy."†

Every one, indeed, who has either attended invalids, or been an invalid himself, must often have remarked, that the visit of a kind and intelligent friend is highly useful in dispelling uneasy sensations, and in promoting recovery by increased cheerfulness and hope. The true reason of this is simply, that such intercourse interests the feelings, and affords an agreeable stimulus to several of the largest organs of the brain, and thereby conduces to the diffusion of a healthier and more abundant nervous energy over the whole system. The extent of good which a man of kindly feelings, and a ready command of his ideas and language, may do in this way, is much beyond what is generally believed; and if this holds in debility arising from general causes, in which the nervous system is affected not exclusively but only as a part of the body, it must hold infinitely more in nervous debility and in nervous disease; for then the moral management is truly the medical remedy, and differs from the latter only in this, that its administration depends on the physician, and not on the apothecary,—on the friend, and not on the indifferent attendant.

In his excellent little treatise on Physical Education, Dr Caldwell justly remarks that the influence of a regulated and well-balanced activity in the moral and intellectual faculties on the general health, compared with that of active and boisterous passions, is like the salutary effect of mild and wholesome nourishment contrasted with the fiery potency of alcohol. The former is eminently conducive to life, health, and enjoyment, while

* Medico-Chirurgical Review, No. xxxvi. p. 430.

† Marshall on the Enlisting and Discharging of Soldiers, p 5.

* Paris's Life of Davy, p. 51.

† F. V. Mye, De Morbis et Symptomatibus, &c., quoted by Dr Johnston in his treatise on Derangements of the Liver, &c., p. 206.

the latter is as eminently opposed to them all. Of this truth Dr Caldwell gives an interesting example from the history of his own country. Of the fifty-six delegates who signed the Declaration of Independence, almost all were men of well-regulated and active minds, not marked by any excess of passion. Two of them died early from accidents. The aggregate years of the remaining fifty-four were 3609, giving to each an average of sixty-six years and nine months; thus affording a striking evidence of the salutary influence of the mind on health. From the same absence of active passion in mathematicians, the average duration of life in twenty of them, taken promiscuously by Dr Caldwell, extended to seventy-five years, while, in an equal number of *poets*, whose vocation greatly depends on excitability of feeling, the average was so low as fifty-seven.*

The powerfully stimulating effect of healthy mental excitement on the bodily functions, is familiar to every one, and is duly noticed in the works of the novelist and poet. In nine cases out of ten, a visit to a watering place, or a journey through an interesting country, does good more by the beneficial excitement which it gives to the mind and brain, than by all the other circumstances put together. It is indeed greatly to the credit of the medical departments of both army and navy, that the influence of the mind in preserving and restoring health is more correctly appreciated and provided for than it is even in private practice. In the late expeditions of discovery to the Northern Regions, the ut most attention was bestowed by the enlightened commanders to keep up a healthful vivacity of intellect and feeling among their men, by constant occupation, intellectual instruction, the representation of plays, masquerades, and other amusing and exciting exertions; and there cannot be a doubt, that their remarkable immunity from disease was in no small degree owing to these admirable arrangements. From this is obvious the immense importance which attaches to the selection of a humane and considerate, as well as scientific commander.

In the second volume of Captain Basil Hall's first series of Fragments of Voyages and Travels, the reader will find a chapter on "*the effects of being well commanded*," which illustrates, very amusingly, many of the principles explained in the preceding pages. "People," he says, "who have no acquaintance with the intricacies of naval discipline, can scarcely comprehend how vast a difference is made in the efficiency of a man-of-war, by the character of the commander."—"Early in the year 1805, we were made abundantly sensible of the truth of this remark, by an important change which took place in the highest office on board. From a state of languid inefficiency, we started in a single moment into the most vigorous activity, and from being almost the laughing-stock of the fleet, for the clumsiness of our gait, and the want of success which attended our cumbrous exertions, we soon outstripped them all, not only in activity, but in the useful result of our services."—(P. 2.)

The new captain was a man who knew his profession, and possessed that decision of character which makes its weight instinctively felt. Between certain disgrace and punishment to offenders, and "high favour to those who took pains to do right, the ship was speedily brought into proper trim. Every thing now seemed alive, and moved smartly; no time ran to waste; even the indolent and the ill-disposed found their best interest in working well. The decks became cleaner than they had ever been before; the people dressed themselves more tidily; the sails looked better furled; the yards better squared; *the complaints of inattention and drunkenness grew daily less frequent, and an air of general happiness, as well as new-born energy, spread itself over the whole ship.*"—"So magical indeed was the effect of this change, that I dare swear we should then have engaged and beaten an enemy, whom it might not have been considered by any means prudent to have brought to action a week before."—(P. 17.)

Captain Hall gives other examples of the same principle, and remarks that, in this way, the simple fact of Nelson joining the fleet off Trafalgar, was almost equivalent to double manning every ship in the line. The explanation which he gives of the "mysterious agency" by which the genius of a commanding officer imparts a portion of its spirit to every one under his orders, is perfectly philosophical. "When a person of talents is placed under an able commander, he feels confident that nothing he does will be passed without notice, and consequently that his exertions must tell to his advantage, exactly in proportion as their utility makes itself felt. This consciousness will, of course, stimulate him to fresh endeavours to excel; and, from thus feeling sure that his conduct is duly appreciated, he has an immediate motive to bring his whole strength into play,—an exercise which must ever produce good results."

But "suppose the case differently put, and let the superior in station be the inferior in abilities or experience, or not so zealous in the execution of his duty as the men he commands. The situation of the inferior is now far from being so independent, or so well calculated to draw forth his powers, as it was in the first case. The subordinate officer has no longer the same animated stimulus to exertion; for, his labours being generally unnoticed, or their results unappreciated, he is left without much encouragement to proceed in fresh endeavours to excel; *while his faculties, instead of improving, through generous exercise, are often deteriorated by the languid manner in which they are brought into play.*"—(P. 6.)

Captain Hall justly observes, that the influence of the commander on men of moderate talents is still more striking, as they stand more in need of a stimulus to duty. "If a commander has skill enough to enlist the sympathies of those placed under his orders, they will feel insensibly drawn on to make common cause with him, and will afterwards exert themselves strenuously to maintain that degree of importance derived from this implied companionship in ability, which they could hardly hope to reach single-handed."—"The invariable effect of these efforts is to improve the character. Such training will certainly not make a clever man out of a stupid one; but it may often render a discontented or useless man of service to himself and the state; and, instead of his continuing a wretched and hopeless being, may convert him into one who is happy and confident of success."

"I suspect, however, that no one who has not been an eye-witness of the condition of a ship under the command of an ignorant, trifling, or otherwise inefficient captain, can have any notion of the mischievous effects of his misrule, or rather of his no rule. Perhaps in the long-run, almost every degree of consistent severity is preferable to the uncertain, higgledy-piggledy kind of discipline on board a man-of-war, in what is called slack-order. The moderately gifted persons feeling that, in these circumstances, they have no chance of notice by any exertions of their own, speedily degenerate into a sort of vegetables, so incapable of any useful exertion, that they infest the ship like the fungus called the dry-rot. This chaotic period is the holiday season of the scamps and skulkers, who then fancy their game the surest. These fellows certainly succeed in working as little as possible, and in making those about them unhappy; but, after all, without any great accession to their own comfort."

"This system," continues Captain Hall, "discourages the cheerful and willing workers by the oppression of its injustice—a feeling which speedily takes away or deadens some of the best motives to improvement." Such a captain, unwilling to see that he himself is in fault,

* Caldwell on Physical Education, p. 84–6.

ascribes the evil to others; and, "by his unfair censure of those who, in fact, are the most deserving of commendation, he scatters *the seeds of discouragement over all the different classes exposed to his unskilful handling, and every thing falls into confusion worse confounded.*"—(P. 10.) The loss of the French frigate Medusa, on the coast of Africa, in 1817, and the tremendous suffering which instantly ensued from the state of anarchy and uproar which took place among the crew, are well known to have arisen entirely from the insufficiency and headstrong conceit of a weak and ignorant commander, and afford a strong contrast to the admirable coolness and high-toned moral feeling displayed on the similar occasion of the wreck of the Alceste, on her return from China with Lord Amherst, and which also made a deep impression, but of a widely different description, on the public mind.

From the above quotations, the influence which the qualities of the commander may exert on the health as well as the discipline of those under his orders, may easily be inferred. So important, indeed, are cheerfulness and confidence, as conditions of health, that if two ships were to be sent out to circumnavigate the globe, each equal to the other in every respect, except the one being under the direction of a humane, vivacious, and considerate man, and the other of a lymphatic, selfish, and tyrannical commander, though both were equal in talent, it is quite certain that the fate of the crews would be widely different, and that sickness would prevail much more in the one than in the other.

CHAPTER XV.

APPLICATION OF THE PRECEDING PRINCIPLES TO THE ORIGIN AND PREVENTION OF BAD HEALTH.

Causes of bad health.—Not always the result of moral or immoral conduct—nor of accident—but of the infringement of the laws of organization.—Proofs from past history.—Diminished mortality from increase of knowledge, and better fulfilment of the conditions of health.—The expeditions of Anson and Cook contrasted.—Gratifying results of the sanatory arrangements of Ross, Parry, and Franklin.—Mortality among the Convicts at Millbank Penitentiary and Woolwich a contrast to these.—Pulmonary diseases in the Channel fleet, from ignorance of physiology.—Causes of late improvement.—Conditions of wealthier and poorer classes compared.—Good done by the apprehension of Cholera.—Influence of habit.—Advantage of knowing the true sources of bad health.—Evils of ignorance exemplified in the recruiting service.—General remarks.

The reader will now be prepared to take a correct view of a question on which it especially interests us to have true and precise notions. I allude to *the real origin of bad health*. On this point, very vague and contradictory opinions are prevalent; and, as our conduct in life must necessarily be closely dependent on our views in regard to this subject, I cannot do better, before concluding, than devote a chapter to its consideration.

Setting aside, for the present, hereditary tendencies to disease (which must have begun at first with some progenitor from ordinary causes, and which, therefore, are not really unconnected with the inquiry), bad health may be regarded in one of three different lights: First, As having no necessary connection with our conduct, but as being the result of circumstances entirely beyond our knowledge and control, and sent by a superintending Providence, not to urge us to more rational care, but to soften our hearts, and warn us from sin; Secondly, As the result of accident alone, or of external influences which we can appreciate, but from which it is impossible to withdraw ourselves; or, Thirdly, As, in every instance, the result of the direct infringement of one or more of the laws or conditions decreed by the Creator to be essential to the well-being and activity of every bodily organ, and the knowledge and observance of which are, to a great extent, within our own power.

According as one or other of these views shall be adopted, the most opposite practical results will follow. If the *first* be received as the truth, and health and sickness be viewed as dispensed without reference to our bodily conduct, but solely as a means of reclaiming us from sin, attention to moral and religious improvement alone will be our best protection, and any attempt to avert bad health, by studying and obeying the laws which regulate the bodily functions, will be entirely useless. If, again, the *second* principle be correct, and disease arise from accident and from influences beyond our control, then neither our moral nor our bodily conduct will avail us as a protection, and our only resource will be humble resignation to the will of God. But if the *third* be true, and the human frame be constructed by the Creator on principles calculated to carry on life for seventy years, and if *de facto* a large proportion of the race perish before attaining ten years of age, chiefly from infringing the conditions on which the due performance of the various vital functions depends, it then becomes an object of great interest to us to study the structure of our organs, to discover the laws which regulate their functions, and to yield to those laws that implicit obedience from which alone health can spring.

That the strictest observance of the moral laws and the purest devotion of which human nature is capable, are insufficient to secure health to the body, without a simultaneous observance of the organic laws, is too clearly proved by the instances already adduced, and by the history of mankind, to require any demonstration here. The biographies of the pious and excellent furnish abundant examples to the contrary; while the annals of crime afford numerous instances of men of the most depraved characters enjoying unbroken health. If, indeed, the organic conditions be fulfilled, the upright man will enjoy a serenity of health which the criminal can never know; but the moral observance alone will not avail him, if he at the same time neglect the organic laws.*

In regard to the second proposition, a little reflection will satisfy every intelligent mind that it is equally untenable, and that disease is not always the result of accident or of circumstances which cannot be modified. There are causes of bad health against which even the most stupid and prejudiced take some precautions, and with success; and the whole art of medicine would be a grosser delusion than ever romancer believed it to be, if health were not influenced by circumstances within our control. All our remedies, and all our attention to diet, clothing, and regimen, are indications of the contrary persuasion. There are, indeed, agencies from which we shall probably never be able entirely to protect ourselves. Such are variations in the state of the atmosphere, epidemic and contagious causes, and necessary exposure, in pursuance of higher duties, to known unhealthy influences; but allowing for all these, ample scope remains within which man may, by an extension of his knowledge and industry, provide himself with safeguards far beyond what he has ever yet made use of, or has ever dreamed of discovering.

The third view, or that which ascribes bad health to the infringement of some one or more of the organic laws, thus presents itself as the only one in accordance with observation and past experience; and, after the full exposition I have already given of the conditions of health of various important organs, I trust that little farther proof of this will be required. At the same time, as the principle is full of practical value, I shall take a short review of some additional facts which go far to establish its accuracy.

* I may again refer to Mr George Combe's "Constitution of Man" for a consistent and intelligible view of the relation subsisting between the organic and the moral and intellectual laws.

Considering that the human frame is constructed to endure, in many cases, for sixty, seventy, or eighty years, it must seem extraordinary to a reflecting mind, that, taking the whole of the deaths in England and Wales for 1838, so large a proportion as 443 out of every 1000 should occur under the age of ten years; and that in Manchester, Salford, and suburbs, the proportion of deaths under the same age should rise to the enormous amount of 602.4 per 1000.* It is impossible to suppose that such a rate of mortality was assigned by the Creator as the unavoidable fate of man; for, by the gradual improvement of society and a closer observance of the organic laws, the proportion of deaths in early life is now much smaller than it was some years ago. We have already seen that so recently as about the middle of last century, when the pauper infants of London were received and brought up in the workhouses, amidst impure air, crowding, and want of proper food, not above one in twenty-four lived to be a year old; so that out of 2800 annually received into them, 2690 died. But when the conditions of health came to be a little better understood, and an act of Parliament was obtained obliging the parish officers to send the infants to nurse in the country, this frightful mortality was reduced to 450, instead of upwards of 2600! Can evidence stronger than this be required to prove that bad health frequently arises from causes which man may often be able to discover and remove, and which, therefore, it is his bounden duty to investigate and avoid by every means which Providence has placed within his reach?

The different rates of mortality in crowded cities and country districts, as exhibited in the instructive returns of the Registrar-General, equally demonstrate the influence of bad air, crowding, and imperfect food, in abridging life. Even in the best managed communities, the number not only of the sick of all ages, but of those who are cut off in early youth, is so prodigious as to shew that we are far from having arrived at the maximum of health of which the race is susceptible; while the advances we have already made give us every reason to hope that, by perseverance and the extension of our knowledge, we may continue to improve for many centuries to come.

The progress of knowledge and the increasing ascendency of reason have already delivered us from many scourges which were regarded by our forefathers as unavoidable dispensations of an inscrutable Providence. In the days of the ancient Romans, their capital and territories were frequently almost depopulated by visitations of plague and pestilence, from which the present generation is, by a stricter observance of the conditions of health, entirely exempted. In London, in like manner, the same contempt of cleanliness, ventilation, and comfort, which was so fatal to the Romans, produced similar results, and swept off its thousands and tens of thousands, till a fortunate disaster,—the great fire,—came in the place of knowledge, and, by destroying the crowded lanes and other sources of impurity, which man had shewn himself so little solicitous to remove, procured for its inhabitants a perfect and permanent immunity from one of the deadliest forms of disease,—and taught them the grand practical truth, that such awful visitations are not wanton inflictions of a vengeful Providence, but the direct consequences of the neglect of those conditions by which the various vital functions are regulated, and by conforming to which alone health can be preserved. Accordingly, by greater attention to proper food, cleanliness, and pure air, London, with its gigantic population, now flourishes in comparative security, and scarcely feels the ravages of an epidemic which has inflicted a blow on some less fortunate cities, the effects of which will be long remembered.

* Registrar's Second Annual Report, 8vo edit. p. 58.

Smallpox is another scourge which annually carried off its thousands, and from which modern science bids fair to protect us; although half a century ago, any one who might have ventured to express such an expectation, would have been ridiculed for his credulity. Even before Jenner's immortal discovery of vaccination, the improvement of medical science consequent on increased knowledge of the structure and functions of the human body, had greatly mitigated the fatality of smallpox. Formerly the patients were shut up, loaded with bedclothes, in heated rooms from which every particle of fresh air was excluded; and stimulants were administered, as if on purpose to hasten the fate of the sick. But sounder views of the wants of the animal economy at last prevailed; and, by the admission of fresh air, the removal of every thing heating or stimulating, and the administration of cooling drinks and other appropriate remedies, thousands were preserved whose lives would have been lost under the mistaken guidance of the older physicians.

So lately as the middle of last century, ague was so prevalent in many parts of Britain where it is now never seen, that our ancestors looked upon an attack of it as a kind of necessary evil, from which they could never hope to be delivered. In this instance also, farther experience has shewn that Providence was not in fault. By draining the land, removing dunghills, building better houses in better situations, and obtaining better food and warmer clothing, it appears that generations now succeed each other, living on the very same soil, without a single case of ague ever occurring, where, a century ago, every man, woman, and child, were almost sure to suffer from it at one time or other of their lives; thus again shewing how much man may do for the preservation of health and the improvement of his condition, when his conduct is directed by knowledge and sound principles.

If we wish for a still more admirable proof of the same practical truth, we have only to compare the condition of our seamen in maritime expeditions undertaken a century ago, with their lot in the present day;—the expedition against Carthagena, or that of Anson, for instance, with those of Cook, Parry, and Ross; or the health enjoyed by the crew of the Valorous, with that of the seamen in the other vessels lying in the same harbour.

Anson set sail from England on 13th September 1740, in the Centurion, of 60 guns and 400 men, accompanied by the Gloucester, of 50 guns and 300 men; the Pearl, of 40 guns and 250 men; the Wager, of 28 guns and 160 men; the Tryal sloop, of 8 guns and 100 men, and two victuallers, one of 400, and the other of 200 tons. They had a long run to Madeira, and thence to the coast of Brazil, where they arrived on the 18th December; but, by this time, the crews were remarkably sickly, so that many died, and great numbers were confined to their hammocks. The commodore now ordered "six air-scuttles to be cut in each ship, to admit *more air between the decks*," and took other measures to correct the "noisome stench on board," and destroy the vermin, which nuisances had become "very loathsome;" "and, besides being *most intolerably offensive*, they were doubtless, *in some sort*, productive of the sickness under which we had laboured." Such is the mild language used by the chaplain Mr Walter, in communicating these appalling truths! On anchoring at St Catharine's, 80 patients were sent on shore from the Centurion alone, of whom 28 soon died, and the number of sick increased to 96. Although this was nothing compared to what took place afterwards, it is nevertheless worthy of remark, for as yet they had suffered no privations or unusual hardships, except from contrary winds. The causes of disease lay entirely within themselves.

After a stormy and tedious navigation of three months round Cape Horn, scurvy carried off 43 more in the month of April, and double that number in May 1741

Those who remained alive now became more dispirited and melancholy than ever; which "*general dejection added to the virulence of the disease, and the mortality increased to a frightful degree.*" On 9th June, when in sight of Juan Fernandez, the debility of the people was so great, that, 200 being already dead, the lieutenant could muster only two quarter-masters and six foremast men able for duty in the middle watch; so that had it not been for the assistance of the officers, servants, &c. they would have been unable to reach the island,—to such a condition was a crew of 400 men reduced in the course of a few months!

I have noticed the cutting of holes for the admission of air between decks, and the dejection of the men. The narrative proceeds to say, that the commodore's principal attention was now devoted to getting the sick on shore, as they were dying fast on board, "the distemper being doubtless considerably augmented *by the stench and filthiness in which they lay, for few could be spared to look after them, which rendered the ship extremely loathsome between decks.*" The officers suffered least, as being the best fed and best lodged. Within a year, out of upwards of 1200 men, composing the crews of the squadron, who had sailed from England, only 335 remained alive.

The fate of the Spanish squadron, which sailed nearly at the same time, was still more horrible. The Esperanza, of 50 guns, lost 392 out of 450 men, and the other ships almost as large a proportion. It is true that, in doubling Cape Horn, they encountered the severest weather and the greatest privations, and that their deplorable fate was aggravated by these causes. But when we look to the conduct of later navigators, in circumstances equally trying, it is impossible to resist the gratifying conviction, that mortality like this forms no part of the designs of a beneficent Providence, and that, for the best of purposes, our safety is placed, to a great extent, within the limits of our own power. The late memorable expeditions of Parry, of Franklin, and more especially of Ross, who, with few resources, spent upwards of four years in the desolate regions of the north, with scarcely any loss of life, are examples pregnant with meaning to all who are interested in the future progress of man.

It may be said that the climate and situation of the two parties were dissimilar. In some respects, the objection is well founded, but Cook's second voyage round the world, in 1772, affords a parallel presenting so many points of resemblance to that of Anson, that no one can reasonably object to their comparison. On this occasion, the vessels selected were the Resolution, carrying 112 men, and the Adventure, with a crew of 81. Enlightened by former experience, Cook spared no pains to effect his equipment in the completest manner, and to lay in such stores of clothing and provisions as he knew to be useful in preserving the health of those under his command. Among these were malt, sour krout, portable broth, sugar, and wheat. Care was taken to expose the men to wet as little as possible, to make them shift themselves after being wet, and to *keep their persons, hammocks, bedding, and clothes, perfectly clean and dry.* Equal attention was paid to keep the ship clean and dry between decks; once or twice a-week it was aired with fires; and a fire was also frequently made at the bottom of the well, which was of great use in purifying the air in the lower parts of the ship. To the last precaution too great attention cannot be paid; as the least neglect occasions a putrid and disagreeable smell below, which nothing but fires can remove. Fresh water, vegetables, and fresh provisions, were also eagerly sought for at every opportunity; and these it was Captain Cook's practice to oblige his people to make use of, by his own example and authority. The results of these measures we shall now see.

The two ships sailed on 13th July 1772. Towards the end of August, when advancing towards the south, the rain poured down, not in drops but in streams; and the wind at the same time being variable and rough, the people were obliged to attend so constantly upon the deck, that few of them escaped being completely soaked:" but although rain is a great promoter of sickness in warm climates, the airing by fires between decks, and the other precautions, were so effectual, that, on arriving at the Cape of Good Hope, *only one man was on the sick list;* whereas we have seen that, after a similar voyage, the Centurion arrived on the coast of Brazil with 80 sick, of whom 28 soon died. As we proceed, the contrast becomes still more striking. On 22d November, Cook sailed from the Cape in search of a southern continent. On the 29th, a violent storm, attended with hail and rain, came on and caused the loss of most of their live stock; and a sudden transition took place from warm and mild to extremely cold and wet weather, which was severely felt by the people. On 10th December they met with islands of ice; and, from that time till the middle of March, continued their search for land with unremitting diligence, amidst cold, hardships, and dangers, such as we can form a very imperfect idea of; and, at last, on 26th March, *after being* 117 *days at sea*, during which they had sailed 3660 leagues, they came to anchor in Dusky Bay, New Zealand. "After so long a voyage," says Dr Kippis, from whose life of Cook these particulars are taken, "in a high southern latitude, it might certainly have been expected that many of Captain Cook's people would be ill of scurvy. This, however, was not the case. So salutary were the effects of the sweetwort and several articles of provision, and *especially of the frequent airings and sweetening of the ship*, that there was only one man on board who could be said to be much afflicted with the disease; and even in that man, it was chiefly occasioned by a bad habit of body, and a complication of other disorders."

Can any thing be conceived more demonstrative of the advantages to be derived from investigating and obeying the laws of health, than these splendid results, when contrasted with those on board of the Centurion? In the Resolution, cheerful activity, cleanliness, dry pure air, adequate clothing, and a suitable regimen, were found to carry man unscathed through hardships and exposure which, in the Centurion, from neglect of the same protective means, were severe enough to sweep off a large proportion of her crew. And, as if on purpose to place the efficacy of these measures beyond a doubt, it appears, that, in the month of July 1773, the Adventure had many sick, and twenty of her best men incapable of duty from scurvy and flux, when the Resolution, with a larger crew, had only three men sick, and only one of them from scurvy. This difference in the state of health of the two ships was distinctly traced to the crew of the Adventure having eaten few or no vegetables when in Queen Charlotte's Sound; while, on board of the Resolution, Cook was most particular in enforcing attention to this part of their dietetic regimen.

By this admirable care and unwearied watchfulness on the part of Cook and his officers, the Resolution performed a voyage of THREE years and eighteen days, *through all climates*, from 52° north to 71° south, with the loss of only ONE man by disease out of 112! And in his last voyage, so efficaciously were the same means put in practice, that his ship was brought home after an absence of FOUR years, without the loss of a single man by disease! Lord Nelson is said to have been equally successful, and to have spent three years on the West India station without one life having been lost by disease.*

Similar results were obtained by the able commanders of our more recent expeditions to the Northern Regions. The Fury and Hecla were, at one time, no less than *twenty-seven months entirely dependent on their own*

* Sir George Ballingall's Lect. on Milit. Surg. p. 73.

resources, before scurvy began to make its appearance; and at the end of 28½ months both ships returned home (in September 1823) with the loss of only five men,—a result which, a century ago, could hardly have occurred, and which, even at the present day, is a remarkble indication of the talent and humanity of the officers by whom it was effected.

Nothing, in fact, could have been better devised than the means practised in these expeditions to preserve the health of the people; and did my limits permit it, I might illustrate almost every principle in this volume by a reference to its actual efficacy as displayed in these voyages. Not only were the conditions of health attended to as regarded the skin, the muscles, the bones, the lungs, and the digestive organs; but the health of the all-important nervous system was sedulously provided for by the constant and cheerful occupation of the people in their various duties and amusements; and so judiciously were these planned, that a spirit of life and activity extremely favourable to the preservation of health was constantly kept up, and had, no doubt, great influence in producing that concord and unity of feeling among them, which were so conspicuous amidst all their privations.

If, from these encouraging examples of the preservative power of knowledge applied under skilful guidance, we turn, for a contrast, to the extraordinary prevalence of disease at the Milbank Penitentiary in 1823–4, we shall see the opposite side of the picture, and discover how much misery may result from the unintentional neglect of sound physiological principle in some of our civil institutions. At the time spoken of, intractable affections of the bowels, and other insidious forms of disease, were so general in the penitentiary, that few of the prisoners escaped, and a Parliamentary inquiry into their causes was ordered. Great discrepancy of opinion prevailed, as usual, among the witnesses, from each giving utterance rather to his own impressions than to opinions founded on any philosophical examination of the circumstances. But evidence enough was brought forward to shew that several great errors had been committed. In the *first* place, the penitentiary itself was built, at an enormous expense, in a *low damp situation*, rather under than above the level of the highest tides in the river, so that ventilation or the supply of dry pure air is always imperfect, and the atmosphere at night is often heavy and damp, as on all low grounds in the neighbourhood of rivers and half-covered mud. To this great and permanent source of debility were added, *secondly*, a very low and inadequate diet; and, *thirdly*, the influence of constant mental depression, arising partly from the local situation of the prisoners, and partly from the monotonous confinement and labour under too scanty a supply of food. In such circumstances, it was certainly not wonderful that a low state of health, and latterly scurvy and bowel-complaints, should make such general havoc.

That much of the sickness was justly attributable to these causes, is shewn by the perfect immunity enjoyed for some years, both by the officers of the penitentiary and by about thirty of the prisoners, who, from being employed in the kitchen and offices of the establishment, were less subjected than the rest to the debilitating influence; and also by the rapid convalescence of almost every one out of 635, on being removed to Woolwich and to the Regent's Park, and supplied with a more nourishing diet. On more minute inquiry, indeed, it appeared that, instead of the bad health having begun all at once in 1823, as at first supposed, bowel-complaints had been extremely prevalent from the first opening of the penitentiary in 1816, and had continued to be so, though in rather a less degree, down to that time; so that the causes, instead of being altogether of sudden origin, must have been inherent in it from the beginning, and only became aggravated by the farther reduction of diet, which took place some months previously, and by the inclemency of the weather.

Dr Latham gives striking evidence of the state of the mind exerting a powerful effect on the health of the prisoners. Speaking of the women who were sent on board of one of the hulks at Woolwich, he says, that individuals were pardoned, from time to time, for good conduct, and that recently pardons had become very numerous, as a kind of atonement for the bad health to which they had been subjected. But, as all had nearly an equal claim, "every one pleased herself with believing that she would be the next who would be set at liberty. Whenever, therefore, an individual was pardoned, all the rest *were thrown into an agony of the bitterest disappointment, and were at the same time overtaken by disease*. It was not a mere nervous or hysterical ailment, but *some actual form of real disease, such as they had before suffered*, and requiring the strictest medical treatment for its relief."* Examples like these, let it be again and again repeated, shew the extent to which health is in our own power, when we choose to fulfil the conditions on which alone it can be obtained.

In the spring of 1841, great mortality also took place among the convicts confined in the hulks at Woolwich, owing, it was said, to some imprudent changes in their management. In one week in April, eleven inquests were held, but as I have not been able to obtain any authentic particulars regarding the causes of death, I am unable to say whether the current reports of mismanagement are correct. But, whatever may have been the causes, it is obvious that a heavy responsibility will rest upon the public authorities, if it shall be proven that the increased sickness and mortality arose from either ignorant or inconsiderate neglect of the laws of health.

In looking forward to a still greater diminution of disease in the human family, it is cheering to fix attention on what has been already accomplished by the hand of authority. Had the same individuals who circumnavigated the globe with Cook, or braved the northern winters with Ross and Parry, been left for an equal number of years to undergo the ordinary vicissitudes of life at home, unrestrained in their inclinations and conduct by the constantly operating and beneficent influence of a superior mind, it is morally certain that disease and death would have made greater havoc among them than actually occurred amidst physical privations and sufferings much greater than they were likely to have ever encountered at home. This renders obvious the pressing necessity of diffusing widely among society that species of knowledge which has proved so beneficial in the hands of those who were fortunate enough to possess it. If human health and happiness be thus effectually promoted by increased attention to the conditions which regulate the vital and animal functions, nothing can be more useful than to communicate to every intelligent being such a measure of knowledge as will enable him to do for his own safety and improvement that which Government now does for those whose services it requires.

With these successful and cheering results of knowledge, it will be instructive to contrast another instance of the fatal effects of ignorance in a situation where knowledge might have been effectual in preserving life and sparing suffering. I shall take the example from an early publication of Dr James Johnson,† who has devoted no small attention to the subject of health and the causes by which it is effected, and whose work contains much valuable matter connected with hygiène, as well as with the history and cure of disease. In treating of exercise, and the evils of its excess, Dr Johnson says—"I shall exemplify this reasoning by an instructive lesson. During the late war, it was observed, that, in its earlier periods, fever, fluxes, and scurvy, made the

* Account of the disease lately prevalent at the General Penitentiary, by Dr Latham, p. 192.

† On the Influence of the Atmosphere on the Health and Functions of the Human Frame, &c. 8vo, 2d edition, p. 139.

greatest havoc; while in its middle and ulterior periods, these diseases almost disappeared, and pneumonia (inflammation of the lungs), with its too frequent consequence, PHTHISIS, became infinitely more prevalent and fatal. The facts were apparent to all, but the causes few could divine. Some of our chemical wise-acres attributed the pneumonic diathesis to the lime-juice served out; but this hypothesis need not detain us, for I think a more rational explanation can be offered. As the period of warfare was lengthened out, discipline gradually became more perfect, and at length attained its acme. Every evolution was now performed with a rapidity and precision that seemed the effect almost of magic. All machinery and apparatus were not only so arranged as to give human power its greatest force and facility of application, but human strength was put to its ultimatum of exertion, and every muscular fibre of the frame called into furious action, during each manœuvre of navigation or war. Thus, in exercising the great guns, the heaviest pieces of artillery were made to fly out and in, or wheel round, with almost the celerity of a musket in the hands of a fugleman. The most ponderous anchors were torn from their beds with astonishing velocity; while the men were often seen lying about the decks breathless and exhausted after such ultra human exertions!

"But reefing and furling sails were still worse. Here, as in all other operations, there was a constant struggle against time. The instant that the word "*aloft*" was given, the men flew up the shrouds with such agility, that by the time they were on the yards, the respirations were nearer fifty than fifteen in a minute! In this state of anhelation they bent across the yards, and exerted every atom of muscular energy in dragging up the sails and securing the reef-lines, while the thorax was strained and compressed up against the unyielding wood! What were the consequences? The air-cells were frequently torn, blood extravasated; and the origins of cough and hemoptoës continually laid. The lungs were now in a proper state for receiving the impression of aërial vicissitudes; and constant exposure to night air, to rain, and every inclemency of the season, soon *evolved the long black catalogue of pulmonic and phthisical maladies, which swept off our men in vast numbers, to the no small surprise of the officers, who could not divine the cause of this new and destructive enemy.*

"But it was not the lungs alone that suffered here. The central organ of circulation bore a part of the onus, and a host of anomalous and otherwise inexplicable symptoms were produced, which completely puzzled the naval practitioners, who rarely suspected any lesion of the heart. These last affections both aggravated, and were in their turn aggravated by, the depressing passions engendered during the long confinement on ship-board, and separation from friends and native home."

I need hardly stop to point out to what extent the fatal results above mentioned might have been prevented, had the officers been possessed even of a superficial acquaintance with the laws of respiration and of muscular action. A perusal of the chapters on these subjects will enable the reader to judge for himself, and to determine whether the cause of the destruction was really difficult to be divined. It is impossible indeed to read such details considerately, without coming to the conclusion that a general acquaintance with the constitution of the human body ought to be rendered imperative on every one who is entrusted in any way with the direction of, or command over, any of his fellow-creatures. Where so much is necessarily left to individual discretion, the possession of knowledge in aid of sound sense is the only security against abuses, which it is possible to obtain. In many situations, a general knowledge of the laws of the animal economy would be of the greatest use, not only to the instructors of youth and the guardians of public institutions, but also to the officers of the army and navy. Independently of all other considerations, it would open up to them a field of interesting study and observation in every country and under every climate, which could not fail to procure for them a large amount of pleasure and instruction. Dr Johnson, it may be mentioned, had the Channel and North Sea fleets chiefly in view in his remarks.

It was very common at one time to eulogize the simple food and hardy habits of the poor and labouring classes as eminently conducive to health, when contrasted with the debilitating effects of the cares and luxuries of the rich. Experience, however, unfortunately reverses the picture, and shews, by arithmetical arguments, that the excess of work and the privations to which the poor are habitually exposed, produce a much higher rate of mortality among them, especially in seasons of scarcity or commercial depression, than among the richer classes of society. In evidence of this fact, I may refer to a table recently published by M. Casper of Berlin, and shewing the influence of wealth and poverty respectively upon the duration of human life. He takes from the register of deaths in the Almanack of Gotha a thousand names belonging to the families of princes and dukes, and from the official returns of the population of Berlin, a thousand names of persons who had lived upon charity, and whose deaths had been carefully registered. Of a thousand rich and poor there were existing, says M. Casper:—

	Rich.	Poor.		Rich.	Poor.
At the age of 5 years,	943	655	At the age of 55 years,	464	283
.... 10 ..	938	598	.... 60 ..	398	226
.... 15 ..	911	584	.... 65 ..	318	172
.... 20 ..	886	666	.... 70 ..	235	117
.... 25 ..	852	553	.... 75 ..	139	65
.... 30 ..	796	527	.... 80 ..	57	21
.... 35 ..	753	486	.... 85 ..	19	9
.... 40 ..	693	446	.... 90 ..	25	4
.... 45 ..	624	396	.... 95 ..	1	2
.... 50 ..	557	338	.... 100 ..	0	0

Considerable inaccuracies obviously vitiate the commencement of this table; but even after making a very liberal allowance for unintentional errors, it cannot be denied that the chances of life are greatly in favour of the rich. This difference, indeed, is observable even in the army and navy, in both of which it is ascertained that the officers suffer less than the men from changes of climate, and from the fatigues and calamities of war.

In strict accordance with these facts, it appears, from late returns, that the mortality among the children of the poorer classes in Paris is nearly double that occurring among those in more affluent circumstances; while, in the wealthier departments of France, the average of life is twelve years greater than in those which are poor. Similar results are observed in London, where, according to Dr Granville's tables, only 542 infants out of every 1000 births among the *poor* survive their second year; and both in Paris and in London, the mortality in the quarters inhabited by the working-classes, is proved to be nearly double that which occurs in those inhabited by the more wealthy. The influence of impoverished diet, defective clothing, and unfavourable moral position, is further strikingly exhibited among the children of soldiers, of whom, according to Mr Marshall, only a very small proportion reach the age of manhood; most of them being stunted in their growth, scrofulous in constitution and bad in morals.*

If such, then, be the disproportion which occurs between the rates of mortality in the different classes of society in Great Britain, it suggests some most important considerations, the first of which is the simple question, Whether that condition of the lower orders can be regarded as eminently prosperous or natural, which subjects them to be cut off by death so many years before

* Marshall on Enlisting, &c., p. 16.

the term allotted to those by whom they are employed? It also illustrates, strikingly, what I have said about bad health being more frequently *the result of gradual causes long in unperceived operation*, than of any sudden or accidental exposure; and proves that a mode of life or degree of labour is not to be rashly pronounced harmless, merely because its injurious effects are not immediately seen, and because years may elapse before it breaks down the constitution. It is blindness to the existence of this principle which still misleads mankind, and renders them insensible to the agency of numerous hurtful influences, from which, by a little exertion, they might easily be relieved.

Much angry discussion has taken place at different times as to the reality of the mischief inflicted by the protracted and unremitting exertion required in our factories and spinning-mills, where an unerring test might easily be found. If those who contend that the times of labour are not too long for either the children or the adults, could produce evidence to shew that, among operative cotton and flax spinners, for example, the average of life is equally high as among the apparently more favoured classes, there would be at once and for ever an end of the argument; while, should the result prove different, the system of labour may justly be deemed oppressive, in the precise ratio in which the mortality among the operatives exceeds that among their wealthier countrymen. No criterion can be so infallible as the one here proposed; and as the Government now possesses the means of obtaining accurate returns, it is very desirable that the fact should be tested. In the two first reports of the Registrar-General, a comparison is made between the mortality of town and country districts, which shews the superiority to be greatly in favour of the country. But as no attempt is made to separate the mortality among the manufacturing population from that of the poor generally, data are still wanting to decide the question conclusively. The French returns, however, are more specific, and they afford direct evidence of both diminished stature and an increased mortality as results of the introduction and spread of manufactures; and I wish much it were in my power to lay some of them before the reader. As it is, I can only refer to the excellent work of Villermé on the physical and moral condition of the manufacturing population of France, as a storehouse of valuable information bearing directly upon the question at issue.

Everything which tends strongly to call attention to the conditions which influence public and individual health, is calculated to do great good to the community. In this point of view, I am disposed to consider the visitation of cholera to the British Isles, some years ago, rather as one of those remarkable instances in which a beneficent Providence brings good out of evil, and converts an apparent calamity into a positive blessing, than as the public scourge which it was generally proclaimed to be. True it is that many individuals perished, and that others suffered by it in their affections and in their worldly circumstances; but I question if any thing short of the dread which cholera produced, could have combined all classes so efficiently and ardently in their efforts to discover and remove every thing in the condition of the poor and labouring portions of the community, which could prove detrimental to health. In the season of apparent danger, not only did the importance of cleanliness, ventilation, warmth, clothing, and nourishment, as preservatives of health, become manifest to minds on which nothing else could have made an impression; but their experienced efficacy gave an impetus to the exertions of the lower orders in their own behalf, which will continue to be productive of good long after the cause from which it sprung shall be forgotten.

The comparative exemption of the wealthier classes from cholera is itself sufficient to shew how much it is in the power of man, by the proper exercise of reason and the application of his knowledge, to obviate the dangers to which his health is exposed; how closely his bodily welfare is dependent on his own conduct and external situation; and how very little, comparatively, it is the result of circumstances which he cannot control or modify. In fact, every one who has investigated the subject with attention, will readily testify, that, but for the establishment of soup-kitchens, the supplies of warm clothing, and the whitewashing, cleaning, and ventilating of the houses of the poor, before and during the epidemic, a much greater number would have fallen victims to its ravages. And it is consoling to know, that even those who regard such visitations as direct inflictions of a vengeful Providence, and as nowise connected with mere neglect of the laws of health, were nevertheless not the least active in enforcing and superintending the removal of every external cause of disease, and promoting the comforts and supplying the wants of the needy and destitute; so that whatever differences in mere belief there might be, all parties were content to act as if the Creator had intended the health of the race to depend, in a very high degree, on the care which was taken to fulfil the conditions which He has decreed to be essential to the due action and preservation of the various bodily organs.

Many individuals exist, who, from hereditary deficiencies, can scarcely attain tolerable health, even with the best care; and many more are to be met with who are exposed to bad health from the hurtful nature of the professions in which they are engaged. Many suffer, also, from vicissitudes of the weather, and other causes which we may never be able entirely to guard against. But all these united are few, when compared to the number of those whose health is ruined by causes capable of removal or of modification, and to which they are now exposed from ignorance of their nature, from apathy, or from the want of the comforts and necessaries of life. If I have succeeded in calling attention to this important truth, one great object of these pages will be accomplished; and here I cannot help repeating the remark already made more than once, that *health is more frequently undermined by the gradual operation of constant though disregarded causes, than by any great or marked exposures of an accidental kind*, and is consequently more effectually to be preserved by a judicious and steady observance of the organic laws in daily life, than by exclusive attention to any particular function to the neglect of all the rest.

It may be said, that I allow nothing for the influence of habit in rendering situations and causes comparatively innocuous, which were dangerous at first. It is quite true that the human constitution possesses a power of adapting itself within certain limits to a change of circumstances; but it is not less true that sudden and extreme changes often destroy health and life before the system can adapt itself to the exigency, and that after making the most ample allowance for this sort of safety, the protection which it affords against the active causes of disease is comparatively trifling.

Where the change is sudden, as in passing from a temperate to a tropical climate, or even from very fine to very inconstant weather, the consequences to health are well known to be highly injurious. But where it is gradual and not extreme in degree, as in passing from winter to summer, health is not much endangered, because the system has time to accommodate itself to its new circumstances. Different organs predominate in activity in different climates and seasons, and time is thus required to admit of the necessary changes taking place without disturbing the general balance of the circulation. In hot countries, for example, the skin predominates greatly in activity in comparison with the kidneys; whereas, in a cold country, the case is precisely reversed. If, therefore, a sudden transition be made from the one to the other without due preparation and attention to the requisite change of dress, the rapid

change in the distribution of the blood from the surface to the internal organs, or from these to the surface, consequent on such change, is likely to be attended with danger; although the same change gradually effected would be unattended with any injurious results.

If, again, the change be from a healthy situation to one only a little less favourable, the consequences to the system will be also gradual and progressive. No immediate injury to health may be apparent, and the body may be said to adapt itself to the circumstances; but, in reality, health will be lowered and life shortened, in exact proportion to the amount of the injurious exposure and the state of the system at the time. Individuals of a peculiar constitution may live long, but the average of health and life will be positively diminished,—a fact which shews that the apparent exception is more a fallacy than a reality, and that, *cæteris paribus, the highest health and greatest vigour will always be on the side of those who make the nearest approach to the fulfilment of the organic laws.*

It is therefore a glaring perversion of logic and reason to infer that we may safely rest satisfied with a limited portion of evil, on the plea that the constitution will adapt itself to its presence. The argument ought to be turned in exactly the opposite direction. If the constitution possesses this power of adaptation to external circumstances, it becomes doubly incumbent on us to have it always surrounded with *beneficial* influences; seeing that, when the laws of health shall be fulfilled, the same tendency to adaptation will operate with equal force in permanently ameliorating the constitution. In every point of view, therefore, it is an object of much consequence to us to become acquainted with and to obey all the laws which regulate the functions of the human body.

It would be easy, were it consistent with the limits and purpose of the present volume, to shew that, although great advances have been made of late years both in physiological knowledge and in its applications to the advancement of human happiness, many of the usages current in society, and many of the practices resorted to in education, are still far from being in harmony with the laws of the human constitution; and that much good may be done by diffusing among the reflecting portion of mankind, and especially among the young, more accurate notions of the structure and uses of the various bodily organs, and of the conditions required for their healthy action. Illustrations in proof of this position, drawn from individual cases, may be cavilled at as incomplete, or regarded as accidental coincidences; but when the principle is exhibited in active operation on a large scale, minor qualifications will fall into the shade, and leave the evidence absolutely unassailable. On this account, I prefer selecting an example from the records of the army, both as being striking in its features, and as being one in which the public interest is deeply involved.

A few years ago, young growing lads were uniformly selected for the army, in preference to men of a mature age, on the supposition that, because their habits were not formed, they could more easily be converted into good soldiers than if taken a few years later. Many officers still entertain and act upon this opinion; and the period at which, by law, liability to military service commences in this country, remains fixed at eighteen years of age, although it has been raised to twenty by most of the Continental governments.

Examined physiologically, the practice of enlisting juvenile recruits seems peculiarly irrational. During growth, the conditions required for the healthy development of the body are, moderate and healthy exercise, plenty of nourishing food, abundance of sleep, and a cheerful state of mind. In making the transition from boyhood to maturity, the equilibrium of action between the different parts of the system is so much disturbed, that, under the most favourable circumstances, an unusual susceptibility of disease prevails, which renders that period of life particularly dangerous. By consulting the statistical tables prepared by Mr Finlaison, and those of the population of Paris, by Count Chabrol, already referred to, it will be seen that, in all classes of society, the rate of mortality suddenly increases from the age of fourteen, when rapid growth may be said to commence, to that of twenty-three, when it is nearly completed. In Paris, for example, the tables for the year 1820 exhibit only 395 deaths as occurring between the ages of 10 and 15; whereas those between 15 and 20, amount to no less than 703, being nearly double; while, in the five years immediately subsequent, they rise to 1339, and afterwards begin to decrease.

Viewing these results in connection with the laws of the animal economy, and bearing in mind that, even in peace, military service implies broken sleep, separation from friends, and occasional exposure to fatigue and privation, we must consider it almost self-evident, that an army composed of young lads at this hazardous period of life must be sickly and inefficient, and that a large portion of the expense and trouble bestowed in enlisting and training them must be entirely thrown away. That such is actually the fact, has unfortunately been too often proved by fatal experience. Mr Marshall, in the valuable work already quoted, adduces an irresistible mass of evidence to shew that, till growth is completed, it is impossible to form any correct estimate of the probable efficiency of a recruit; as numbers of apparently promising young men are cut off by affections of the chest, and other acute diseases, before attaining maturity, and before being exposed to any unusual privations or fatigue. So literally accurate is this statement, that Coche, a high French authority referred to by Mr Marshall, mentions distinctly, that even in time of peace, when no great hardships are to be encountered, volunteers, received into the army at the age of eighteen or twenty, pass two, three, or four years of their period of service (eight years) in hospital, solely from inability to bear up against difficulties which scarcely affect those who are a few years older.

If such be the result during peace, I need hardly say that, in time of war, the practice of enlisting very young men must be not less fatal to the recruits than costly to the country. It appears, accordingly, that, in the army in Spain, sickness and inefficiency prevailed almost in proportion to the youth and the recent arrival of the soldiers. Sir James MacGrigor cites the 7th regiment as an illustration, and adds, that between 9th August 1811 and 20th May 1812 it lost 246 men; of whom 169 were recruits landed in the preceding June, while only 77 were old soldiers. The original number of this detachment of recruits was 353, so that *more than one-half died within the first eleven months.* The total number of old soldiers, on the other hand, was 1143, and of them only 77 perished in the same time! So convinced, indeed, is Sir James of growing "lads being unequal to the harassing duties of the service," that in making calculations for measures in the field, he thinks that 300 men, who had served five years, would be more effective than 1000 newly arrived, not simply from their greater experience, but chiefly from the additional stamina proceeding from maturity.*

In a note subjoined to the preceding opinion of Sir James MacGrigor, Mr Marshall says, "Numerous examples might be quoted to shew that young lads are much less able to endure the fatigue of marching than men a little more advanced in life. During the winter of 1805, a French army, which was stationed on the coast in the neighbourhood of Boulogne, marched about 400 leagues to join the Grand Army before the battle of Austerlitz, which it effected *without leaving almost any sick in the hospitals on the route.* The men of this army had served two years, and *were not under twenty-two years of age.* The result of the march of this army may be compared with that of another under different cir-

* Marshall on Enlisting, &c. p. 5.

cumstances. In the campaign of the summer of 1809, the troops cantoned in the north of Germany marched to Vienna, but, by the time they arrived at the place of their destination, *all the hospitals on the road were filled with sick. More than one half of the men* composing this army were *under twenty years of age*, the usual levy of conscripts having been anticipated. After the battle of Leipsic, Napoleon made great exertions to recruit his army, and called upon the legislative senate to give him their assistance, to which they shewed some reluctance. "Shame on you!" cried the emperor; * * * " I demand a levy of 300,000 men, but *I must have grown men*; BOYS SERVE ONLY TO ENCUMBER THE HOSPITALS AND ROADSIDES."

In similar defiance of the laws of physiology, half-grown lads were at one time preferred for the East India service, on the false supposition that their unconsolidated constitutions would more easily adapt themselves to the climate than those of men already arrived at maturity, a proposition very nearly equivalent to saying, that because a person is already enfeebled, exposure to the causes of disease will *therefore* have less effect on him than after his strength shall be restored! Palpably fallacious as this kind of logic now appears to be, it nevertheless reigned for years with undisputed sway, and still has a few staunch supporters. Sir George Ballingall is entitled to the credit of having early and earnestly raised his voice against it, in his work on Fever and Dysentery, published on his return from India in 1819. His evidence is very striking; but so slow is the march of reason, that it was only in December 1829, that an order was issued from the Horse Guards that no recruits under *twenty* should be received for regiments serving in tropical climates; and so late as the year 1826, nearly 15 per cent. of the king's troops in Bengal were under that age.

Mr Marshall also, in touching upon this question, supports his positions by reference to facts of a very conclusive kind, and to authors whose opinions ought to have great weight. Among other evidence, he quotes the register of a regiment employed in the Burmese territory in 1824–5, from which it appears that, in 1824, the ratio of mortality among the young men who went out with the corps was 38 per cent. or 1 in every $2\frac{1}{4}$; while among the volunteers, who were considerably older, the mortality was 17 per cent., or only 1 in 6. In 1825, it was 30.5 or 1 in $3\frac{1}{3}$ among the younger class, and *only 6 per cent.*, or 1 in 16, *among the older*. P. 10.*

Some other instances might be quoted in proof of the greatest mortality being always among the youngest men; and I might refer to a regiment mentioned by Dr Davies, in which, when it was sent out to Bombay in 1808, there was not a single private above 22 years of age, and in which, out of 550 men, nearly 300 required medical assistance within six weeks after he joined it; but it is unnecessary, as, although individual officers still prefer young men, Government is at last awakened to their unfitness. A vague notion that growing lads do not bear fatigue, is indeed prevalent enough; but I venture to say, that if those by whom the age of enlistment was first determined had been thoroughly acquainted with the laws of physiology, and had possessed a clear preception of the conditions of healthy growth, the practice of receiving recruits at 17 or 18 years of age would never have been sanctioned, and the country would have been saved the pain and expense of sending thousands of young men to "incumber the hospitals and roadsides" of the Peninsula, or to perish under the exhausting influence of a tropical climate.

I have dwelt at some length on this subject, both because the practice which I condemn was lately in full operation, and is even yet not entirely exploded, and because from the magnitude of its results, and the clearness with which they can be traced to the direct violation of a natural law of the constitution, it affords an instructive example of the evils arising from ignorance of the structure and functions of the human body, and of the aid which might be derived from a general acquaintance with physiology, in preserving health and promoting the happiness of the race.

It was my intention to analyse, in the same way, various other practices in which public and private health is concerned; but I have already so far exceeded the limits originally proposed, that I must now draw to a conclusion, and leave the reader to determine how far I am right in believing that information of the kind now communicated will be acceptable or useful to the public.

* In availing myself of Mr Marshall's labours, I may be allowed to express my opinion of the benefit he is conferring by his statistical researches, not only on the service with which he has been so long and honourably connected, but also on the public at large. There are many practical questions deeply concerning public health, which can be fully elucidated only by such masses of facts being grouped together as shall destroy all minor inequalities, and place the operation of principles prominently in view. But to effect this object with due regard to accuracy, requires an acquaintance with details, an acuteness of observation, and a power of successful generalization, which are rarely found in combination with adequate zeal and industry. It would be very useful if similar researches were instituted in regard to the occurrences in our public hospitals.

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