L. Osborn
Brixton


GRAVES

STUDIES

IN

PHYSIOLOGY AND MEDICINE,

BY THE LATE

ROBERT JAMES GRAVES, F.R.S.,

PROFESSOR OF THE INSTITUTES OF MEDICINE IN THE SCHOOL OF PHYSIC IN IRELAND.

EDITED BY

WILLIAM STOKES,

REGIUS PROFESSOR OF PHYSIC IN THE UNIVERSITY OF DUBLIN.

Thus it will be proved, that if man has passions which impel him to the destruction of man, if he be the only animal who, despising his natural means of attack and defence, has devised new means of destruction, he is also the only animal who has the desire or the power to relieve the sufferings of his fellow creatures, and in whom the co-existence of reason and benevolence attests a moral as well as an intellectual superiority.—*Clinical Medicine.*

LONDON:
JOHN CHURCHILL & SONS, NEW BURLINGTON STREET.
MDCCCLXIII.

LONDON: PRINTED BY HARRISON AND SONS, ST. MARTIN'S-LANE, W.C.

THIS VOLUME,

A Memorial of Graves,

IS,

BY HIS BROTHER, AND BY THE EDITOR,

DEDICATED

TO

PROFESSOR TROUSSEAU,

MEMBER OF THE IMPERIAL ACADEMY OF MEDICINE, COMMANDER OF THE LEGION OF HONOUR.

EDITOR'S PREFACE.

The following papers, by Dr. Graves, have been selected from many, which, from time to time, have appeared in various periodicals. The essays which form the series ending with the paper on Dietetics, were published by him in the *London Medical and Surgical Journal*, as Lectures introductory to his course on the Institutes of Medicine, delivered in the School of Physic, in 1834. Those on special topics in Physiology, as well as most of the papers in the Miscellaneous collection, are taken from the *Dublin Journal of Medical Science*, 1st and 2nd series, and from the *London Medical Gazette*. The memoirs on the Anatomy of the Hock Joint in the Horse, and of the Vertebral column in certain Cetacea, were published in the *Transactions of the Royal Irish Academy*; while the Essay on the comparative characters of the Great Salt Lake of North America, and the Dead Sea, appeared originally in the *Edinburgh Philosophical Journal*. In the table of contents will be found the date of publication of each of these papers.

In this selection of papers those only which bear on Physiology or Medicine have been reproduced. In some instances the supervision of these writings, as they originally appeared in print, seems to have been intrusted to other hands than those of the Author; in all such cases the Editor has sought to convey the meaning of the writer so as to prevent misconception. He gratefully acknowledges assistance received from friends during the revision of these papers, and especially that given by Dr. William Daniel Moore, but for whose valuable, earnest, and continued help, the publication of this volume would have been long delayed.

It is hardly necessary to say that this book is not to be taken as setting forth the state of Physiology in our time.

But these remains of Graves have an especial value, as showing how the mind of a great physician dealt with Physiology in its true relations to medicine.

The frontispiece is from a bust by Hogan, which was presented to the King and Queen's College of Physicians in Ireland, by the Rev. Richard Hastings Graves, D.D.

CONTENTS.

MISCELLANEOUS ESSAYS.

THE LIFE AND LABOURS OF GRAVES.

Ten years have elapsed since the death of the author of the *Clinical Medicine*, and now, in attempting to give a sketch of the life and works of him who was once his teacher, then his colleague, ever his friend, the writer but obeys the promptings of a desire which has long been present to him, that the members of his profession should have a more intimate knowledge of one who was so worthy of being enrolled among the benefactors of medicine. For, although the scope of the work with which his name is honourably connected is so great, although it shows evidences of successful labour so multitudinous, it does not, nor from its nature could it, convey a fitting idea of the varied stores of knowledge laid up in the mind of its author, whose life and works, whose powers of observation, whose energy and faithfulness in teaching, mark an epoch in British medicine.

To avoid excessive eulogium is above all things the duty of a biographer; yet, it may safely be said, that the life and labours of Graves, shew, in an admirable manner, how the past can be made to illuminate the works of the present time; for his mind, while it mastered all modern discoveries in physiology and in medicine, still remained imbued with that old strength and breadth of view, so characteristic of the fathers of medicine,—of Sydenham, Fothergill, Haygarth, Huxham, Cullen, and Gregory, and among Continental writers, of John Peter Frank. And thus he had the rare privilege of leading the advance of the modern school of practical medicine in this country, while, in his practice and in his teaching, he never ceased to venerate and to be influenced by the thoughtful labours and the wisdom of the past.

The pedigree of the family of Graves in Ireland, can be traced back to the period of the subjugation of the country by Cromwell. His ancestor, Colonel Graves, an officer in the Protector's cavalry, at that time acquired large estates in the county of Limerick. The subject of this memoir was the youngest son of Richard Graves, D.D., Senior Fellow of Trinity College, and Regius Professor of Divinity in the University of Dublin, and of Eliza, daughter of James Drought, D.D., also a Fellow of Trinity College, whose family had been long settled in the King's County.

Dr. Richard Graves, the author of the work entitled *Lectures on the Pentateuch,* was afterwards promoted to the Deanery of Ardagh. His sons, Richard, Hercules, and Robert, passed through the University with great distinction, and it is worthy of note, that these brothers each obtained, at the degree examinations of three successive years, the gold medal in science and in classics, then the highest distinction attainable by students.

The degree of Bachelor of Medicine in the University of Dublin, was conferred on Robert Graves in 1818. He soon after proceeded to London, where he studied for some time. The schools of Berlin, Göttingen, Vienna, and Copenhagen, and those of France and Italy were subsequently visited.

Three years were thus employed, and then, after having resided for some months in Edinburgh, he returned to Dublin.

In this large and truly liberal education, which embraced the training of the school, the university, and the world, we can discover in part the foundations of his subsequent eminence. He did not content himself, as is so commonly the case, with commencing—to use his own words—"the life of a practitioner without practice," but he made himself intimate with the recent discoveries and modes of thinking in every great school of medicine, whether abroad or at home, and formed friendships with the leading physiologists and physicians of Europe, with many of whom he kept up a correspondence during his life. His power of acquiring languages was remarkable. On one occasion, when on a pedestrian journey in Austria, having neglected to carry his passport, he was arrested as a spy, and thrown into a dungeon. His assertion that he was a British subject was disbelieved by the authorities, who insisted that no Englishman could speak German as he did! In his imprisonment, which lasted for ten days, he suffered great privations.

During his sojourn in Italy, he became acquainted with Turner, the celebrated landscape painter, and was his companion in many journeys. He often spoke of the pleasure he enjoyed, during the sketching tours taken in company with the great painter. The history of his first meeting with Turner, may be here related:—

Graves was travelling by diligence, when, in one of the post stations on the northern side of the Alps, a person took a seat beside him, whose appearance was that of the mate of a trading vessel. At first, no conversation took place between them, but Graves' curiosity was soon awakened by seeing his fellow-traveller take from his pocket a note-book, across the pages of which his hand, from time to time, passed with the rapidity of lightning. Overcome at length by curiosity, and under the impression that his companion was perhaps insane, Graves watched him more attentively, and discovered that this untiring hand had been faithfully noting down the forms of the clouds which crossed the sky as they drove along, and concluded that the stranger was no common man. Shortly afterwards, the travellers entered into conversation, and the acquaintance thus formed soon became more intimate. They journeyed together, remaining for some time in Florence, and then proceeding to Rome. Graves was himself possessed of no mean artistic powers, and his sketches from nature are full of vigour and truth. He was one of the few men in whose company Turner is known to have worked. The writer has heard him describe how, having fixed on a point of view, he and his companion sat down, side by side to their work. "I used to work away," he said, "for an hour or more, and put down as well as I could every object in the scene before me, copying form and colour, perhaps as faithfully as was possible in the time. When our work was done, and we compared drawings, the difference was strange; I assure you there was not a single stroke in Turner's drawing that I could see like nature; not a line nor an object, and yet my work was worthless in comparison with his. The whole glory of the scene was there." The tone and fire with which Graves uttered these last few words, spoke volumes for his sympathy with, and his admiration of the great painter of nature.

At times, however, when they had fixed upon a point of view, to which they returned day after day, Turner would often content himself on the first day with making one careful outline of the scene. And then, while Graves worked on, Turner would remain apparently doing nothing, till at some particular moment, perhaps on the third day, he would exclaim, "There it is!" and seizing his colours, work rapidly till he had noted down the peculiar effect he wished to fix in his memory. It is a curious fact, that these two remarkable men lived and travelled together for months, without either of them inquiring the name of his comrade, and it was not till they reached Rome, that Graves learned that his companion was the great artist.

After leaving Rome he visited Sicily, and in connection with this excursion, the following incident is worthy of being recorded, as giving an insight into his character, and as preparing us to estimate one of its features, for which in after-life he was justly distinguished, namely, his promptness and vigour of action, when confronted with difficulty and danger.

He had embarked at Genoa, in a brig bound for Sicily. The captain and crew were Sicilians, and there were no passengers on board but himself and a poor Spaniard, who became his companion and messmate. Soon after quitting the land, they encountered a terrific gale from the north-east, with which the ill-found, ill-manned, and badly commanded vessel, soon showed herself unable to contend. The sails were blown away or torn, the vessel was leaking, the pumps choked, and the crew in despair gave up the attempt to work the ship. At this juncture Graves was lying on a couch in the cabin, suffering under a painful malady, when his fellow-passenger entered, and in terror, announced to him, that the crew were about to forsake the vessel; that they were then in the very act of getting out the boat, and that he had heard them say, that the two passengers were to be left to their fate. Springing from his couch, Graves flung on his cloak, and, looking through the cabin, found a heavy axe lying on the floor. This he seized, and concealing it under his cloak, he gained the deck, and found that the captain and crew had nearly succeeded in getting the boat free from its lashings. He addressed the captain, declaring his opinion, that the boat could not live in such a sea, and that the attempt to launch it was madness. He was answered by an execration, and told that it was a matter with which he had nothing to do, for that he and his companion should remain behind. "Then," exclaimed he, "if that be the case, let us all be drowned together. It is a pity to part good company;" as he spoke, he struck the sides of the boat with his axe, and destroyed it irreparably. The captain drew his dagger, and would have rushed upon him, but quailed before the cool, erect, and armed man. Graves then virtually took command of the ship. He had the suckers of the pumps withdrawn, and furnished by cutting from his own boots, the leather necessary to repair the valves, the crew returned to their duties, the leak was gained, and the vessel saved.

During his stay on the continent, he corresponded with the late eminent Dr. Perceval of this city, it being arranged that his letters should be circulated among his friends, among whom may be mentioned Wolfe, the author of the lines on the Burial of Sir John Moore; the late Bishop of Meath, Dr. Dickinson; and the present Archdeacon of Clogher. To the latter he also addressed several letters, expressing his desire that they, as well as those to Dr. Perceval, should be read by his friends. In these communications, as might be expected, he avoided much allusion to matters purely professional, but they contain a large amount of information on the state of society on the continent, and also some admirable disquisitions on subjects relating to natural history and classical antiquities.

In 1821, Graves returned to Dublin, and, as was anticipated, at once took a leading position in the profession and in general society. Nature had been bountiful to him: he was tall in stature, of dark complexion, and with noble and expressive features. In conversation he possessed a power rarely met with; for while he had the faculty of displaying an accurate and singularly varied knowledge without a shade of egotism, he was able to correct error without an approach to offence. From this may be learned one source of that power he so possessed of influencing the minds of men; for there is nothing more captivating than the conversation of one, who though by nature proud, has trained himself to be mentally humble.

He had at once a warm and a sensitive heart, and ever showed lasting and therefore genuine gratitude for the smallest kindness. Loving truth for its own sake, he held in unconcealed abhorrence, all attempts to sully or distort it; and he never withheld or withdrew his friendship from any, even those below him in education and social rank, if he found in them the qualities which he loved, and which he never omitted to honour.

As bearing on this point, it is to be remarked, that his love of civil and religious liberty, often ardently and fearlessly expressed, led men of limited views to think him imbued with the doctrines of continental liberalism; yet he was, in principle, a thorough monarchist, and few more admired, because few better understood, the nature and value of that constitution and that law under which it is our happiness to live. The following passage from the Essay on the Laws of Periodicity, page 128, may here be quoted.

"It is, then, perfectly well ascertained that in England, Ireland, and Scotland, the mortality is much lower than in the poetic 'lands of the sun,' Italy and Greece. But we are not to attribute the superiority of any country in this respect, either to its soil or climate, for there is no doubt that if civilization, the blessings of a free government, and the enjoyment of the comforts of life, were as extensively diffused among the Greeks and Italians as they are among the inhabitants of the British Islands, the rate of longevity in these countries would be remarkably increased."

It is to be observed that as his mind was open and unsuspicious, he, occasionally, fell into the error of thinking aloud without considering the nature of his audience, and of letting his wit play more freely, and his sarcasm, when defending the right, cut more deeply than caution might dictate.

This outline of the character of Graves at the commencement of his public life, will throw light on many matters relating to his subsequent career, and it is important to note that the world never spoiled him, so that he preserved most of the youthful, and all the kindly and better qualities of his mind up to the hour of his death. His friends became bound to him with ties stronger than those of relationship, and thus he was enabled to take with a "frolic welcome" the occasional and natural hostility of the bad, the presuming, or the indirect man.

It will be well to review the condition of the School of Medicine in Ireland up to 1821.

For at least a century previously, the medical faculty in the University of Dublin had a *bonâ fide* existence. The Regius Professorship of Physic had continued as a separate institution from the time of the Restoration, and we find appointments to the chairs of Anatomy, Chemistry, and

Botany, so early as 1711. With anatomy, surgery was combined, and from these chairs, courses of lectures were delivered to such pupils as were on the books of the University as students in arts, without excluding those who chose to take a purely medical education. Subsequently, the chairs of Medicine, Institutes of Medicine, and of Materia Medica, on the foundation of Sir Patrick Dun, were added, by act of parliament, so as to constitute a complete School of Physic. It is greatly to the credit of the University of Dublin that from an early period it possessed a full and endowed medical school, and so, in no small degree, preserved academic rank for the Irish physician. This circumstance, and also the determination of the University not to grant medical degrees on any system of exclusively medical, or special education, have, doubtless, had their influence in giving to the profession in Ireland that high tone and social position which it has so long enjoyed. It is not to be denied that the preservation and development of the faculty of medicine in the University of Dublin were favoured by external circumstances, among which may be noted the metropolitan position of Trinity College, and the existence of so many hospitals in the city.

The Royal College of Surgeons was founded in 1784, and in its school, subsequently established, chairs of anatomy and surgery were ably filled. The teaching of clinical medicine had been, at least, attempted, and the breaking out of the war with France, by increasing the demand for military and naval surgeons, gave a stimulus to surgical training, and led to the application of private enterprise to the business of teaching, for it was little better; the object being to qualify young men, by special instruction in anatomy and surgery, to enter the public service in the shortest possible time. For this end, the facility of obtaining in Dublin, subjects for dissection, gave a great opportunity. We may safely designate as unproductive those periods of the Irish school, when its energies were confined to the mere teaching of anatomy and surgery, and even of medicine, in the theatre. Dublin was then little more than a school of elementary anatomy, of book-medicine and book-surgery. And although it possessed teachers of excellent calibre, they had but a local reputation.

For it is with societies of men as with individuals, that which earns and extends respect does not depend so much on the teaching of what is already known, no matter how excellent that teaching may be, as upon the productiveness of the society or the individual, of original work. As might bee xpected, the system then in operation produced a few anatomists of average ability, but little more. Among the teachers, most of them who had reputation were otherwise trained. Clinical investigation and clinical teaching could scarcely be said to exist, and so the great path to the advancement of the healing art was almost untrodden, and the minds of our young men were not only left unawakened to the value and the necessity of original work, but were even trained to hold in contempt the results of pathological study in other places.

This state of things was not to last. In 1817, we find that Cheyne, a native of Scotland, and educated in Edinburgh, made the first step towards inducing the taste for original observation, by the publication of the first volume of the Dublin Hospital Reports. In this effort he associated with himself the leaders of the professions of medicine and surgery in Dublin, but the credit of the undertaking is due to him alone.

Among the medical reports in this work must be especially noticed those on Fever by Dr. Cheyne, which are examples of what clinical reports ought to be. In them, the facts are given calmly and simply, without effort to bias opinion, or to gain notoriety by peculiarity of views. It may be well said, in proof of their value, that they appear to have given the tone to the subsequent labours of the Irish school, which have, as it were, inherited their practical nature and truthfulness, and have earned for their authors so high a reputation. Of this character of the contributions to the sciences of medicine and surgery from Dublin, the writer has elsewhere spoken, and even after the lapse of years he feels bound to repeat, that while these works have aided in building up the scientific character of the country, they may be appealed to as evidences of its moral worth.

Yet, in accounting for the development of the scientific, or, as we may term it, the productive period of Irish medicine, we must look to something more than the influence of individual example, or genius, and inquire whether it was but one of the results of an advance in the whole mental energy of the country. It is certain that the period from 1800 to 1821, was characterised rather by a kind of mental collapse than by activity. Such a result might naturally be expected when the political changes which the country had undergone are considered; and a period of at least one generation, seemed requisite for the growth of those energies which would work out for Ireland her proper place, as an integral portion of the British Empire. The quarter of a century following 1821 is not the least remarkable period of our history, for it was then that a general movement in most departments of mental culture commenced among us—a movement giving good hope for the future of the country. It was then that the modifications of the University system, as introduced by Dr. Lloyd, Provost of Trinity College, gave such an impetus to collegiate study, and spread a new influence over the country, as evidenced by the general advance in mathematical, physical, and natural sciences, and in the studies of literature and archæology.

Even so early as 1821, the influence of this new movement on medical science was shown in Dublin, and to Graves, among its leaders, must be given a foremost place. During that year, he appeared as one of the founders of the new School of Medicine in Park Street, and was also elected physician to the Meath Hospital, where he commenced that system of clinical observation and instruction which has done so much for the Irish School of Medicine.

The following extract from his first introductory lecture in the Meath Hospital, in 1821, will best explain his views on clinical instruction :—

"The other branches of medical education may be cultivated at different times, and according to a certain order of succession,—one period of your studies demanding a particular application to anatomy, another to chemistry, while a third must be especially devoted to materia medica. With the observation of disease it is otherwise. From the very commencement, the student ought to witness the progress and effects of sickness, and ought to persevere in the daily observation of disease during the whole period of his studies."

"The human mind is so constituted, that in practical knowledge its improvement must be gradual. Some become masters of mathematics, and of other abstract sciences, with such facility, that in one year they outstrip those who have laboured during many. It is so, likewise, in the theoretical parts of medicine; but the very notion of practical knowledge implies observation of nature. Nature requires time for her operations: and he who wishes to observe their development will in vain endeavour to substitute genius or industry for time. Remember, therefore, that however else you may be occupied—whatever studies may claim the remainder of your time, a certain portion of each day should be devoted to attendance at an hospital, where the pupil has the advantage of receiving instruction from some experienced practitioner. A well-arranged, and sufficiently extensive hospital contains everything that can be desired by the student; but, unfortunately, his improvement is seldom proportioned to the opportunities he enjoys. Whence this deficiency? How does it happen that many attend hospitals day after day, and year after year, without acquiring much practical knowledge? This may be attributed to want of ability or diligence on the part of the student, or to an injudicious or careless method of teaching on the part of the hospital physician. It may be well to examine more in detail the errors to which the student and the teacher are respectively most exposed.

"A great number of students seem little, if at all, impressed with the difficulty of becoming good practitioners; and not a few appear to be totally destitute of any prospective anticipation of the heavy, the awful responsibility they must incur when, embarking in practice, the lives of their fellow-creatures are committed to their charge. It is by persons of this description that the earnest attention and permanent decorum, which ought to pervade a class employed in visiting the sick, are so frequently interrupted. Young men of the character to which I allude, attend, or, as it is quaintly enough termed, *walk* the hospitals very regularly, but they make their appearance among us rather as critics than as learners: they come, not to listen, but to speak; they consider the hospital a place of amusement rather than of instruction.

"Students should aim not at seeing many diseases every day; no, their object should be constantly to study a few cases with diligence and attention; they should anxiously cultivate the habit of making accurate observations. This cannot be done at once; this habit can be only gradually acquired. It is never the result of ability alone; it never fails to reward the labours of patient industry. You should also endeavour to render your observations not only accurate but complete; you should follow, when it is possible, every case from its commencement to its termination; for the latter often affords the best explanation of previous symptoms, and the best commentary on the treatment. Did time permit, I could expose many other erroneous practices calculated to render your studies comparatively unprofitable; but I must turn from the student to the teacher—from the errors of the learner to the imperfection of the mode adopted for instructing him."

"I have had an opportunity of observing with attention three different methods of conducting clinical instruction; the first is that practised in Edinburgh and Dublin. I shall select that of Edinburgh for examination, it being by far the most celebrated of the British schools of physic, and much resorted to even by foreigners for instruction.* Two clinical clerks, one for the male, another for the female wards, are selected by the physician from among the senior pupils; their business is to write an accurate history of the cases, to

* I speak of Edinburgh as it was when I studied there, in 1819.

report the effects of medicines, and record the symptoms which may have occurred since the physician's last visit. All this is generally done with fidelity and zeal. At his daily visit the physician stops at the bed of each patient, and having received the necessary information from his clerk, he examines the patient, interrogating him in a loud voice, while the clerk repeats the patient's answer in a tone of voice equally loud. This is done to enable the whole audience to understand what is going on; but indeed, when the crowd of students is considerable, it is no easy task; it requires an exertion almost stentorian to render this conversation between the physician and his patient audible by the more distant members of the class; while the impossibility of seeing the patient, obliges all who are not in his immediate vicinity to trust solely to their ears for information.* This information is not indeed neglected, for every word so attentively listened to, and heard with so much difficulty, is forthwith registered most faithfully in each student's case-book; and afterwards all the observations the professors make in their clinical lectures are taken down with equal care and fidelity."

"It is really a pity to find so much labour and diligence thrown away, for it is evident that the practice of medicine cannot be thus taught or learned, as it were, by hearsay; and it is consequently to be feared that many are annually dubbed Doctors at Edinburgh, who have been scarcely ever called on to write a prescription. The chief objection to this mode of teaching is, that however well inclined the student may be, he is never obliged to exercise his own judgment in dis-

* When this information was conveyed, as it formerly was at Sir Patrick Dun's Hospital, in Latin, the student had to encounter another barrier to the acquisition of knowledge. I have called the *language* LATIN, in compliance with the generally received opinion concerning its nature.

tinguishing diseases, and has no opportunity of trying his skill in their cure; and, consequently, at the end of his studies he is perhaps well grounded in the accessory sciences—is a perfect medical logician—able to arrange the names of diseases in their classes, orders, and different subdivisions; he may be master of the most difficult theories of modern physiologists; he may have heard, seen, and if a member of the Medical Society, he may have also talked a great deal; but at the end of all this preparation, what is he when he becomes a full Doctor?—*a practitioner who has never practised!*

"I do not assert that a diligent student may not obtain a good deal of knowledge by attending one or several clinical courses in Edinburgh; no doubt he will gain many useful general ideas concerning the nature and treatment of disease; and if he himself examine the patient after the physician's visit, he may even acquire a certain degree of tact in recognising symptoms and appreciating their value. This method of instruction is indeed very useful, and nothing better can be devised for a beginner; but for the more advanced student it is by no means sufficient, nor is it calculated to give him practical experience, without which all other acquirements are of no avail. I say it does not give him experience, because he has at no time been charged with the responsibility of investigating a case for himself, and by himself; because at no time has he been called on to make a diagnosis unassisted by others, and, above all, because he has never been obliged to act upon that diagnosis, and prescribe the method of treatment. If those who had been thus educated, and who had been made doctors upon so slender a foundation, were to confess the truth, we should be presented with a picture calculated to excite dismay, if not a stronger feeling.

How many doubts and distracting anxieties attend such a man at his first patient's bedside? If the disease be acute, and life in imminent danger, and if he shrink under this sudden and unusual load of responsibility, he gains little credit for professional ability; if, on the contrary, inexperienced as he is, he assumes that decision of judgment, that energy of practice, which experience alone can confer, it is not improbable that the result may be still more disastrous."

"Gentlemen, I am not drawing a picture from my imagination alone; I have had occasion too often to shudder at the original,—too often to deplore the sad effects resulting from the well-meant but totally mistaken treatment employed by young men; and often have I regretted that, under the present system, experience is only to be acquired at a considerable expense of human life. There is, indeed, no concealing the truth,—the melancholy truth,—that numbers of lives are annually lost in consequence of mal-treatment. The victims selected for this sacrifice, at the shrine of experience, generally belong to the poorer classes of society, and their immolation is never long delayed when a successful candidate for a dispensary commences the discharge of his duty. The rich, however, do not always escape; nor is the possession of wealth in every instance a safeguard against the blunders of inexperience.

"This charge of inexperience is not necessarily confined to the beginner; it applies equally to many an old practitioner, whose errors have grown, and have increased in strength, during a long succession of years; because, from a defect in his original education—from the absence of a properly directed clinical instruction, he commenced practice without having previously acquired the power or the habit of accurate observation; because he had not in his youth been taught to reason justly upon the facts presented to his view; because not having learned in the beginning to think accurately, he contracted a loose and careless mode of examining the progress of disease, and the effects of remedies; and, consequently, the lapse of time has had no other effect upon his errors than that of rendering them more inveterate. Such a man has generally an overweening confidence in his own judgment; he never detects or is conscious of his own mistakes, and instead of improvement, years bring only an increased attachment to his opinions—a deeper blindness in examining the results of his own practice; and do not such persons abound in every branch of the profession?—are there not general practitioners, are there not physicians, are there not surgeons, are there not apothecaries, who answer to this description, and who nevertheless are cheerful in their demeanour, and enjoy a good repute among their clients? Believe, me, gentlemen, the quacks who cover our walls with their advertisements, vend not annually to the community more poison than is distributed according to the prescriptions of your routine and licensed practitioners:—and yet the science of medicine is improving daily, and treatises on the practice of physic are every day multiplying. Why, then, is society so infested? Many circumstances concur to produce this effect; but the most influential is undoubtedly that which now occupies our attention,—I mean a system of clinical instruction radically wrong, because it does not teach the actual practice of medicine. Is there any other profession or art, or even trade, in which any but a madman would embark unprovided with a store of practical knowledge? But enough of this unpleasing subject. Let us next consider what systems have been adopted in other countries, with a view of judging how far it is either practicable or expedient to introduce them into this.*

"In France, the mode of conducting clinical instruction is very similar to that which we have already described, and is consequently attended with nearly the same advantages and defects. In the French hospitals, however, no reports are dictated to the clerks, and more care is taken to explain the symptoms and progress of each case at the bed-side of the patient: in fact, these explanations answering to the original institution and design of clinical lectures, are attended with many important advantages, and are well worthy of imitation. By this means the trouble and uncertainty of a circumstantial and detailed description are frequently avoided, by a direct reference to the matter to be described; and the interest of the student is secured by a very slight exertion on the part of his instructor, while the latter owes many new ideas to the degree of attention which he is thus forced to give to each case. It is true that the duration of the visit is thereby increased; and in Italy, where the same plan is pursued, it is not unusual for Tommasini to expend, in the morning, more than two hours upon eight or ten cases, besides the time devoted in the evening to the same purpose. When the importance of the subject to be taught is so great, it is wisely judged that the teachers must be laborious; and it is thought necessary to use every possible means to convey clear ideas concerning each case to the student. His atten-

* As truth has obliged me to expose a fault, which the Edinburgh school shares in common with the other schools of Great Britain, I am bound in candour to acknowledge the very great advantages which Edinburgh, in other respects, offers to students; they there find themselves surrounded by so much diligence, enthusiasm, and zeal, that they can scarcely resist the impulse of improvement, and consequently many learn there to think and to labour, who had been previously careless idlers.

tion is not distracted by seeing a great number of cases in rapid succession, nor (as is too often the case in the hospitals of Dublin and London) are the inquiries dictated by a laudable curiosity on the part of the student, suppressed by a forbidding demeanour or an uncourteous answer from his teacher.*

"Although the French clinic thus presents several manifest superiorities over the British, yet it is liable to the chief objection already urged against the latter—that the student is not supplied with an opportunity of learning the actual practice of his profession. I am by no means disposed to join in the cant of humanity; yet I cannot overlook another disadvantage in this mode of teaching. I cannot help feeling that it is scarcely justifiable to lecture upon a patient's case in his presence, and in his native language; that it is cruel to explain (as must, when this method is adopted, be often done,) that the patient is labouring under a fatal complaint. During such a lecture I have often watched the worn and pallid countenance of the sufferer, while he listened attentively to the record of his past and present sufferings, and I have marked the settled expression of despair it assumed, when the prognosis thus tediously ushered in was too clearly announced. It is cruel to banish from the sick man's bed his sole remaining comfort, it is unmerciful to scare away hope—his only consolation during hours of pain and watching. We ought never to allow any expression to

* In this respect our hospital physicians and surgeons have improved much since 1821. I am strongly disposed to believe that the improvement was not owing to a voluntary change, but to a certain salutary fear of public castigation from the weekly medical press; much, however, remains to be done, for the influence of the last century has not yet entirely ceased, and there are those still lingering among us, who no doubt regret the aristocratic era, when an impassable gulf lay between the student and his teacher.

escape from us which could possibly add the terrors of apprehension to the weight of actual suffering. On this account, while we borrow the useful part of their system from the French, we must correct so glaring a defect by making use of the Latin language, whenever it is absolutely necessary to make any observation that might alarm the patient.* One of the most important duties of a surgeon, or physician, consists in the practice of humanity; and it is very doubtful whether the student does not experience as much difficulty in deriving benefit from the precept as from the example of his seniors, in this department of his profession.

"Observe, gentlemen, I speak not of French but of Irish hospitals; for, saving the objection already adverted to, the conduct of the French physicians is in every respect praiseworthy. We do not find them indulging in coarse, harsh, and even vulgar expressions to their hospital patients; we do not find them provided with two vocabularies—one for the rich, and another for the poor.† The medical, more than any other profession, requires that the better feelings of our nature should be cultivated and fostered. The nature of anatomical pursuits obliges us to violate

* This rule is always observed in Germany, a country remarkable for the zeal and humanity of the medical profession. In Italy both professors and students are less scrupulous. Thus Dr. Clark relates that he has heard the case of a phthisical person explained in all its bearings, by the professor of Bologna, in the patient's presence: in another instance, which occurred at the same place, a female, labouring under cancer uteri, burst into tears on hearing a detailed account of the nature of her complaint.

† When the above lecture was delivered, the abuse I speak of was but too frequent; and will it be credited that many other and greater abuses had existed during the preceding generation? Death, the most efficient of all reformers, had then removed several of the chief actors from the scene, for which, as on most other occasions, he has, I rather think, been undeservedly censured.

many of our natural prejudices, and disregard some of our strongest propensities; let us therefore be doubly anxious to give, by means of the most diligent cultivation, an additional and more vigorous growth to our better feelings —to our social affections; and if we are accused of disrespect for the dead, let us answer the accusation by our humanity to the living.

"But to return to our subject. The third mode of conducting clinical instruction, is that adopted generally throughout Germany; and which, in addition to the means of improvement, comprehended in the plan of the French and English methods, possesses the advantage of allowing the more advanced students to undertake the care of patients in the hospital, under the direction of the attending physician."

"The importance of clinical instruction is so much felt in Germany, that each school has three distinct medical clinics attached to it, by which means the labour of teaching is divided among the professors, and the number of students attending each is diminished. There is one clinical hospital for the treatment of acute diseases, and another for chronic diseases, while a clinical dispensary is devoted to the care of extern patients. The pupils are divided into two classes,—the more advanced, who get the care of patients,—and the junior students, who merely look on and listen. When a patient is admitted, his case is assigned to one of the practising pupils, who, when the physician is visiting the ward, reads out the notes he has taken of the patient's disease, including its origin, progress, and present state. This is done at the bedside of the patient; and before he leaves the ward, the physician satisfies himself whether all the necessary particulars have been accurately reported by the pupil.

After all the patients have thus been accurately examined, the professor and his class proceed to the lecture-room, and a list of the patients and the practising pupils is handed to the professor: the cases admitted that day are first inquired into, and the pupils are examined concerning the nature of their diseases, their probable termination, and the most appropriate method of treatment,—each student answering only concerning the patients entrusted to his special care. During this examination, the pupil's diagnosis and proposed remedies are submitted to the consideration of the professor, who corrects whatever appears to be erroneous in either, and then the student retires to write his prescriptions, while the rest of the cases and pupils undergo a similar examination. At the conclusion, the prescriptions written by the students are read out in order by the professor, who strictly comments on and corrects any inaccuracy or inelegance they may contain. When the prescriptions have been revised and corrected, they are signed by the physician, and handed to the apothecary to be made up and distributed. In some clinics, the price of each medicine is affixed to the bottle or box containing it, in order that the students may become acquainted with the comparative expense of various prescriptions, and may thus be enabled, in private practice, to accommodate, as far as is possible, the expense of the remedies to the circumstances of their patients. The clinic for extern patients is conducted on the same principles: patients who are able to attend, are examined at the dispensary; those who cannot leave their homes are visited by the senior practising students, who always seek the advice of the professor when the case is urgent, or the treatment doubtful.

"Nothing, gentlemen, can be better adapted than this plan of clinical instruction for the improvement either of the beginner, or of the more advanced student; this daily deliberation and anxious discussion concerning the nature and treatment of each case, is peculiarly interesting, and serves to accustom the beginner to habits of accurate examination, whereby he is taught to interrogate nature for himself, and learn the history and treatment of disease, not from books and descriptions, but from direct observation. The advantages gained by the practising pupils are too obvious to require comment: being obliged to give reasons for every plan of cure that they propose, they are accustomed to a rational and careful investigation of disease; and enjoying the most important of all advantages—the early correction of their errors—they commence private practice with a sufficient degree of experience to render them unlikely to commit any very serious mistakes."

"It is evident that, according to the German method, no regular clinical lectures are necessary, as the pupil becomes accurately acquainted with the physician's views of each case, and no step is taken in the treatment without the reasons for it being given. This is the best sort of clinical lecture; the pupils have their doubts solved, and their erroneous views corrected, while the professor is enabled to mention, as the disease proceeds, every thing which he thinks illustrative of its nature."

"Eleven years' experience, since I first delivered the foregoing observations, enables me strongly to recommend the method of instruction pursued in Germany. Since my appointment to the Meath Hospital, I have had extensive opportunities of observing its good effects. Not a session has elapsed without furnishing proofs in its favour. This system, however, at first met with much opposition, and its introduction was ridiculed in every possible manner; even now it may be doubted whether its well-wishers are as numerous as might be expected. It is still opposed by several narrow-minded persons, whose opinions have much weight with the pupils."

Some apology seems necessary for the length of the preceding extract, but when it is remembered that in this, the first lecture delivered by Graves, he has given his views as to how medicine,—that is, practical medicine,—medicine employed to prevent, to cure, or alleviate disease, is to be learned; and that it conveys the leading thoughts of his mind on the entire subject, the time given to its careful study cannot be termed misspent. For three successive years did he return to this subject, dwelling on the errors of the system of instruction, if such it might be called, which was, and, it is to be regretted, is still too much in use among us. It may be safely said, that up to his time clinical teaching, in the true sense of the word, was unknown, and that clinical knowledge was attainable but to the few who were forced by circumstances into observation at the bedside. To teach the general class of an hospital, in the fulfilment of a duty to them or to science, was an idea never realized by our hospital physicians and surgeons. Those great responsibilities of the British teacher of medicine, of which he has so largely and eloquently spoken,* were unregarded, and so the student, unassisted, undirected, was left to grope his way as best he could. He was kept at a distance; no one cared to instruct him, to show him how to teach himself, to make him familiar with bedside medicine and the "ways of the sick," to exercise his powers of perception, to train his mind to

* See page 422.

reason rightly on the phenomena of disease; and lastly, to make him learn the duty as well as taste the pleasure of original work. The impassable gulf which in that aristocratic era lay between the student and his so-called teacher, was by Graves made to disappear, and for the first time in these countries was the pupil brought into a free and full and friendly contact with a mind so richly stored that it might be taken as an exponent of the actual state of medicine at the time; a mind ardent in research, fruitful in discovery, and yet no miser of its wealth, but ever ready to pour forth its riches to all, and for all who were ready to receive them.

The writer will be borne out in what he has now said by those who remember the impetus which the teaching of Graves at the Meath Hospital, gave to clinical study in Dublin. In the opinion of the world the great sources of success in a teacher are his powers of exposition, and his extent of knowledge combined with the gift of eloquence; but this view of the matter is too limited. All these, indeed, he had. The style of his speaking was massive, nervous, and forcible, unweakened by sentimentality and undisfigured by bathos. Yet in considering the sources of success in a teacher we must look beyond oratory or erudition. A great teacher must in the first place be gifted with that strange power, partly physical, partly moral, which in itself gives to its possessor command over the minds of men. In the next place, the teacher must be thoroughly in earnest, for this gives to every word he utters a power of forcing its way that cannot be resisted. Lastly, to use the words of Arnold, "he must not supply his hearers from a cistern, but give them living water." He cannot expect to command attention or interest when he gives, year after year, only the same facts, views, and arguments, no matter how valuable they may be. For even to those who hear him for the first time, his discourse will fail in vitality, and in producing that sympathy between the speaker and the hearer, which makes the latter not only receive gladly what has been said, but almost anticipate that which is to follow. This power is attainable only when the teacher is himself an original investigator, when he has himself been permitted to strike the rock, and to cause it to pour forth the fresh and sparkling stream. Genius, the creative power, so far as such a power is given to man, will, while it produces its golden fruits, find a descriptive language of its own, which he who deals merely with the thoughts and discoveries of other men can never speak.

Original investigation, it is plain, not only is concerned with the new, the unknown, but gives to the past a freshness by the analogic method. In this latter, Graves was preeminent. His active mind was ever on the search for analogies, and thus he was led to the discrimination of things apparently similar, and to the assimilation of things at the first view dissimilar, in a degree hardly surpassed by any teacher of medicine.

It has been held by some that Graves advocated the system of a special or exclusive education for the student in medicine; and a superficial study of his views, as given in his second and third discourses, might lead to such a conclusion, the erroneousness of which is plain, when we consider closely the opinions given in these lectures, and the entire scope of his writings. Indeed, the mode by which he prepared himself for the duties of a physician is conclusive against such an idea. His leading thought on the matter was, that while the successful cultivation of medicine required the most enlarged training of the mind, the study of disease could not be commenced too soon; and that after a certain period, it becomes a grave error to divert the mind of the student from observation and study at the bedside. It was against this still existing evil that he testified; for few held in higher esteem the observation of Davison, that the main ingredients of practical ability are requisite knowledge and cultivated faculties, which latter give to a man the command of another's knowledge, while the want of them deprives him of the command of his own.

In his address to the Dublin Medico-Chirurgical Society, a society of students, in 1836, he observes—

"Many causes contribute to prevent students from attaining to what after all should be the great object of their wishes—practical knowledge. The different sciences to which you are required to turn your attention successively, possess so many fascinations that you may attach to some an undue degree of importance; but be assured of this, that however accurate be your knowledge of anatomy, healthy and morbid; however skilful you may be in chemical theories and manipulations; however extensively you may have mastered the necessary portions of Botany; however well you are acquainted with the nature and properties of drugs; be assured, I say, that you have acquired all this knowledge in vain, unless you have diligently studied symptoms at the bedside of the patient, and have observed the consequences and causes of disease in the dead-room. In fact, in whatever other pursuits you may employ your afternoon hours, the morning should be always dedicated with earnestness to the hospital: from its wards all appearance of levity and inattention must be banished, for your neglect of the opportunities there presented for observation, loads you with a serious amount of responsibility, I had almost said of guilt. It is no light thing to have life entrusted into your hands: we all are liable to err, we all commit mistakes; the rules of our art are not invariably precise and certain; but they only are guilty who have not used every opportunity of acquiring practical knowledge; he is doubly guilty, who, conscious of his neglect, embarks in practice, and commences with the decision and boldness true experience can alone confer. In this point of view, Gentlemen, your Society seems to have worked most advantageously, and we have observed with pleasure that since its foundation your hospital attendance has become more punctual, and your interest in the cases greater. The chief object of medical science is to relieve suffering and to save life: you must therefore anxiously watch the action of remedies, and by constantly noting down the effects of the treatment, learn to appreciate its merits, and apply it when required. Nor is this an easy task, or a simple study; some indeed have vainly imagined that the method of treating or curing disease, could be compressed within the limits of a few short directions easily deducible from some general principles, and easily applicable in any particular case; but it is not so. Gentlemen, we have as yet discovered no such general principles to serve as guides. This discovery presupposes a knowledge of the laws and relations of the vital powers, far beyond what we now possess: no, we must toil onwards by a much more laborious and circuitous route, and must commence by making ourselves thoroughly masters of a vast number of individual cases, assisted by the observations and the writings of practical men; we may afterwards proceed to arrange our knowledge, to classify it, so as to render it more available; analogy and induction are here our only, or at least our most valuable guides, and they will seldom fail to instruct us how to act when properly consulted.

"Many, indeed, aiming at acquiring the character of medical sceptics, think they exhibit proofs of superior discrimination when they, with apparent candour, make the confession that the more they see, the less confidence they have in the resources of medicine. This confession should be interpreted, not as a reproof to our art, but as a testimony of the want of skill of the would-be philosophical assertor of so false a proposition. No, God be praised, our predecessors have not toiled in vain; the anxious experience of ages has not been recorded to no purpose; our art is, in truth, boundless in resource, and, when applied with ability, most successful. There are, indeed, some acute, and many chronic diseases, which baffle our powers of diagnosis, and defy our modes of treatment; such opprobria are, however, not numerous, when compared with the great mass of cases capable of cure or alleviation. The medical sceptic, however acute his powers of reasoning may be, and however he may labour to render plain subjects obscure, and direct facts ambiguous, can never rob the good practitioner of the pure, the inward joy he feels, when conscious that he has snatched a patient from the jaws of death.

"Be assured, Gentlemen, you are not associated together, as the sceptic would have you believe, for an idle purpose, or a trifling object—you labour to attain a knowledge of the nature of diseases, and the means best adapted for their cure; you are zealously employed in studying the noblest of professions, that which seeks to alleviate human sufferings, and administer consolation and health to your fellow-creatures. It is not mere book learning, it is not an accurate acquaintance with the accessory or fundamental sciences of medicine, that enables the physician and surgeon to arrest the progress of disease, and (what seems almost too glorious for a mortal man) to scare from his victim, the great destroyer, death. This the chemist cannot accomplish, this cannot be done by the anatomist, the physiologist, or the compounder and weigher of drugs. To combat disease and death we must attentively watch the symptoms which accompany the one and denote the approaches of the other, and must search among the productions so bountifully provided by the hand of nature, for the means of defeating, for a time at least, the mighty victor.

"To create life is the attribute of God; to preserve life is the noblest gift man has received from his Creator. Life and death are engaged in an eternal struggle—they succeed—they alternate—they displace, but never annihilate the one the other; they fill the world with their strife, but it is a strife where the antagonists contend, like night and day, each chasing but never overtaking each. Between life and death there is no twilight; the gladness and brightness of life end suddenly in the deep and awful darkness of death. Is it then given to man to warn back this dreaded power? Can man, even for a moment, retard the advances of death? Yes, we are permitted to relieve one another, we are allowed to exercise our reason in exploring the means of curing disease, and have been granted the power of applying these means successfully. Had man, like other animals, been gifted only with organs of destruction; had his reason been employed solely in increasing the power of his natural weapons of offence, then indeed he would have been an animal accursed on the face of the earth, and war and bloodshed would have been blessings if they effected only the destruction of so hateful a being—but it has not been so ordained. The possession and exercise of the healing art shed a kindly lustre over man's nature, and afford him the means of practising the sweetest of all the offices of charity—curing his fellow-creatures; but if this be one of the goodliest fruits borne by the tree of knowledge, it cannot be attained, nor enjoyed by all; it can be reached only by him who, patiently labouring year after year, has perseverance enough to seek, by means of constant study and constant observation, this precious gift.

"I would not depreciate the utility of other literary pursuits, and do not wish to undervalue the studies or the objects of other professions. The natural historian is justly proud of a science, which constantly employs him in observing the works of his Creator; the chemist boasts with reason that his favourite study teaches him to lift up the veil which concealed some of the most precious and singular among nature's secrets; the astronomer examines the position and the motions of distant worlds, weighs the satellites of Jupiter, and follows the comet to the remotest verge of its eccentric orb; nay, he even ventures to predict its return after thousands of years, and feels no doubt that a late posterity will be called on to record the occurrence of the event he has prophesied.

"This is a glorious triumph of man's reason, and well may the votaries of astronomy and the physical sciences refer with pride to such victories over space and time; but is there not more of the Deity in a single particle of living matter, than in the whole inanimate mass of a planet or a sun? Is not Life the clearest, the most direct revelation of Himself, which the Creator has deigned to make?

"When all was without form and void, the Spirit of God moved, it is true, on the surface of the chaotic mass, but it did not enter into its pores until life was to be produced; then God breathed forth, and man rose vivified by the divine expiration. This life, this direct emanation from the Deity, forms then the subject matter of your studies; to observe its laws is the privilege of the physiologist—to maintain it, to resist the encroachment of disease, or to defer the approach of death, is the hallowed end of medical science. This is assuredly one of the noblest functions of reason, and for nothing should man be more humbly grateful to his Maker, than for having conferred on him the power of relieving human suffering."

Finally, we may hold that there can be nothing more likely to excite the student to love his profession, and to labour for it, than to see his instructor remaining as his fellow-student; young in mental energy, and in the desire and acquisition of knowledge; for thus only is it given to us to resist the advance of time.

In reviewing the medical doctrine of Graves we find it to be essentially eclectic. The legitimate object of physiological medicine, according to him, was not the study of vital actions, but rather the investigation and arrangement of their effects. This doctrine is well illustrated by showing how medicine retrograded whenever a different course has been pursued, and by referring to the endless mazes of speculation which followed on the doctrines of Brown, and of the school of the Vitalists. The errors in practice and in pathology, and the necessary twisting of the truth to fit the theory, in the system of Broussais, are strong examples of the evil consequences of beginning at the wrong end, and of puzzling ourselves with systems based on the still unknown nature of vital actions, rather than on their effects. So long as we confine ourselves to these latter we advance in two directions; in the one, absolutely, by extending our knowledge of the mechanism of organs, and of course in applying that knowledge to the treatment of their diseases; in the other, by approximation, if the writer may use the expression, for we are laying up data for the ultimate solution of the higher problem of the nature of life. This is well exemplified by reference to the structure of the eye, an organ which gives light to the body in more senses than one.

In his general pathology, great importance was attached to the action of the capillary system, and the *vis à tergo* theory of the circulation in health and disease was on every occasion combated by him; for this question bore strongly on that great revolution in practice, by which the lancet has become nearly discarded in the treatment of disease in this country. His arguments in favour of the independence and importance of the capillary circulation are beautifully illustrated by reference to the phenomena of the gravid uterus. Here we see not only vessels innumerable, but nerves developed without any increased *vis à tergo;* and the nerves, like the vessels, formed from the circumference to the centre. This subject of a temporary nervous development is one full of interest; and he declares his conviction, that, did our means of investigating the nerves equal those we possess in the examination of the vessels, we should find, that in inflamed parts the nervous matter increases, in many cases, as rapidly and as considerably in extent as the vascular.

The relation of morbid anatomy to practical medicine has been looked at by physicians in various points of view; and it becomes difficult to say which of their theories has been most injurious to the cause of practical medicine. The local change is not the disease; for, to produce it, a change in the vital action of the part must go before. It is, then, but a symptom; but yet not the less important, for the physical alteration becomes the most useful of symptoms, enabling us to discover the seat, the progress, and sometimes the intensity of diseased action. There is no physical sign of the first stage of any disease; and the period between the truly first stage, and that in which mechanical change sufficient to give a physical indication occurs, varies infinitely, not only in different diseases, but in different cases of the same disease. But it happens, fortunately, that this period is generally so short, that the discovery of the mechanical change can be made sufficiently early to enable us, as it were, to overtake the disease. Exactly in proportion to the facility and the accuracy with which we can ascertain the nature and extent of the alteration, will be the progress of practical medicine. But it was no part of this doctrine that we were to follow an anatomical theory of disease; for, in truth, the local or detectible change is often not the second, but really the third link in the chain of phenomena which constitute a disease. Thus, in essential affections, we have, as the first condition, a change affecting the entire organism, in which it acts apparently under a new system of vital laws. Secondly, a special, local, but still vital or non-mechanical alteration; and, thirdly, the anatomical change. Thus, so far, at least in a large proportion of cases, is the follicular disease of the intestine from being the first change, and the local cause of fever, that it is actually the third in the series of phenomena. But the great fact is insisted on, that even in the non-essential diseases, lesion of structure does not necessarily attend upon the most striking symptoms of disease. This is shown most remarkably in the class of the neuroses. On the other hand, the attempt to classify diseases, ignoring their possible anatomical alteration, and of founding a system of treatment based on the existence of this or that group of symptoms, is justly condemned.

"Tell me the name of the disease," was the motto of the nosologists, "and I will tell you the remedy." But the names of a hundred diseases may be told, and accurately told, without our being able to give the proper mode of treatment. A picture is drawn by Graves of a case of dropsy, in which hydragogues and diuretics are successively administered on the nosological indication, until the scene so distressing to humanity is closed. We are to found medicine, then, on no narrow basis. The accurate study of symptoms must be accompanied, on the one hand, by an extended knowledge of physiology,—that is, the science of the effects of vital action; and, on the other, by an equally comprehensive view of pathological anatomy; and to all these we must add the effects of therapeutic agents. Looking at the results of the full adoption of these principles carried out by the collective energies of the world, Graves observes, that—

"The reason of man is now more fully employed than at any former period; a vast store of mental power, a vast mass of mind is everywhere at work; what formerly was vainly attempted by the labour of a few, is now easily accomplished by the exertions of the many. The empire of reason, extending from the old to the new world, from Europe to our antipodes, has encircled the earth; the sun never sets upon her dominions; individuals must rest, but the collective intelligence of the species never sleeps. At the moment one nation, wearied by the toils of the day, welcomes the shades of night and lies down to seek repose, another rises to hail the light of morning, and, refreshed, speeds the noble work of science."

In an earlier writing, the same idea is eloquently given.

Speaking of the progress of the human mind (See page 25 of the present volume) he observes—

"That since the invention of the art of printing, it has become steady and uniform. The stream of knowledge which, not many centuries ago, shallow and narrow, toiled painfully to wear away or avoid the obstacles that impeded its course, now fed by a thousand new sources, flows along, deep and rapid, sweeping away every obstruction, *and defying all human opposition.* Mankind having thus arrived at the maturity of collective intellect, we are every day surprised at the results obtained by the vast mass of mind now diligently employed in the acquisition of knowledge. What was formerly the termination of a science, is now but its commencement; what was formerly deemed unattainable, is now elementary; so that it is impossible to foresee how far improvement may be carried. A short and transitory existence has been allotted to our bodies; individuals die, and generations pass away, but the common intellect of mankind fears not the same fate, nor shares the same brief mortality."

It would be out of place to introduce here a detailed review of the *Clinical Medicine,* yet, as illustrating the author's mode of thinking and of working, the writer will refer to two of his leading subjects, viz., Cholera and Fever.

His views on the contagion of cholera are given in this volume (see page 364), but the history of its progress westward over the world is detailed by him in a succession of elaborate papers in the first and second series of the *Dublin Journal of Medical Science.* These papers, subsequently embodied in the second edition of the *Clinical Medicine,* must earn for Graves the title of the historian of this disease in the Old and in the New World, from its rise in India to its appearance in England and America.

This review of the onward march of the pestilence seems conclusively to establish its contagious nature; it shows how in all cases it proceeded by the most direct route of human intercourse and traffic, and whether it crossed the highest mountain ranges, as in India, or traversed the ocean, or ascended rivers, making the towns on their banks the successive stages of its journey; the only common physical circumstance attending its progress was the intercourse of man with man.

Further, it is shown that, in no recorded instance, has cholera appeared in any locality sooner than it might have been brought from some infected place by the ordinary modes of communication. And again, that the rate at which cholera travels, varies with the rapidity of that communication, whether it be by land or by water. It seems to have had no fixed rate of progress; spreading in various directions, sometimes northwards, sometimes southwards, and occasionally changing its ordinary course, and moving eastwards, its route being determined, not by the points of the compass, but by the great lines of internal or international communication.

The results of this study of the new epidemic led Graves to a suggestion, the importance of which to the well-being of the human race it would be hard to over-estimate. Referring to our ignorance of the laws of epidemics, he proposed, with the view of determining these still hidden laws, that the different civilized Governments of the world should unite in the wide establishment of medical observatories, in which, always in connection with a complete system of meteorological observation, careful records should be kept of the rise, progress, and character of disease, whether endemic or epidemic.

"While the art of navigation was in its infancy, and communication by land between distant countries unfrequent and insecure, the different races and families of mankind who dwell far asunder on the earth's surface were necessarily unacquainted with the appearance of new, or the existence of remarkable diseases amongst each other, and, consequently, that department of medical science which may with propriety be termed the Geography of Diseases, remained uncultivated. Now, however, we approach a new era, when the means of intercourse between the most distant nations have been so facilitated by the aid of an improved system of navigation, a commerce almost universal, and the daily increasing efficacy of steam power, that we may indulge in the rational hope of seeing the sciences studied after a new method, which will embrace within the range of observation, not merely the phenomena occurring in a single district or country, but those which take place over the whole surface of the globe.

"Already have the enlightened efforts of our own University, and the genius of one of its Professors, prompted the rulers of many kingdoms to join in an alliance destined to establish magnetic observatories in distant regions, so as to make the globe of the earth itself a subject of extended experiment; the philosophers of the new world have combined with those of the old, to examine simultaneously meteorological phenomena, and already have the records preserved by observers at sea and land, revealed the hitherto mysterious course of storms, and enabled us to map out the extent and direction of the shocks of earthquakes. When we investigate the physical changes which occur in our planet, we are encouraged to repeat and multiply observations, in the hope of discovering general laws, whose application will enable us to explain the past and predict the future. But the surface of the earth abounds with beings in whom the creative powers of life display an order of phenomena more complicated and refined than anything existing in unorganized matter. But for this very reason, and on account of this superiority conferred on organized matter through the agency of vitality, each being thus animated is governed by laws which often seem incapable of extension even to other living creatures of the same species; and consequently we are led to expect an individuality, an insulation, among animals, which will prevent them from exhibiting changes occurring simultaneously among great numbers, and capable of being traced to the operation of general laws.

"A closer examination, however, proves that animals and plants are subject to the operation of physical agencies which act upon numbers of individuals at the same time, and thus give rise to great varieties of diseases. Such diseases should be made a special object of study; many of them are, as it were, fixed, stationary, and confined to certain countries and districts. Thus the goitre, the *tumidum sub Alpibus guttur*, has from the earliest times been endemic in the valley of the Rhone, and other parts of Switzerland; modern travellers have observed it in certain parts of South America, and in Kemaon, a subalpine department of Hindoostan. Agues, typhus, yellow-fever, elephantiasis, beriberi, Guinea-worm, yaws, and Egyptian ophthalmia, are chiefly confined to the inhabitants of certain districts, and with a host of other complaints, would afford ample materials for the geography of fixed diseases.

"On the other hand, there are affections of men and animals which travel from nation to nation, and tribe to tribe; sometimes these moving epidemics progress with such rapidity, that they speedily migrate over the whole earth: at other times they creep along with a slow and stealthy step, but their journey is continued year after year, until they have travelled round the world. The Asiatic cholera affords an example of the latter class, having been twenty years in compassing the earth; while influenza, an example of the former, often traverses the same space in a few months.

"Influenzas differ from each other, not merely as to their rate of traveling, but as to the extent of the earth's surface which they affect. Some, as that of 1782, spread from China all over the inhabited parts of Asia, Europe, and America; while others, as, for instance, the great influenza of 1837, did not reach the new world at all, although it passed the equinoctial line, and was severely felt at the Cape of Good Hope and in Australia. These facts are alone sufficient to stimulate our curiosity, and ought to direct the attention of philosophers as well as physicians, to the study of endemic and epidemic diseases; nor will their study be destitute of practical benefit, for were the rulers of civilized nations to bring into active operation a number of institutions, which, discharging the functions of *medical observatories*, should observe and record the appearance and symptoms of epidemics, many curious facts relating to their origin and progress would be soon brought to light, and we might then perhaps be enabled to arrive at a knowledge of some general laws respecting their motions. Thus, we could ascertain whether, as has been asserted, influenza always progresses from east to west, never from west to east;

whether, originating on one side of the equator, it often passes to the other?"

It need hardly be remarked, that if the establishment of such observatories were confined merely to the dominions of the British Crown, they might exist in almost every latitude, from the Arctic to the Antarctic circle. Beyond the United Kingdom stations might be formed at Gibraltar, Malta, China, and various points of the continent of India: southern Africa, Australia, and New Zealand, would give centres of observation for the southern hemisphere; while in northern latitudes, Newfoundland, Canada, and New Columbia, would be all available. In each station should be placed a medical officer, trained, not alone in practical medicine, but in the use of all instruments necessary for meteorological observation. He should, if possible, be acquainted with natural history, in the broad sense of the term. The duties of such an officer should be to rêport not only on the phenomena of disease, simply considered, but on the concurrent conditions of the atmosphere, whether with reference to its pressure, temperature, electric condition, its cooling force, as observed with Professor Osborne's sensation thermometer, and its evaporating power as measured by the instrument of Dalton, which has been recently improved by Professor Haughton.

We owe to Graves the introduction of the use of the acetate of lead in the treatment of cholera in this country; for although it had been previously recommended by Dupuytren, and was actually employed in the first epidemic in Dublin, in 1832, at the Cholera Hospital, yet it was from his advocacy that the Irish profession learned to employ this remedy with confidence. And it is interesting, as the result of a clinical experiment on a vast scale, that of the many thousands of patients in cholera treated, during the last epidemic, by this medicine, no case has been recorded of the appearance of saturnine poisoning during convalescence.

In a lecture on Spasmodic Cholera, delivered in 1826, Graves predicted the arrival of the disease. It did not reach Sunderland until 1831. This prediction, he modestly states, was not his own, but that of his friend and relative, Bishop Brinkley. Even at the cost of digression the writer cannot refrain from giving another instance of the powers and foresight of that remarkable man. Nearly twenty years before the failure of the potato crop in Ireland he predicted that occurrence and the attendant famine, and in a letter to Graves, following up the consequences of the event, he dwells on the horrors of the want, the pestilence, the emigration, the depopulation, and the general ruin which would follow the inevitable change in the social system of Ireland. So deeply did all this affect him, that for days and nights the contemplation of the sorrows in store for his adopted country, deprived him of rest.*

In reviewing the portions of the *Clinical Medicine* which are devoted to Fever, we are at once struck with the absence of that tendency to dilate upon fine or doubtful distinctions, which is so often met with in medical writings. We have no long disquisitions on the differences between typhus and typhoid fever, with which so many of our brethren have been lately occupied; nor, again, have we arguments to show that dothinenteritis is a mark of civilization and comfort, while its absence in fever is characteristic of the want and degradation of the Irish branch of the Celtic race. He did not form any theory of fever; but he did much

* Dr. Brinkley, of Caius College, Cambridge, was Professor of Astronomy in the University of Dublin, and Astronomer Royal of Ireland, in 1790. He was subsequently elected President of the Royal Irish Academy, and was consecrated Bishop of Cloyne in 1826.

better, in diligently studying its symptoms, watching how they were grouped, and in what order they followed each other; and lastly, in observing the effects of treatment in their progress. For, he well remarks, that the knowledge we possess of the nature of fever is of a negative character, telling us what it is not, rather than what it is. The writer is anxious to insist on this point, perhaps, indeed, because it coincides with his own convictions, as well as on the following, that after the experience of a life, and in circumstances the best adapted for observation, Graves arrived at the conclusion,—that the several forms of continued fever in this country are varieties, not distinct species, differing by any anatomical character. It may be held that, in this country at least, there is no essential difference between typhus and what is called typhoid fever. We know that the same contagion will produce both forms; and, again, that these forms are mutually convertible. Before physicians indulge in theories, as to any particular disease, it is necessary that they should study it in different countries. Had Broussais studied fever in Ireland, the so-called physiological doctrine, so far at least as fever is concerned, would never have been announced, nor the error committed of taking the anatomical consequence for the cause. Had Clutterbuck followed a similar course, we should never have had the cerebral theory. Had Rasori been a physician to an Irish fever hospital, would the contra-stimulant doctrine have existed? And, to come to later times, we may safely affirm that the distinctions of recent British and American writers would have been at least less strongly drawn, had they studied the disease in our hospitals.

Let us briefly enumerate the leading points of the doctrine of fever, as given in the *Clinical Medicine*.

1st. Its existence as an endemic disease in Ireland, but occasionally taking an epidemic character.

2nd. The existence of a general and peculiar character in each epidemic, subject, however, to modifications at different periods of the epidemic, and in different places, even at the same period of the disease. This had already been established by Cheyne and Barker.

3rd. The contagious quality of all the forms of continued fever in this country; but especially the maculated form, the occurrence of which, however, seems to establish a greater immunity in the individual affected, from subsequent attacks than is observed in other varieties.

4th. The necessity of avoiding a routine treatment, and the importance of the anticipative use of nutriment.

5th. The doctrine, that fever in Ireland was to be attributed neither to miasmata nor to deficient food.

If we pause for a moment to consider some of these points of doctrine, our time will be usefully employed. It was plain to Graves, as it must be to all unprejudiced men, that in this country fever is both epidemic and contagious, and that fever having commenced in any district or number of districts, may extend itself under either of these agencies. The arguments, then, of epidemists who deny contagion, or of contagionists who deny the epidemic origin of fever, may be put aside, for the great facts of the simultaneous outbreaks and disappearances of fever over so large an extent of country, are sufficient to prove its epidemic character; and, on the other hand, its transmissibility from individual to individual is a truth which it is idle to gainsay. Those who deny contagion have a seeming advantage in the argument, as, during the prevalence of an epidemic, the sickening of A or B may be plausibly attributed to the general effect. There are but two modes, with which the writer is acquainted, of establishing the existence of contagion. The one is that of referring to a certain occurrence or set of occurrences during an epidemic, and then to calculate the chances against such events, supposing that the disease was not contagious. This mode was adopted by the late Dr. Whitley Stokes. He did not trust himself to make the calculations, but submitted the problems to Bishop Brinkley, who was not only a first-rate mathematician, but especially skilled in that part of mathematical science which relates to the doctrine of chances.

"I proposed," says he, in his Observations on Contagion, "the following problems to a friend particularly acquainted with this species of computation:—

"Problem the first: An epidemic prevails so severe that one out of every seven sickens. A family of twelve is selected in a particular district before the epidemic has visited it. What is the chance that eleven out of the family shall take the disease, supposing the sickness of one of the family does not promote the sickness of another, and supposing the family not unusually liable to disease?

"Answer: The probability against the event is 189,600,000 to 1, if the population amount even to 7,000.

"Problem the second: The same general conditions being assumed, and also that the number of the inhabitants in the district in question is 7,000, what is the chance that, in any family of 12 within the district, 11 will sicken?

"Answer: It is above 300,000 to 1 that no family of 12 persons, in a population of 7,000, will have 11 sick. All this according to the condition, that the sickening of one does not promote the sickening of another."

The second kind of evidence is that deduced from the great proportion of cases of the disease observed among those who attend on the sick. The events of 1847 and 1848 are still fresh in our memory, and if the deaths of so many of the physicians and surgeons in Ireland during that season of calamity, confusion, and error, be not an answer to the non-contagionist, the writer knows not anything that could convince him, nor does he believe that his mind would be capable of being convinced, or of receiving the truth at all.

Another part of these doctrines claims our attention. It was a strong opinion of Graves, not only that the former epidemics in Ireland could not be attributed to deficient food, but that even the desolating epidemic of 1847 and 1848, which followed or attended the famine, was attributable to other causes; and there is some reason for the belief, that the crowding together of the famished people into workhouses, then so recently established, and again into the towns and other places where sustenance could be expected, was the great cause of the outbreak and the virulence of the epidemic. Whether simple want affecting a population is by itself sufficient to cause an epidemic of fever, is a question which, fortunately, we are not in a position to solve satisfactorily, nor can we yet say whether simple inanition can develop a typhus fever in an individual. That it may cause a condition similar to fever, we know from the effects of inanition on the sufferers on board the "Alceste" and the "Medusa;" but whether this condition of raging thirst, dissolution of the blood, and cerebral excitement, is truly one of typhus,—of a diseased condition capable of reproducing itself by a special contagion, is a question still unanswered. During the famine, many cases of protracted starvation were admitted into our wards in the Meath Hospital. They had all a dreadful similarity. The history, symptoms, and even the physiognomy of these unhappy patients seemed to be the same. Weak, cold, and shriveled, they lay uncomplaining, more like cadavers than living beings. They seldom asked for food or even drink. The pulse was quick and feeble; the skin earthy, and of the colour of parchment; and the tongue pale. It is, however, true, that in several cases in which, by the most cautious and graduated exhibition of nourishment, this state of collapse was at last got over, the patient suddenly showed the symptoms of the worst form of putrid fever.

The evil consequences, however,—the demonstrable effects of over-crowding in producing an outbreak of fever, were never more strongly shown than by Graves. And it really seems probable, that, injurious as such a proceeding must be with people, natives of any country, it will be so to a greater degree when we deal with the inhabitants of Ireland. Is this owing to any speciality belonging to the race? Is there a pathological, as well as a physiological stamp, on the races of men? Or is it that soil, climate, and other circumstances, make the Irish more subject to typhus? This much is certain,—and it is insisted on in the *Clinical Medicine*,—that other affections, even local diseases, which elsewhere would run their usual course, in Ireland exhibit a marked tendency to take on the typhoid type.

After speaking of the spread of Irish fever in Liverpool, and the other large towns of Great Britain, where this compression of the poorer population is so great, Graves makes this appalling statement:—

"The number of emigrants who left this country in the year 1847 for America is calculated to have been more than double that of the previous year, and, as a necessary consequence, the ships were all not only crowded, but packed with passengers. There was scarcely a single ship in which typhus fever did not break out on the passage; and the mortality, as we might expect, was still greater than on land. From authentic documents now before us, it would appear, that the number of Irish who emigrated to British North America in 1847 was, at the lowest computation, 74,539: of these, 5,293 are reported to have died on the passage; 8,563 were admitted into the Quarantine Hospital at Grosse Island, of whom 3,452 are said to have died,—an average of 40 per cent.; and of those who were taken into the Marine and Emigrant Hospital at Quebec, or who had procured lodgings in that city up to the 9th of October, there died 1,041, an aggregate of 9,786 deaths, up to the period of the survivors leaving for Montreal,—an average of over 12 per cent. From the account which we have had of the losses of individual ships, I am quite sure that this statement is anything but overdrawn. The 'Ceylon,' with 257 steerage passengers, had 117 deaths, and 115 in fever on her arrival. The 'Loosthank,' with 349 steerage passengers, had 117 deaths, and only 20 escaped fever. Three vessels, taken together, lost 275 passengers. The return of the Health Officers at New York shows an aggregate of 957 deaths at sea on board of vessels coming from European ports, and likewise that three-fourths of the number admitted into the Quarantine Hospital (most of them Irish) have been taken from British vessels."

But whatever view we take of the comparative effects of want, or of overcrowding, in producing disease, it seems sufficiently plain, that the doctrine, that if there be no want there will be no fever, is to be taken with certain limitations. Doubtless an abundant supply of food, if the people had the means of purchasing it, was a thing to be desired; doubtless the eleemosynary distribution of food was also good, if to obtain this great boon the people had not been forced to congregate into masses, and to suffer the consequences of want, not indeed of food, but of pure air and cleanliness. The opinion of the writer is, however, that we should not attribute all the evils through which we have passed, too exclusively to this or to that cause; and that however injurious may have been the close congregating of so many miserable men, women, and children, into certain localities, other causes must also have operated. Want, contagion, and epidemic influence have over and over again produced fever in Ireland, when there were no such things as Relief Acts, or Government aid, or Poor Laws in the country; and if many were lost, perhaps ignorantly, let us think on the number saved. We cannot be suddenly wise. Nations, as well as individuals, must purchase experience, even though the cost may be ruinous. And whatever fault we may find with the modes adopted for extending relief to the sufferers in the famine of 1847, we must applaud the intention, and be grateful for the efforts that were made.

To return to the general principles advocated, not only as to the natural history, but the treatment of fever, we find that in no one sense was Graves a routinist, unless in attention to the support of the patient, by nutriment given from an early period. The doctrine of a general inflammatory state in fever, or of the dependence of the latter on local disease, was rejected by him. Yet in his hands, stimulants were employed with the same watchful care as other remedies, and were not used, as of late, indiscriminately, or from any assumed physiological theory.

The experiments of Beaumont, which were relied on to prove that the existence of fever suspended assimilation, were taken at their true value, and Graves insisted on the necessity of our not permitting a fever patient to suffer from starvation. "In a patient," he says, "labouring under fever and a protracted abstinence, whose sensibilities are blunted and whose functions are deranged,—it is not at all improbable that such a person will not call for food, although requiring it; and if you do not press it on him, and give it as medicine, symptoms like those which arise from starvation in the healthy subject may supervene, and you may have gastro-enteric inflammation or cerebral disease as the consequence of protracted abstinence. You may, perhaps, think it unnecessary to give food, as the patient appears to have no appetite, and does not call for it. You might as well think of allowing the urine to accumulate in the bladder because the patient feels no desire to pass it. You are called upon to interfere where the sensibility is impaired, and you are not to permit your patient to encounter the terrible consequences of starvation because he does not ask for nutriment."

This quotation calls to the mind of the writer a saying of Graves worthy of being recorded. He was going round the hospital, when on entering the convalescent ward, he began to expatiate on the healthy appearance of some who had recovered from severe typhus. "This is all the effect of our good feeding," he exclaimed; "and lest, when I am gone, you may be at a loss for an epitaph for me, let me give you one, in three words:—

"He fed Fevers."

The limits of this volume will prevent even a cursory review of the special contributions to Practical Medicine which we owe to Graves; some of the more important may be simply enumerated:—

1st. The employment of food and stimulants in fever, even from its earlier periods; in other words, their use by anticipation.

2nd. The exhibition of the acetate of lead conjoined with opium in spasmodic cholera.

3rd. The development of the laws of pathological reflex action, as given in his Lectures on Paralysis, in which he has anticipated the views of Marshall Hall.

4th. The employment of tartar emetic and opium in the delirium and insomnia of typhus fever.

5th. The method of operating for the evacuation of hepatic abscesses by promoting adhesion between the hepatic and parietal peritoneum.

6th. The observation of the latent periodicity in intermittent fevers.

7th. The demonstration of the independent action of the capillary system in health and in disease, and the practical applications of this doctrine in the treatment of disease.

8th. The account of the yellow fever as it appeared in Dublin in 1826.

9th. The observations on symmetrical diseases.

10th. The nature and functions of the lymphatic system.

11th. The influence of position on the pulse, in health and in disease.

12th. The description of the disease lately termed Exophthalmia cachectica.

It is difficult to estimate the importance of the doctrine, that although the fevers of the tropics may vary in certain phenomena, according to seasons, locality, or special epidemic nature, yet, that in all essential characteristics, they are of the same nature as those met with at home. When we remember that to fever, in a great measure, is to be attributed the mortality in our armies and navies, no matter in what part of the world they may chance to be, it is no slight matter to think that in the wards of a fever hospital at home, the student may learn the pathological nature and the principles of treatment of those diseases with which, in warm regions, he may have to be confronted. As bearing on this most important question, the writer gladly quotes from Dr. Dundas, whose opinions have the weight which a large personal experience of tropical disease can give.

"I am not aware whether Dr. Graves, of Dublin, has visited hot climates; but in his valuable work on *Clinical Medicine* he observes, that 'there is not so much difference between the diseases of Ireland and of warmer countries, as has been imagined; they differ, it is true, as to their degree, but not as to their pathology.'

"Now this is a remarkable statement; and, supposing Dr. Graves had not himself visited tropical countries, it is strongly indicative of the genius of the man; for, of the absolute truth of the doctrine, here so broadly laid down, there exists not the shadow of a doubt. Dr. Cormack justly remarks, 'were this doctrine more generally appreciated, the accounts of the different fevers unfolded to us would, perhaps, present less picturesque and piquant, but certainly simpler and truer pictures of disease.' Most undoubtedly they would.

"The parallel, moreover, drawn by Dr. Graves, between the Dublin and the tropical yellow fever, admits of no dispute; the correspondence is complete."*

In connection with the subject of fever in Ireland,

* See *Sketches of Brazil, &c.*, by Robert Dundas, M.D. London, 1852, page 28.

Graves' warm advocacy of the claim of the Dispensary Surgeons and Physicians throughout the country, during the disastrous epidemic of 1847 and 1848 cannot be passed by without notice. It was one of the few occasions, if not the only one, on which he directed the powers of his mind to any subject of medical politics; and in his letter to the Board of Health* he dwelt strongly on the fact, that the advice of the chartered medical bodies in the country had not been sought for by the authorities. The time was one of great excitement, public fear, and professional discontent, and with all the ardour of his nature he lent his aid in upholding the claims of his brethren at large to a more liberal remuneration for their public and truly perilous services. Years have now passed by since those days of darkness, when in one year, 1847, nearly 7 per cent. of the Irish practitioners died, the great majority falling victims to contagious disease; and though the wisdom of pressing a claim for higher remuneration at such a crisis has been questioned, all must admit and admire the fearless devotion of the Profession throughout the land in that season of pestilence and of ruin.

It would be unjust to the memory of Graves were the following tribute to his character and works, by Professor Trousseau, omitted in this notice. It is contained in a letter to the translator of the *Clinical Medicine*, and appears as a preface to the French edition of that work:—

"For many years I have spoken of Graves in my Clinical Lectures; I recommend the perusal of his work; I entreat those of my pupils who understand English to consider it as their breviary; I say and repeat that, of all the practical works published in our time, I am acquainted with none

* See *The Dublin Quarterly Journal of Medical Science*, 1848.

more useful, more intellectual; and I have always regretted that the Clinical Lectures of the great Dublin practitioner had not been translated into our language.

"As Clinical Professor in the Faculty of Medicine of Paris, I have incessantly read and re-read the work of Graves; I have become inspired with it in my teaching; I have endeavoured to imitate it in the book I have myself published on the Clinique of the Hotel-Dieu; and even now, although I know almost by heart all that the Dublin Professor has written, I cannot refrain from perusing a book which never leaves my study.

"Graves is an erudite physician; while so rich in himself, he borrows perpetually from the works of his contemporaries, and at every page brings under tribute the labours of German and French physicians. Although a clinical observer, he loves the accessory sciences; we see him frequently having recourse to physiology, in the domain of which he loves to wander; to chemistry, with which he is acquainted, which he estimates at its true value, and to which he accords a legitimate place. He often reminds me of the greatest clinical teacher of our day, Pierre Bretonneau, an able physiologist, a distinguished chemist, a learned botanist, an eminent naturalist, who incessantly, in his lectures and conversation at the Hospital of Tours, found in all those accessory sciences, with which he was so conversant, those useful ideas and ingenious views, which he subsequently applied with unusual felicity to the study of our art.

"Shall I now say what are, in Graves' work, the most remarkable and most important lectures? To be just I ought to indicate all in succession; there is not one of them, in fact, which does not abound in practical deductions;

there is not one which does not bear the impress of that admirable and powerful faculty of observation which distinguishes among all, the physician of the Meath Hospital. The lectures on scarlatina, paralysis, pulmonary affections, cough, headache, have acquired an European reputation, and the interest with which they inspire every attentive reader is assuredly their best panegyric.

"There are, however, two points to which it is important to call particular attention.

"Graves has devoted a great many lectures to typhus fever, which so cruelly decimates Ireland. It might be supposed, at first sight, that the study of this portion of his work is not of much importance to us French physicians, who fortunately have not to contend with the formidable malady in question; this is a mistake. All the precepts of the author upon the treatment of this pyrexia are so applicable to the severe forms of our typhoid fever, that we shall with the greatest advantage consult this remarkable work; moreover, the maxims relating to regimen have become the guide of the practitioners of all countries: it is they which now direct us in the treatment of putrid fever. And nevertheless, when he inculcated the necessity of giving nourishment in long-continued pyrexias, the Dublin physician, single-handed, assailed an opinion which appeared to be justified by the practice of all ages; for low diet was then regarded as an indispensable condition in the treatment of fevers. Had he rendered no other service than that of completely reversing medical practice upon this point, Graves would, by that act alone, have acquired an indefeasible claim to our gratitude.

"On the other hand, I cannot sufficiently recommend the perusal of the lectures which treat of paralysis; they contain a complete doctrine, and this doctrine has decisively triumphed. The sympathetic paralyses of Whytt and Prochaska have now their place assigned in science, under the much more physiological name of reflex paralyses, and the Dublin Professor is the first who has studied with exactness their etiological conditions, as he is the first who has made known their pathogenic process. Anticipating by many years the admirable works of Marshall Hall, he has comprehended, he has seen that anomalous peripheric impressions may react upon any section of the medulla, and determine at a distance disturbances of movement or of sensibility; he has, in a word, created the class of peripheric or reflex paralyses, and he has clearly established the relations existing between these paralyses and acute diseases. Unhappily these remarkable lectures have remained a sealed letter for the majority of French practitioners; but it is time to render to the physician of the Meath Hospital the justice which is due to him; it ought to be known that Graves is the creator of this new doctrine which has profoundly modified, within a few years, the pathology of the nervous system; it is right, in fine, to refer to its true author the suggestive theory of the paralyses and the convulsions of peripheric origin.

"You have, then, sir, done a very useful work in publishing Graves' Lectures. You have rendered a great service, if not to beginners,—who will perhaps not find in them the elementary ideas which are necessary to them,—at least to physicians, who must understand the reasons of instinct and intelligence by which they ought to allow themselves to be guided in the difficult paths of practice; who are called upon to assist in the doubts, embarrassments, and perplexities which trouble the conscientious man when he is engaged in those obscure cases which so frequently present themselves in the wards of an hospital.

"Graves is often empirical. What true clinical observer can avoid being so? But he is so only in spite of himself. He seeks, he points out the reasons which determine him; he discusses them, and he conducts his pupil step by step from the theory, occasionally too ingenious, to the application, which is always useful, though often unexplained.

"Graves is a therapeutist full of resources. For the majority of French physicians his medications present something unusual, because the agents he employs are rather less used in France; but we learn in his lectures the medicine of our neighbours at the other side of the Channel—a medicine strange to us, as ours is to them. We learn in them the methods most relied upon in the United Kingdom, and the remedies to which our English colleagues give the preference.

"I freely confess that I had some difficulty in accepting, notwithstanding the imposing authority of Graves, what he states of the influence of certain remedies, such as mercurials, essence of turpentine, spirituous preparations, nitrate of silver, &c.; but the Dublin Professor speaks with so much conviction that I ventured to follow his precepts, and I must say that my early trials very soon encouraged me to adopt unreservedly what at first I accepted only with misgiving. There is not a day that I do not in my practice employ some of the modes of treatment which Graves excels in describing with the minuteness of the true practitioner, and not a day that I do not, from the bottom of my heart, thank the Dublin Physician for the information he has given me.

"Graves is, in my acceptation of the term, a perfect clinical teacher. An attentive observer, a profound philosopher, an ingenious artist, an able therapeutist, he commends to our admiration the art whose domain he enlarges, and the practice which he renders more useful and more fertile.

"We shall, therefore, all be much indebted to you, my dear confrère, for having rendered familiar to us an author unfortunately too little known among us.

"A. TROUSSEAU."*

As might have been anticipated, the efforts of Graves' mind were by no means confined to subjects purely medical. For all the events of the time, and more especially for those which concerned the advance of civilization—for discovery—the struggles of a people for freedom—or the military undertakings of his own country, he ever showed a continued, but not an empty sympathy. Many important writings, to which his name is not attached, were contributed by him as leading articles in the public press, all distinguished by a careful preparation, and a singular knowledge of the history, topography, the political condition, and material resources of various countries. Among the events of the time which most interested him may be mentioned the Hungarian Revolution, and the war in Affghanistan. His history of the latter event is a good example of his powers of investigation and arrangement.

Commencing with an examination of the state of English rule in India previous to the interference by Lord Auckland in the affairs of Affghanistan, he proceeds to sketch the

* From *The Medical Times and Gazette.*

physical characters of the country invaded, and the tremendous strength of its natural defences. At this time the Khoord Cabool massacre had taken place. General Nott was beleaguered in Candahar, the heroic Sale at Jellalabad, and Palmer at Ghuznee. He showed, however, that although the Khoord Cabool Pass, where the bones of thirteen thousand of our soldiers lay bleaching, could not be made available for the entrance of a relieving force, yet that our troops might enter Affghanistan by the way of Scinde and the Bolan Pass, at the mouth of which part of Lord Keane's army was already lying. An interesting letter from a personal friend in the camp at Dadur is given, in which the fact of two bags of Venetian sequins being tendered by a native merchant, as part payment for a draft on the Bengal Government, is mentioned. These sequins were probably brought to Asia by the Venetians themselves in times long past, when Venice enjoyed an Eastern trade, and her coins circulated even as far as China.

After reviewing the prospects of our forces in Affghanistan, he says:—

"The preceding speculations about the results of the campaign have been made on the supposition that the Affghans will everywhere rise *en masse* against the English, and will make their expulsion not only a matter of national policy but of religious enthusiasm. A fanatical and religious war would be truly formidable, and would, if the Affghans were united, end in the total destruction of the Feringhees or Infidels, as they call the English and the Hindoos. Notwithstanding the inglorious beginning of the war, and the melancholy fate of so many brave soldiers; and knowing, as we do, the incapacity of Eastern Shahs, the changeable and fickle character of Orientals, the fear they have hitherto entertained of the British, and the probability of discord among the Affghan chiefs themselves, we still indulge a hope that the storm may not prove as great as it threatened to be.

"One thing is clear, that we must abandon Affghanistan the moment we have vindicated our tarnished honour, and rescued our beleaguered troops.

"God grant that we may be enabled to effect these objects, even though they cost us another seventeen millions, the sum already expended in this unholy war."

It will be remembered that the leading argument in favour of the war was the probability of the success of Russian intrigue among the Affghan chiefs, which would prepare the way for the occupation of India. The fallacy of this argument is strongly shown by him; but he takes occasion to dwell on the danger that would follow were the affections of the native troops interfered with, or their loyalty shaken by mismanagement; and he indicates even then, symptoms of that disaffection which eventuated in the disastrous mutiny of 1857.

Speaking of certain malcontents at home, who had prophesied the downfall of our rule in the East, he says:—

"One of the observations most commonly used by such persons is, that the British, like the Roman empire during its latter periods, is in a state of decline; and as the one lost province after province, so must the other be speedily shorn of the extensive colonies, islands, and we had almost said continents, which acknowledge her sway in either hemisphere.

"Half a century ago the French compared the power of Britain to that of Carthage; but as fate willed it otherwise, and the mistress of the sea did not fall, but has gone on adding kingdom to kingdom, and empire to empire, her disappointed enemies have been obliged to prophesy anew, and now threaten us with the fate of Rome; but we disavow the comparison, for Britain's prosperity differs in all essential points from the prosperity of Rome, and the ties which bind it to its distant possessions are very different from any that existed in ancient time, and cannot be severed by the means which led to the dismemberment of the Roman empire. The Romans were essentially conquerors and plunderers. They were indeed tolerant as to religion; and as easily adopted the gods as the vices of the vanquished. If they, as they often did, improved roads, increased commerce, provided for internal tranquillity, and the just administration of the laws in a province, they did all this merely to render it more productive, in order that they might afterwards rob to greater advantage. In consequence of this system, wealth everywhere flowed towards Rome, and the whole world was impoverished to enrich the 'city.' To what extent the prætors carried their exactions, and how difficult it was to expose their iniquity, or to bring them to justice, may be learned from the speeches of Cicero against Verres; and yet Sicily was Rome's nearest, fairest, and most valued province. The strongest proof of the grinding extortions practised by the Romans is the fact mentioned by Cicero, that the people of the subject provinces had actually formed the design of petitioning for a repeal of the existing law against extortion; and 'there can be no doubt,' argues Cicero, 'that they would be greatly benefited by the change; for in that case the governors sent into the provinces would be content to plunder only to a sufficient extent, to accumulate immense fortunes for themselves. At present they are obliged, in addition to this, to acquire enough to serve as bribes to their future judges at home.'

"Thus, Verres had been heard to boast, that he should be well satisfied to expend the proceeds of two years of spoliation in defeating the ends of justice, provided he were to retain for himself the profits of the third. Pompey deposited in the Treasury of Rome four millions sterling, and Cæsar six millions, gained from enemies not more vanquished than impoverished. Such was the connection between Rome and her provinces.

"England, on the other hand, not only wields the trident and the sword, but walks among the nations in a shape unknown to antiquity—the majestic dispenser as well as the receiver of wealth. As England grows rich, so do her provinces; for however wide-spread the fame of some potentates, whose dominions are now merged in our Indian empire, their wealth consisted of barbaric gold and precious stones, accumulated by hoarding or acquired by pillage; and in proportion as the state of the monarch was splendid his subjects were impoverished.

"The state of India under our rule is different. The palaces of Delhi may have fallen into decay, but the humble dwellings of the farmers display increased comforts. England has become richer by conquering India, and India richer by being conquered.

"It is because she is at once a commercial, a manufacturing, and a warlike nation that England has been enabled not merely to acquire kingdoms, but to retain them; and for this reason, what Alexander, Tamerlane, and Nadir Shah failed to accomplish, has been achieved by the arms of a company of merchants; and *it is because they are merchants* that they have not merely founded but consolidated and established our great Indian Empire.

"In this instance, an enlightened perception of selfinterest has with just discrimination pointed out, that we can only derive permanent revenues from a country when its natural resources are cultivated and improved, and our intercourse with it maintained by a liberal and well-adjusted interchange of productions. On this principle has England acted towards India, whose natural productions and indigenous arts and manufactures have been encouraged; and thus has native industry reaped its reward, while the population of India acquires materials for purchasing English goods and manufactures.

The second paper on Affghanistan presents us with a well-considered and learned disquisition on the origin of the Duranee and Giljhian tribes, with notices of the Eusofzyes and the Khyberees, who inhabit the north-eastern parts of the country. The author then gives a history of Affghanistan, from the invasion of Alexander the Great down to the twelfth century, when the Affghan kingdom of Delhi was founded. In the fifteenth century, Sultan Baber, descendant of Tamerlane, conquered Cabool, and, like his predecessor, advanced to the subjugation of India. This being effected, he returned to Cabool, where his tomb is still an object of veneration. After his death, the Affghans resumed their independence, but the Persians soon regained their short-lived possession of the country, again to be expelled by the Dooranees and Giljhies, one of their chiefs seizing on Ispahan, and mounting the Persian throne, from which his successor was expelled by Nadir Shah, whose popularity was such that he ultimately made himself King of Persia. His death, by assassination, led to the return of his Affghan troops to their native country, under the guidance of Amed, who was crowned king, and assumed the title of Dooranee.

He added the Punjaub and Cashmere to his dominions, subdued Khorassan and the kingdom of Balkh, and rendered Scinde and Beloochistan tributary to the throne of Cabool.

This history is then followed during the contentions of the sons of Amed down to the expulsion of Soojah by Dost Mahammed; his flight to the court of Runjeet Singh and his subsequent escape to Loodiana, where he became a pensioner of the British Government.

The subsequent events leading to the occupation of the throne of Cabool by Dost Mahammed are then given, and the narrative of the war admirably elucidated by a series of the letters of Colonel Dennie, furnished by Dr. Steele, which were never before published. This officer, well styled the very Diomede of the British army, fell in the memorable sortie from Jellalabad, in April, 1842, when Sale made the desperate attempt to fight his way to Peshawur, a distance of about seventy miles. The centre was commanded by Colonel Dennie, the right by Captain Havelock, and the left by Colonel Monteith. "Colonel Dennie rode in front, and when within a few yards of the fort, received a ball in the hip, and before he could witness the glorious termination of the action, this devoted soldier breathed his last."

On these letters, twenty-three in number, bearing dates from Landour, Shikarpore, Candahar, Cabool, Syghan, Ghuznee, and Gundamuc, Graves remarks:—

"If they evince a greater degree of egotism than suits the taste of *general readers*, the latter will please to recollect that for them they were never intended, and that the value of such productions, and the charm they convey to distant and beloved relatives, consist chiefly in the narration of deeds, however insignificant, which engross the time and attention of the absent friends. But making every allowance for this peculiarity, let us ask,—Do these personal

f

memorials magnify Colonel Dennie's exploits beyond their real importance? Let it be borne in mind that it is to him, who voluntarily commanded the storming party at Ghuznee, who gained the important victory at Bameean, who conducted the forces from Khoord Cabool to Gundamuc, and who in the brilliant sortie from Jellalabad, gloriously fell, we are indebted for nearly all that we have reason to be proud of in the military operations conducted by our armies in Affghanistan."*

In the biographies of many remarkable men, especially in latter times, the details of their social or domestic life are dwelt on, and for no conceivable purpose but that of satisfying an intrusive curiosity. The writer believes that such a course is in every way to be reprehended. Again, to give publicity to any writings of an author which he himself has thought fit to retain, seems also to be unjustifiable. In the present case, however, the writer has, through the kindness of the Archdeacon of Clogher, and of the representatives of the late Dr. Perceval, received some letters written by Graves during his first visit to the Continent, and which he expressly directed should be circulated among his many friends. This latter circumstance will be the apology for introducing here a few extracts from these letters.

Naples, December 21st, 1819.

* * * * * * *

As I am upon the subject of satires, it will not be out of place that I mention one made by a celebrated Italian author, himself a nobleman, upon the character of the Italian nobility, which he thus briefly describes:—"Or superbi, ora umili, infami sempre."

* "Narrative of the War in Affghanistan," see *The Dublin University Magazine,* vols. 19 and 20.

When Napoleon thought fit to imprison the present Pope, whose dominions then lay open to every invader, and from whose influence he could have had little to dread, the following from the Book of Job, was written upon the door of the house in which the General sent to take the Pope prisoner lived:—"Contra folium quod vento rapitur, ostendis potentiam tuam." When in Rome the Pope has been termed "folium quod vento rapitur;" may we not conclude that the temporal power of Rome is again dead; indeed, at present the kings of the earth seem as little influenced by the authority of the representative of St. Peter, as by that of the remnant of the Roman senate, for there still resides in the capital *one* senator. When the Papal authority had made Rome a second time mistress of the world, when the bulls of her Christian Pontifex Maximus bore a sway as extensive as formerly did the edicts of her Pagan *imperial* Pontifex Maximus, Rome's aspiring genius rising from amidst the tombs of her ancient heroes, seemed to console herself for the loss of her former power; but her consolation is now passed, and she stalks, the shadow of a shade, between the Vatican and the palace of the Cæsars, mourning over the ruins of universal empire, twice gained, and now lost for ever. I say for ever, because the character of its inhabitants, particularly the higher orders, is now so degraded, that there seems to be little chance of Italy's recovering her rank among nations. Whatever may have been the other causes which contributed to effect this degradation of character, it seems to me to be chiefly owing to the almost total annihilation of virtue which took place under the Emperors, a period when poverty and obscurity seem to have been insufficient protections against the contagion of vice; for a people who had no wish higher than bread and the amphitheatre, to which all ranks flocked in thousands to witness with delight the effusion of human blood, could have but little if any virtue. But when vice has once taken root in a nation, it flourishes amidst the general corruption, and many ages must pass away before the descendants cease to inherit the vices of their forefathers, before calamities, the consequence of such an inheritance, cease to be visited on them, for with nations the visitation extends beyond the third and fourth generations. The southern, indeed the greater part of Italy, seems at present incapable of furnishing a sufficient quantity of honesty and patriotism to fill the different offices of a free government, for it needs but little proof to show that true patriotism cannot exist without virtue. Of this the admirable effects of the British constitution transplanted into Sicily is a striking instance. I shall now mention some of the miseries of Rome, which have continued to exist from Juvenal's time to the present, and in spite of their *classicality*, still annoy the strangers. One of the greatest grievances common to ancient and modern Rome is the difficulty of finding any private house, much less any inn, where one can slumber undisturbed. Hence it came to pass that formerly many sick people died from want of sleep, and that it required great wealth to obtain a bed-room in the city free from the cause of the disturbance—noise. But although nocturnal noises are no longer annoying in Rome, yet another cause of vigilance has succeeded, still more general in its effects; for now not only the sick but the healthy are affected. Nor can wealth itself purchase exemption from its operations. This you will readily allow, Sir, when I tell you that what I allude to is a certain animal which, together with the "culices" and "ranæ palustres," may have robbed Horace of a night's rest on his journey to Brundusium. An English lady of noble birth was so much in dread of these creatures that she brought with her into Italy a portable iron bedstead, the feet of which she placed at night each in a tub of water. Vain effort! Her ladyship had scarcely passed the Alps before she bore visible marks of the inutility of this contrivance—quis talia fando temporet a lachrymis. A friend of mine was so tormented by their bites that when visiting the Capitol he flung, in a fit of rage, thirty of the ringleaders headlong down the Tarpeian rock!

Naples, December 3rd, 1819.

* * * * * * *

Last night I was awakened by the thunders of Mount Vesuvius, and am told that a smoking chasm has this morning been observed in the side of the mountain; the people seem to expect an eruption. If anything worthy of this "vultus præclara minantis" takes place, I shall let you know of it. I remember, Sir, that when I was in Germany, I formed a plan of describing that country to you as far as my observations and reading should enable me to do, but the wish to assist my observation by reading was the very cause of my abandoning that plan, for finding Madame de Stael's work so complete as nearly to have exhausted all the most interesting subjects, and feeling that any attempt of mine to treat of the same subjects, would be like my endeavouring to retouch one of Raphael's pictures, I retired like Ariosto's Rodomonte vanquished by the enchanted spear of a female, and vowed not to use my arms, for a year, a month, and a day; but my muse (an acquisition which I have made by quaffing all sorts of poetical wines, from the Rhœtian to the Falernian) quoting the example of Lord Byron to prove that such vows are not now so scrupulously observed as they were by the knights of old, I break my vow with less remorse, and shall without adding to my already unreasonably long prooemium, proceed forthwith to my peroratio. Madame de Stael's Corinne, Eustace's Classical Tour, and Gondoli's Plays, are the books which I think best calculated to convey a good idea of Italy, and the manners and customs of its inhabitants, but I shall make no other use of my having read them, than the avoiding what has already been so well described by their authors, I must therefore omit many of the most interesting subjects and present you with an irregular heap of gleanings and fragments. The gallery containing antique sepulchral inscriptions, &c., in the Vatican, first claims attention, and in it the inscriptions found in the vault of the Scipios, which was opened not very long ago. In this vault was a large and rudely-worked sarcophagus, of a sort of light grey stone, together with a bust, which, as it is made of the same stone, was probably that of the person contained in the sarcophagus. The inscription is as follows, —Cornelivs. Lvcivs. Scipio. Barbatus. cnaivod. patre. prognatus. fortis. vir. sapiensque. quoivs forma. virtutei. parisvma fuit. Consol. Censor. Aidilis. quei fuit apud vos Taurasia. Cesavna. Samnio. cepit. subigit. omne. Louconam. opsidesque. abdoucit. When the first words are not in italics, they are meant to convey an idea of the shape of the letters in the inscription; the following seems to me not destitute of beauty, its style is very antiquated. L. Cornelius. Cn. F. Cn. n. Scipio. magna. sapientia. multasque. virtutes | aetate. quom. parva. posidet. hoc. saxsum | quoiei. vita. defecit. non. honos | honore. is. hic. situs. quei. nunquam. victvs. est. virtutei. annos. gnatus. xx.— the rest is not legible by me. I have placed the strokes to show where I think the divisions in the sense are. I translate the first clause as if sapientia were sapientiam, and the verb habuit *understood*, for other inscriptions prove that the old method of declining

f 2

the nouns was very different from that of the Augustan age; quei. quius. quoiei. quom. for qui. cujus. cui. quam. but the next inscription I think tends to confirm my opinion. L. Corneli. L.F. P. Scipio. quaist. Tr. mil. annos. gnatus. xxxiii. mortuos. Pater. Regem. Antioco. subegit, here is Antioco instead of Antiocum, unless it be the name of the king not yet latinized. In another in verse, the person is represented as passing no slight encomiums on himself, a practice frequent among Homer's heroes, and resulting from the simplicity or rather the honesty of ancient manners. The first part is in prose, Cn. Cornelius. Cn. F....Scipio. Hispanus. Pr. Aid. Cur. Q. Tr. mil. ii. xvir. sl. ivdir. x. vir. sacr. fac. then follows the verse, Virtutes generis mieis moribus accumulavi | Progeniem genui facta patris petici | majorum optenui laudem ut sibi me esse creatum | laetentur stirpem nobilitavit honor. | here the strokes indicate the end of each verse; the first verse conveys the idea that virtues constitute a sort of family property, to hand down which, increased from father to son, was certainly a noble ambition, an ambition, however, which in process of time died away among the posterity of the Scipios, as may be collected from the reproof of Juvenal, "Effigies quo tot bellatorum, si luditur alea pernox ante Numantinos? si dormire incipis ortu Luciferi, quo signa Duces et castra movebant?" the very irregular and crooked letters, put together without much attention to *relative* position prove the low state of the arts, at a period when Roman glory and power were extending themselves rapidly. Many of the inscriptions of the Plebeians are scarcely intelligible on account of the badness of the Latin, some, however, are *tolerably* correct, as for instance: Ac veluti formosa rosa cum tempore prodit | Arescit certo tempore deinde suo | Sic tu cæpisti primo formossa Anna videri | Tempore sed subito desinis esse mea | Hoc, stabilis tuus, eheu quo possum munere parvo | Prosequor, atque opto sit tibi terra levis | the last line is to be found, nearly word for word, in Ovid; the two following cannot boast much grammatical accuracy: D. M. Claudiæ Elaïdi uxori, cum qua vixi ann. xiii—Claudiæ Sturehelene [?] uxori cum quem vivo ab infantia sine contumleias. Ann. XXXXIIII. Tit. Claudius Pannychus cum inscriberem aram hanc habui Ann. LXXXVI. The second is short. A. Considius Hermes vivo fecit sibi hoc sacrophagum: translated grammatically, he made the sarcophagus to bury himself alive in. On a neatly worked sarcophagus of white marble, is the half-length bas-relief figure of a handsome boy. The inscription is D. M. Mulpio materno filio dulcissimo, parentes infelicissimi. Vixit Ann. xv. mens. v. Diebus xi.

In reading this short but affecting expression of sorrow a solemn feeling is excited; and on considering how many ages have elapsed since these unhappy parents bewailed the loss of their beloved son, and how short in comparison the time which added the ashes of the weepers to those of the wept for, we are almost tempted to add grief to the list of human vanities; but in this as in almost every instance we find the frailties and perfections of our nature so closely allied, that the former cannot be eradicated without injuring the very roots of the latter, nor could the finer affections flourish in a heart so petrified as to be incapable of grief. Christ wept, but Satan has always been imagined a being without a tear. Whence, it may be asked, originates the difference between the subjects chosen for the ornamental sculpture of the ancient Roman sarcophagi and those selected for the tombs of Christians? The former represent battles, triumphs, chariot-races, groups of Cupids, &c., but never anything to remind one that the interior is the abode of death; whereas on the latter, figures of the grim conqueror, with the dart and hour-glass, skulls, bones, &c., render the churchyard an appalling scene. To me it seems to arise from the difference between the heathen and Christian religion. A people who has no *settled* belief either in a future life or future rewards and punishments; who seem in general to have considered the Elysian fields and realms of Pluto merely as poetical existences, whose perspective extended no farther than this world, and seemed eternally closed by the tomb; such a people could have no reason for adding artificial terrors to death, and sought rather to render their sarcophagi, as far as possible, pleasing to the eye; and hence they present no other *memento mori* than the use to which they were applied. But to the Christian the tomb forming not only the close of one but the commencement of another, and infinite perspective, he is not so anxious to strip it of its gloom; but, on the contrary, in order the more strongly to contrast his immortal hopes with its mortal terrors, surrounds it with the most revolting images of death, over which the cross rising triumphant seems to exclaim, "Oh, grave, where is thy victory? Oh, death, where is thy sting?" No part of the Vatican interested me more than the immense room in which the sarcophagi, urns, and inscriptions are arranged in departments, containing the epitaphs of the different ranks of society, from the meanest artisans to the Cæsars; but time and violence, not respecting one more than the other, have mutilated and deformed many of them, "nam et ipsis fata sepulchris." May that gallery of the Vatican long escape its *fates*, for I consider it, as it were, the sepulchre of the Roman nation. A gallery 800 feet long, together with a double one 200 feet long, contain the books of the Vatican library. As the bookcases are all closed no books are visible, but their number is certainly very great, and no doubt this library contains a vast quantity of *latent* learning,—latent, I call it, for no one ever reads in it.

The preceding extracts are from letters written to Dr. Perceval. The following are selected from among his letters to Archdeacon Russell:—

* * * * * * *

Although I have no doubt that you will be surprised, yet I am not without hopes that you will be pleased at receiving a letter from your quondam messmate and chess rival; if not, I beseech you to bear your misfortune with patience, as the only amusement I have in my leisure hours is to sit down, and endeavour, as far as possible, to enjoy the idea, that by means of what I write I may, in some measure, carry on a sort of conversation with my friends. Here in solitude, and as it were in another world, where I am without connections, without friends, and stand completely insulated, I feel no small comfort in endeavouring to prevent those whom I value from forgetting me. When one is absent for any length of time from home, one soon forgets the common *run* of saluting acquaintances, and at the same time learns to set a proper value on those who are worthy to be called friends.

* * * * * * *

I am every day the more convinced of the judgment which my brother Hercules showed in the most weighty of all choices,—that of his friends. How few die for whom three friends shed tears. No wonder, then, that in respect to his memory and his judgment I should covet the friendship of one of those who were as brothers to my brother. I can assure you that in writing to you I feel as if I was doing something by which, if it were possible, he must be gratified; for as he loved me, I know he would rejoice to think that during his life he had been able to make a friend for me after his death.

Aix, January 16th, 1820.

I arrived here this morning from Marseilles, where I had spent the greater part of the night in witnessing the follies of the celebration of the last night of the Carnival, when I witnessed scenes in public which you would scarcely believe could have taken place; but I feel little inclined at present to give any account of them, as I have since paid a visit to what is to me the dearest spot in France, viz., that which contains the remains of our beloved Hercules. Melancholy as it was, I thank God that I have been able to perform it, as it was a scene which I can never remember without improvement. Immediately on my arrival here I was directed to the churchyard, which is on the outside wall of the town. After waiting some time, an old woman opened the door which leads into it, and I entered this abode of death with a strong impression of awe. It is about half an acre in extent, bounded on one side by the ancient wall of the city, and of a triangular shape. There are two doors, each with a cross on the wall above it. The greater part is dedicated to the interment of Catholics, but there are but few tombstones or graves in it. A wall three feet high divides the upper part, or Protestant burying-ground. In the sketch I have marked by crosses a small chapel, and by H the grave of Hercules. The two other crosses mark the graves of an Englishman and a young English girl. The churchyard is very clean, decent, and well enclosed, which was to me gratifying. At the head of Hercules' grave is a green marble stone with the following inscription:—"At Aix, on the 6th November, 1817, departed from this life, aged 22 years, Hercules Henry Graves, in the faith of Christ and the fear of the Lord." This was, I believe, dictated by himself, and shows the judgment which formed one of the most valuable of his many endowments, for he omits all the circumstances of his situation, country, &c., and only mentions about himself that he died in the faith of Christ and the fear of the Lord. "Aged 22 years," made a deep impression on me. And am I then older than he? Has time then ceased for him? God forbid! Never did I so strongly feel how gratifying it must be to mark the spot of a departed friend with some token of remembrance; and had time permitted, I believe that I should have indulged myself with getting the names of his three friends inscribed upon the tombstone.

Graves was a Fellow of the King and Queen's College of Physicians, and was subsequently elected King's Professor of the Institutes of Medicine. He was chosen President of the College of Physicians in 1843 and 1844, and was elected a Fellow of the Royal Society in 1849. Besides these distinctions, he received the diploma of Honorary or of Corresponding Member from many of the Medical Societies of Europe.

It was in the autumn of 1852, he being then in his 57th year, that the symptoms of the malady, which was to prove fatal, first shewed themselves. In the following February he began to succumb to the disease. Although at times his sufferings were great, yet he had many intervals of freedom from pain. And he then showed all his old cheerfulness and energy. To the very last he continued to take pleasure in hearing of any advance of knowledge that tended to ameliorate the condition of man, or to throw light on his relations to a future state. In this latter point of view, the discoveries of Layard greatly interested him, as illustrative of the Sacred History; and thus he was permitted to fill up the intervals of his sufferings, even to the last; for his mental faculties never failed or flagged,—a mercy for which he often expressed a fervent gratitude; and so he was providentially enabled to review the past, and to form a calm and deliberate judgment on the religious convictions of his earlier years. And once the truthfulness of these were ascertained, he adhered to them with that earnestness which characterised all his decisions.

It was after the attainment of this state of patient expectation that one who was dear to him expressed a prayerful wish for his recovery. "Do not ask for that," he replied, "it might prove a fatal trial."

His mind having become thus satisfied he made few remarks on these subjects, except in reply to the inquiries of others. Thus, when referred to the prophetic illustration of purifying and redeeming love, "A fountain shall be opened for sin and for uncleanness," "No," he said, "not a fountain, but an ocean."

On the day before his death he desired (a second time) to partake of the Holy Communion, with his family. When some explanations were commenced, he answered, "I know all that; I do not regard this as a charm, but I wish to die under the banner of Christ." Feeling himself sinking, he asked for prayer, and a petition was offered suitable to his condition; but he seemed to long for something more, and when questioned, replied, "I want some prayers that I know, some of the prayers of my youth, some of my father's prayers." The Litany was commenced, he immediately took up the well-known words, and when the speaker's voice faltered, he continued them alone, and distinctly, to the end of the strain, "Whom thou hast redeemed with thy most precious blood."

On the 20th day of March, 1853, and without renewed suffering, he ceased to breathe.

His tomb is in the cemetery of Mount Jerome. It bears the following inscription, dictated by himself:—

ROBERT JAMES GRAVES,
SON OF RICHARD GRAVES, PROFESSOR OF DIVINITY,
WHO,
AFTER A PROTRACTED AND PAINFUL DISEASE,
DIED IN THE LOVE OF GOD, AND
IN THE
FAITH OF JESUS CHRIST.

PHYSIOLOGICAL ESSAYS.

THE UBIQUITY OF LIFE.

Endowed with reason, Man alone seems capable of understanding the construction of his own body, and the uses and functions of its various parts. He is, in truth, the only animal that has attempted the problem of explaining itself. All living creatures are indeed placed within the influence of numerous agents capable of deranging their health, but Man alone has considered the causes of disease, and sought to avert its fatal consequences, by the suggestions of reflection and experience. Wonderfully and fearfully made, our bodies, composed of matter in itself inanimate, are governed, during health, by the laws of vitality, and each particle obeys an influence always different from, and often opposed to, that which presides over the same particles, when placed beyond the sphere of the living agency. Yet so beautifully perfect is their structure, that we are unconscious of the struggle, unceasingly maintained in every member and in every organ, between the conflicting laws of animate and inanimate matter. When life ceases, the latter instantly resume their sway, and death is the commencement of a change, which soon destroys the shape and texture of each part, and dissolves the mortal mass into a few simple elements. To investigate the form and structure of the living body; to examine the functions of each organ—their mutual connection, and their various uses in supporting this conflict between life and death, is the proper business of the physiologist. His attention must be directed not only to Man, considered as a whole, but to each individual organ and its structure, traced with as great a degree of minuteness as can be accomplished with certainty. He must also endeavour to ascertain of what elementary principles these parts are ultimately composed; he must examine the mechanism of each organ, and accurately study its functions, not only in Man but in other animals. Comparative anatomy has indeed become indispensable to the physiologist—a name which no one can now claim who has not studied this accessory science, and that not superficially, but with perseverance and labour. General views of structure, striking analogies between organs, and instructive illustrations of function, do not unfold themselves to the comparative anatomist, until, painfully and tediously climbing, he reaches an elevation whence the most distant objects, that lie scattered over the wide kingdom of nature, can be seen at one view; and thus he is enabled to compare the near with the remote, to separate what had been previously classed together, and to collect into the same group what had before appeared distinct.

Ardently engaged in studying the laws of those functions by which life is carried on, begun, or continued from one generation to another, the physiologist seeks illustrations of his favourite pursuit, in every living object that presents itself to his observation. He travels nowhere without meeting something worthy of his attention, for it may be truly said, that most parts of this world are dwelling places of living creatures, and that we can scarcely find a spot uninhabited by beings endowed with life. We find life in the air, in the waters, in the eternal snows of the arctic regions, and the burning sands of the torrid zone. We find it near the summits of the loftiest mountains, and in the deepest caverns; even mephitic pools, poisonous soils, and boiling springs, teem with animals and plants, adapted to the peculiar circumstances in which they are placed, and furnished with an organisation wisely contrived for their existence. As this forms a subject well worthy of the consideration of every thinking mind, and furnishes abundant proofs, it might almost be said of the ubiquity of the Creator's animated works, we may select a few examples in proof of the assertion just made.

In the warmer regions of the earth, where copious exhalations arise from rivers, swamps, and impenetrable forests, the insect inhabitants of the air swarm in such myriads, that they seem to the tortured traveller to fill the whole atmosphere, while, at certain seasons of the year, their attacks become so troublesome and incessant, that they force whole tribes of people to save themselves by a temporary migration.

Even in the higher northern latitudes, the heat of the summer solstice calls to a short-lived existence, swarms of mosquitoes, from which the Esquimaux, the Laplanders, and the Samoieds are forced to protect themselves by keeping their huts constantly filled with smoke. How far the upper regions of the atmosphere may be peopled has not been ascertained, but it seems improbable that winged insects exist to any great distance above the highest flight of the Swallow and the Swift, although wanderers from the plains are occasionally met with at considerable heights on mountains. Thus, in traversing some of the loftier regions of the Alps and Pyrenees, I have met with flights of butterflies, the emblems of summer and of sunshine, migrating from some neighbouring valley, and, in their fluttering and devious course, almost touching with their fragile wings the hard surface of the glacier and perpetual snow—the types of cold and of winter.*

* Ramond (*Voyages au Mont Perdu*, a work replete with original views and new facts) in climbing a very dangerous precipice, arrived at a spot where both advance and retreat seemed impossible. In this painful and hazardous situation the appearance of a fly awakened a curious reflection. "Durant cette inaction qui devenait d'autant plus penible qu'elle se prolongeait davantage, la mouche apiforme vint se poser auprès de moi, et nettoyer ses petites ailes dont nous etions réduits à envier la puissance!"

De Luc, Ramond, Saussure, and Humboldt have all seen insects at heights equal to, or even exceeding, that of the summit of Mont Blanc. Of all animals the Condor, or enormous vulture of the Andes, attains to the greatest elevation, for Humboldt saw it describing with expanded wings, its aërial circles far above the highest peaks of Chimborazo, where the barometer would have sunk below ten inches. The ocean seems to mark the boundary of that part of the atmosphere which is inhabited by winged insects, whose larvæ cannot find the necessary shelter and rest in its disturbed and unfathomable waters. But the depths of the ocean itself are not therefore untenanted; the waters everywhere teem with life, both vegetable and animal. Between the tropics, the mariner, leaning over the side of his vessel, watches with interest the motions of the various species which everywhere swim around, and sees with pleasure the flying fish glancing through the air, where it is forced by its numerous pursuers to seek a momentary refuge. In the West Indian seas, where the water is extremely clear, and its depth but small, he beholds on the bottom a thousand varieties of sea-worms, star-fish, snails, and mussels, besides fish in prodigious numbers, and as he sails along, he passes over whole groves of luxuriant fuci and other marine plants, together with immense masses of gorgonias, corallines, and alcyonias. He observes too, with delight, sponges, which, as large as shrubs, present the most beautiful play of colours to the eye, and, as they softly undulate with the motion of the waves, produce the pleasing illusion of traversing fields covered with a profusion of flowers.

In other regions, notwithstanding the rapid course of his ship through the water, the navigator day after day beholds the ocean all around, thickly covered with luxuriant sea-weeds, which, floating on the surface loose and unattached, grow without roots, and, to the inexperienced, convey the idea of rocks and shallows—dangers still far distant.

Were we to seek an illustration of infinity in point of number, we would find it in those shoals of codfish, herrings, pilchards, or sprats, whose moving and almost solid masses occupy many leagues. Even in the colder regions, and within the arctic circle, the bosom of the ocean is scarcely less prolific of life. In some places, indeed, Captain Scoresby observed its waters tinged brown, as by a species of minute animalcula, which, seeking light and heat near the surface, formed a living stratum not more than a few feet in thickness, but which covered a vast extent of the sea near the coasts of Greenland. Captain Parry, while engaged in his bold attempt to reach the North Pole, observed that the little pools formed by the action of the sun on the surface of the snow and ice were full of animalcules.

On the coast of Greenland and other arctic countries, the snow which covers mountains and valleys, and whose surface scarcely yields to the influence of the solar rays at midsummer, is in some places reddened* for miles together by a minute species of alga, which grows in vast quantity in the substance of the snow.

The infinity of animal life is exemplified in the most striking manner by a consideration of the *Infusoria*, an accurate

* The redness of this snow, depending upon the presence of a minute alga, Protococcus nivalis, must be carefully distinguished from the red colour which Captain Parry observed on certain occasions, where the feet of his men or the bottoms of the sledges left impressions on the snow. This phenomenon was probably caused by a certain degree of transparency, which the surface-snow possessed in consequence of having been previously melted, and which allowed the transmission of the red rays alone through the parts forming the edges of the footsteps and sledge-tracks. The great obliquity of the sun's rays in so high a latitude favoured the production of this effect. No adequate explanation is given in the published account of Captain Parry's attempt to reach the North Pole over the ice. A most interesting paper, written by Count Xavier de Maistre, on the Colour of the Atmosphere and Deep Water, suggested this explanation.—Vide Jameson's *New Philosophical Journal*, July, 1833.

The red appearance of the sun, when near the horizon, or when viewed through a dense fog, affords a familiar illustration of the rapid loss of the other component parts of the solar ray, in penetrating through certain media. Another curious illustration is mentioned in the *Saturday Magazine* for Aug. 18, 1832:—The ephemera, or day flies, in the height of summer, sport over rivers, pools, and streams in such numbers that they, in some instances, absolutely darken the sun, or *make its light fall red upon the ground*.

and satisfactory account of which the student will find in Mr. Prichard's *Natural History of Animalcules*:—

"The bare knowledge," he says, "that there are myriads of atoms existing in a single drop of water, recreating and executing all their functions and evolutions with as much rapidity and apparent facility as if the range afforded to them was as boundless as the ocean, must carry with it an intensity of interest to the mind of every human being; of every one, at least, who is at all accustomed to meditate on the perfections of Nature, and to recognise and adore the hand which guides her through all the vast variety of her stupendous operations." * * * "Until Dr. Ehrenberg adopted the expedient of introducing vegetable colouring matter into the fluid which supplies them with food, an experiment attended with the most successful results, these creatures were commonly supposed to be entirely devoid of internal organisation, and to be nourished by the simple process of cuticular absorption. By the application of coloured substances, which, moreover, have been found to invigorate rather than depress the animalcule, and to maintain it in the full exercise of all its functions, this erroneous notion is set at rest, and an internal structure has been discerned in some, equal to, if not surpassing many of the larger invertebrated animals, and comprising a muscular, a nervous, and, in all probability, a vascular system, all wonderfully contrived for the performance of their respective offices."

He who has attentively watched the motions of these living atoms in a single drop of water, as displayed by the oxy-hydrogen microscope, must feel impressed with the conviction that their motions are voluntary, and that their lives, like that of Man, exhibit a mingled scene of pain and of enjoyment. Their extreme minuteness, as judged of by our feeble senses, does not prevent them from having a multiplicity of organs for their use, probably as perfect as in much larger animals. In the *Rotifer vulgaris*, or common wheel animalcule, which varies in size from one-thirtieth to one four-hundreth part of an inch, nerves and nervous ganglions; organs of mastication, deglutition and digestion; sexual organs; *and a pair of eyes* have been distinctly seen and described, besides a very complicated apparatus, by means of which its peculiar rotatory motions are performed. Baker relates the following curious observation concerning a minute hair-like animalcule discovered in prodigious numbers in a ditch near Norwich:—" A large cohering cluster of them was put in a jar of water, when one part went down to the bottom, whilst the other continued floating on the top. All things remained for some time in this condition, until at last each swarm of animalcules grew weary of its situation, and had a mind to change its quarters. Both armies, in short, began their march at the same time against the side of the jar, and as one proceeded upwards and the other downwards, after some hours they were nearly meeting about the midway. The desire to know in what manner they would behave on this occasion engaged the observer to watch them with a careful eye; and, as they approached still nearer, he beheld, to his great surprise, the army that was marching upwards open to the right and to the left, and leave a convenient space for the army which was marching downwards to pass between its wings. Thus, without confusion or intermixture, each held on its way, the army which was going upwards marching in two columns to the top, and the other proceeding in great regularity and order in one column to the bottom. This amusing spectacle serves to show that, however mean or contemptible these creatures may appear to us, the Almighty Power that created them has not left them destitute of sagacity to associate together, and to act unanimously for the benefit of the community, both these armies marching as regularly as if under the direction of wise leaders."

In Africa, particularly in the neighbourhood of the Egyptian pyramids, the heat is so intense, and the sand appears so parched and burned, that it seems impossible for either plant or animal to find sustenance, and yet Hasselquist found both here, viz.—the Chondrilla juncea; a small species of lizard, and lion ants innumerable. Scheuchzer and Pallas both observed plants and animals in sulphureous springs. Forskal, in Arabia, Barrow, at the Cape of Good Hope, and Hooker, in Iceland, found different species of conferva and ulva growing in boiling springs. The most remarkable account of vegetation at a very high temperature is mentioned in Staunton's account of Lord Macartney's embassy to China. They found, at the Island of Amsterdam, a spring, the mud of which, hotter than boiling water, gave birth to a species of marchantia. The Turbo thermalis, a shell fish indigenous in the Adriatic, is found also in the thermal springs of Abano, at a temperature of 120°.

Soils abounding in metallic impregnations are generally found to be very unfavourable to the development of vegetable life; and among these the refuse of lead mines is one of the most remarkable for its sterility, a quality which makes it an extremely valuable substitute for gravel, in making walks through fields and gardens, as has been done by my friend, the Rev. Dr. MacDonnell, at Dalkey; and yet, even in this soil, which is so peculiarly poisonous to most plants, the Arenaria verna grows with luxuriance. Sir Joseph Banks made an attempt to raise this plant in his garden; but, before he could succeed, he was obliged to send to the mines for a quantity of its native lead rubbish, which, having been put into a pit made for that purpose, soon became covered with the Arenaria, although every effort to make it thrive in other soils, not adulterated by this metallic impregnation, had proved utterly unsuccessful. Covered with the Arenaria verna this patch appeared as fertile as any other part of the garden; but had not the seeds of this plant been procurable, that soil would have remained incurably barren and unproductive of any other known plant. Some soils, however, are composed of materials which the most long-continued exposure to atmospheric influences seems unable to prepare for the sustenance of vegetable life. In 1828, I had an opportunity of observing a striking illustration of this fact in Auvergne, where several of the conical mountains, produced by volcanic eruptions of a date manifestly prior to the Christian era, have their sides still naked and destitute of the slightest trace of vegetation. The interior of their broken craters, rugged, black, and scorified, as well as the rocky floods of lava with which they have loaded the plains, have a freshness of aspect, such as the products of fire alone could have preserved so long, and offer a striking picture of the operations of this element in all its most terrible energy; and indeed some of the streams of lava near Clermont, are as fresh in their aspect as those which have flowed in Italy within the memory of man.

In addition it may be stated that I observed others of these extinct volcanoes, covered with a thick sod of luxuriant herbage even to the very bottom of the craters. It not unfrequently happens, that of two volcanic cones, touching each other at their bases, the one is perfectly bare and destitute of vegetation, while the other affords a sweet and abundant pasturage. This phenomenon struck me very forcibly, and indicates a chemical difference in the ejected matters worthy of further investigation.

Nothing can be more singular than the unaccountable manner in which plants spring up on certain occasions. Thus after the great fire of London in 1666, a large portion of the devastated city was in a short time covered with a luxuriant crop of the *Sisymbrium irio*, in such profusion, that it was calculated that the whole of the rest of Europe did not contain so many specimens of this plant.

Again, wherever a salt spring breaks out at a distance from the sea, its vicinity immediately abounds with salt plants, although none grew there before. When lakes are drained, a new kind of vegetation springs up. Thus when some of those of the Danish island of Zealand were drained, Vilny observed *Carex cyperoides* springing up, although that species is naturally not a native of Denmark, but of the north of Germany.

M'Kenzie, in his North American tour, speaking of the country bordering on the Slave Lake, says, "it is covered with large trees of spruce pine and white birch; when these are destroyed poplars succeed, though none were before to be seen." Evelyn notices a fact very similar to this, which is observed in England, in Nova Scotia, and in the United States of America, that where fires have destroyed the original wood, the new saplings which spring up are generally different species of trees.

But life is not limited to the surface of the earth. Thousands of worms, snails, slugs, and the larvæ of many insects, form a subterraneous population which live for the most part concealed from observation, but come forth at stated intervals in quest of food. Even caverns which had no previous communication with the open air, have been found, when opened, to contain living vegetable matter. Thus Humboldt saw in a cave just opened at Muggendorf, the beautiful stalactites covered with Lichen tophicola.

But the physiologist is not contented with merely considering the present population of the kingdom of life; the eye of rational curiosity turning retrospectively on the past, discovers a scene still more astonishing, and, if possible, more instructive: for we find that the living beings which have existed within the historical era, are as nothing compared with the countless millions which age after age had tenanted the world, long before Man appeared on its surface.

"Measuring time," says de la Beche, "as Man does, in the minute manner suited to his wants and conveniences, a few thousand revolutions of the earth in its orbit appear to him to comprise a period so considerable, that he feels it difficult to conceive that great lapse of time, which geology teaches us has been necessary to produce the present condition of the earth's surface, *and which, when we even take some great astronomical period as an unit, we still find it impossible to express.*"

Let us then for a moment turn from the present to the past, from what is, to what has been, from the living to the dead, and we shall find the remains of living beings still more universally disseminated, and, with a providence most worthy of admiration, even the relics of death converted into habitations for life, and contributing materially to enrich the scenery, and increase the fertility and extent of the dry land. When we reflect how many islands, and mountains, and what large portions of continents are formed of secondary limestone,—in many cases almost entirely composed of organic remains,—we must yield to animals of ages long gone by, the merit of forming vast tracts of country, eminent for the fertility of their soil and the utility of their rocks, both in agriculture and in the arts.

When we behold coral reefs and islands raised from the depths of the ocean, through the agency of successive generations of animalcules, whose hordes, united by some common impulse, all contributed to rear after a fixed plan the mighty structure, which, firmly rooted in the deep, defies the raging of the elements, affording shelter and an habitation to various animals, we must—to beings so small and so simply organised, that they occupy the lowest rank of animal existence, concede the merit of forming structures, compared to which the most magnificent piles, raised by human labour, shrink into insignificance.

When we consider that, at the bottom of vast lakes, the *cases* or *deserted shells*, in which dwelt the larva of the minute *Indusia tubulata* (the *caddisworm* of fishermen), accumulated in process of time in such immense quantities as, on a subsequent revolution of the earth, to supply solid strata, supporting not only extensive plains, but constituting the sides of deep valleys, and the tabular summits of lofty mountains; we must admit that these apparently insignificant creatures have left behind them a memorial of their existence, which, far more permanent than the boasted monuments of man, has resisted the dilapidating hand of time, and, although torn and convulsed, has not been annihilated by the impetuosity of the flood, or the shock of the earthquake.

By giving birth to new strata, while they overwhelmed and dislocated the old, volcanoes have left indelible and awful marks of a power, at once destructive and creative. Nor has the action of water been less energetic in modifying the surface of our globe, as is proved by the number and extent of formations and strata, produced by an accumulation of marine depositions, but now elevated to the height of eight or ten thousand feet above the present level of the sea. Such convulsions, by resuscitating fires long slumbering in the bowels of the earth, or by calling forth the mighty deluge of waters, have wrought indeed great and wonderful effects, but have scarcely produced more extensive alterations on the surface of our planet, than have been effected by the slower but unceasing agency of living beings. The philosopher who reflects on these things is inspired not merely with wonder, but with awe, seeing that, in traversing the earth, the very rocks which support his footsteps are the tombs of myriads once alive, and finding with amazement the globe we inhabit incrusted, as it were, with a vast cemetery, the records of whose dead are still extant, and may be deciphered by a patient study of the characters inscribed on the strata that contain them.

Had each successive change in the physical state of the earth, its atmosphere, and its waters, been effected tranquilly, then had the corresponding alterations thereby produced in its plants and animals been indelibly recorded in the strata of each period, and the study of geology would have disclosed the history of by-gone ages, arranged in exact chronological order. Such has not been the fate of our planet. Its eras of change have not always been those of quiet transition.

Although portions of the surface of the globe have from time to time undergone violent revolutions, still, age after age of quiescence must have been necessary for the formation of those massive and extensive depositions, consisting almost entirely of organic remains, that occur in the secondary limestone and in the contiguous strata so widely diffused over Great Britain and the Continent. In the examination of these remains, the labours of the naturalist, combined with those of the physiologist, have attained results the most brilliant and instructive. They have enabled us to ascertain that the greater portion of Europe once lay beneath the surface of a shallow sea, of estuaries, or of lakes, whose expanse abounded in islands and was surrounded by low and marshy lands, covered with a vegetation more than tropical. This expanse, our minds can repeople with huge amphibious monsters, belonging to genera now extinct, but which then enjoying the fresh existence of a new creation, disported in the still tepid waters, or basked in the sun's red rays, transmitted through a loaded and aqueous atmosphere, unfitted for the respiration of man, or of birds, but still sufficient for the support of invertebrated animals, fish, and reptiles. The physiologist, in studying the evidences of this era, recognises the wise adaptation of animals to the circumstances in which they were placed, and dwells with admiration on a world teeming with life, at a time that the calcareous precipitate formed in the water, tended gradually to purify the air, and to render it capable of supporting creatures of a higher order; while it enveloped the remains of those then in existence, in such a manner as to preserve them perfect for our inspection. The vast beds then forming under water were in after ages to be elevated, and to become fertile tracts of country, fitted for the reception of man; nor was the vegetation, then so luxuriant, destined to disappear and decay unused. The tree-ferns and lofty palms, that waved in the damp and warm winds, where the highest levels of the still submerged Europe protruded above the surface of the waters—the luxuriant growth of those giant equiseta and reeds, which fringed the lakes, and afforded a lurking place to the enormous ichthyosaurus, and to fierce tribes of crocodiles and alligators; the numberless varieties of aquatic plants, which clothed the stagnant waters with their verdure; those primæval forests, whose depths were tangled by various species of climbers: all these diversities of vegetation continued unchecked for ages, and seemed doomed to moulder and decay, unprofitably for man, then uncreated.

But, behold, a change has come over the scene, and all those accumulated stores of vegetable matter have disappeared without being destroyed; for now, deep beneath the surface of the earth, they lie compressed and carbonised, forming immense strata of coal, in which they are preserved, as by a miracle, from further change, so that thousands of years afterwards, when raised by the hand of civilised man, the stony mass burns with a flame as bright, and with a heat more intense, than can be obtained from the combustion of recent wood.

The inferences drawn from the study of the human body and its functions may be extended to that of other animals, and even to plants;—a circumstance calculated to excite the physiologist to persevere in his observations and experiments, in the hope of throwing light not only on the structure and vital actions of man, but of the whole tribe of animated beings. Thus when we examine the function of respiration in man, we become aware of certain changes produced in the air which has been breathed, and we observe that one of its constituents has disappeared, while its place is occupied by another gas. The part thus used in respiration, we soon discover to be actually necessary for the support of that function, for when it is exhausted or much diminished in quantity, the air is vitiated, and life soon ceases.

Now what an additional interest this single and insulated fact receives, when further observations have extended it into a law equally applicable to the respiration of all animals and plants. What a stimulus to exertion must the reflection prove, that our discoveries are not limited to man alone, but extend throughout the whole animal and vegetable kingdom. Inspired with fresh zeal, the physiologist now examines the respiratory organs in birds, fishes, insects, and plants, and everywhere observes the same effects produced by organs the most different, but in all cases displaying a wonderful adaptation to the general structure of the being, and the peculiar nature of the medium in which it lives.

He finds the bird respiring with ease during its rapid flight through the air. He finds the fish breathing under water, and the worm under ground. When he walks abroad in the fields he finds that the breath of life issues from every leaf of each tree and plant that adorn the scene; he becomes conscious that every living thing derives its vital principle from a common source, and, feeling a sympathy with all around, he refers with gratitude to the First Great Cause, whose laws govern the whole kingdom of animated nature, and he returns to his chamber a wiser and a better man.

The physiologist, from considering the structure and functions of the different orders of animals, at last arrives at a variety of species, which in many respects approximate to plants, and subsist without heart, brain, or nerves. On the other hand, the botanist observes many plants which, endowed with a degree of locomotion* and sensibility to stimuli, seem to approach the limits of the animal kingdom. The investigations of the chemist confirm this analogy, and displaying the animal and vegetable kingdoms still more closely joined together, supply another link of the chain which unites the various ranks of living beings. But chemistry does not stop here, for from this science issues a light still more brilliant, revealing to us, in the most striking manner, the simplicity of the means employed by the Creator in the construction of the earth and all it contains. Thus we find that the very principles, used in the formation of animate, constitute also the basis of inanimate matter, and consequently the infinite variety of animals and plants, which throng with life air, earth, and water, together with the solid basis of the earth itself, its plains, its mountains, and its seas, are composed of ultimate principles, so few in number, that specimens of all might be easily contained together within a nutshell. Nor can the physiologist confine his admiration of the Deity to the display of his power on this earth, although manifested on a scale so stupendous. No, his imagination,

* Since this was written, the more careful study of cryptogamic plants has shown that many of the lower algæ, either as *spores* or as full grown individuals, have powers of locomotion not dissimilar in kind from those exercised by the infusoria.—Note by Professor Harvey.

as well as his reason, will carry him still further, even into the utmost verge of space. When he reflects what an influence gravity, light, heat, and electricity exert upon living beings, and how intimately the two latter appear to be combined with the very existence of the vital principle; when he finds that every system in the universe is subject to the laws of gravity; when he observes that, though gifted with a speed almost exceeding that of the imagination, even light itself cannot escape into a region, where it may wander disobedient to the laws impressed on it at the commencement of its flight; when he finds heat and electricity everywhere borne on its wings; and reflects on all these things, he can scarcely avoid inferring the *ubiquity of life*.

THE POSITION OF MAN IN THE SCALE OF LIFE.

In her operations on inanimate matter, nature pursues a system, which gradually rises from what is simple to what is complicated. In the organisation of living beings the same law is universally observed. Looking at the lowest tribes, we find an organisation the most simple, combined with what may be termed the *unit* of life, and, as we ascend in the scale, we find that organisation more complicated, and the display of vitality more extensive and more intense.

This law is illustrated, when, directing our attention to the formation of the living body, we observe the embryo of a perfect animal from its commencement, and watch all the various and successive changes it undergoes during its progression from its rudimentary state, to that final arrangement, which consists of tissues so dissimilar in their composition, and of organs exhibiting such an endless variety of shape and texture. And it is again manifested, if turning from mere matter, we view it in connection with the principle of life, and examine the effects of this new agent, scarcely discernible in the nascent embryo, but which is in the perfect man not less astonishing, as the cause of his corporeal functions, and as intimately associated with the human intellect.

The physiology of man includes that of the inferior orders of animals, whether we consider their vital functions, the mechanical arrangement of their tissues, or the chemical composition of their bodies. In all these points man forms the summit of the series. In him we find the results of a chemical composition the most refined; in him its products are the most animalised and most varied; in the structure of his body we observe displayed all the wisdom of mechanical and physical contrivance; and in him are found all the varieties, all the actions, of vitality, from those inherent in the scarcely animal zoophyte, to those performed in the most perfect organisation.

In studying physiology, then, we must ascend from the simple to the compound, from the lower order of animals to the human species. Man was not created at a distance from the rest of living beings; no marked and determinate barrier separates him from the other inhabitants of this world; he enjoys like them corporeal vitality, and like them his body withers and dissolves under the hand of death. His high degree of organisation is not attained at once; but the human embryo, though at first similar to that of an animal of the lowest order, has powers within it by which it assumes higher forms of arrangement and composition. With these it discharges more numerous functions; rising from step to step, while its organs, in the progress of their formation, are analogous to those of a successive series of inferior animals. This could be explained more fully were we speaking in detail of the development of the fœtus and of human monsters—an important and instructive subject, for the very irregularities of nature often afford the most useful commentaries on her more regular proceedings.

But if our bodily formation is thus connected with the lowest orders of animals, is there nought in Man which is peculiar to him? Does the human species enjoy no particular attribute, no special mark which at once separates and exalts it above its fellows? Or is Man endowed with no quality which ought to rescue him from the humiliating classification of the natural historian, and vindicate for him a place apart from the subordinate genera of the mammalia of Linnæus? Yes, a consideration of the manner in which the human species has obtained a degree of knowledge and power, so much above all other animals will prove, that, although intimately connected with them in bodily formation and development, Man is separated from them by a well marked line. The same power that breathed into Man's nostrils the breath of life, infused into him a portion of that divine intelligence, which, although infinitely minute, when compared with the omniscience of the source from which it was derived, is yet more than sufficient to exalt him so far above the rest of living beings, that he rises into a distinct class, and by the sole gift of reason is constituted the lord of the creation.

Let us now consider more closely the senses Man possesses, and the means by which they have been made subservient to the exertion and improvement of his reasoning powers. Placed amidst an endless variety of external objects, Man feels himself excited by an external impulse, to inquire into their various qualities and relations, for the perception of which, nature has bounteously granted him senses, few in number, but comprehensive in application. Two of these senses, touch and taste, are destined for the examination of objects brought within his immediate contact; while the senses of smelling, hearing, and vision, extend the range of his observations, and convey information concerning certain physical properties of distant bodies. Of these the sense of touch, including taste, which may be considered a modification of it, conveys the most numerous notices concerning physical qualities, serving to reveal the flavour, temperature, superficial configuration, general shape, and consistency of material objects. The touch, too, is the sense most constantly and unceasingly employed; our bodies, always in contact with matter, can never entirely escape from its immediate influence; for though amidst the silent darkness of night, the senses of smelling, hearing, and vision may lie dormant and unexcited from the absence of their proper stimuli, the sense of touch, so long as we are awake, continues its wonted activity. This sense, too, with all its various modifications, and all the varieties of internal feelings to which it gives rise, preserves its relative importance in disease as well as in health, and thus forming the chief basis not only of our bodily pleasures, but also of our bodily pains, has been considered of all our senses the most closely connected with matter. Hence moral philosophers have decried its pleasures as sensual, and have inculcated fortitude under its sufferings.

Modern metaphysicians, however, seem determined to raise the sense of touch in the intellectual scale, and, acknowledging it to be the most extensive, have endeavoured to prove that it is also the most exact of all the senses. Many have gone so far as to constitute it the corrector of the ideas derived from other senses, such as vision; and some have attributed the pre-eminence of Man, to the exquisite sense of touch with which his fingers are endowed.

Were we to speak of the physiology of the senses, we should have occasion to examine this opinion more at large, and to prove that the sense of touch is as fallible as the rest. At present it is sufficient to remark, that the various senses have each separate claims for pre-eminence as sources of intellectual light. Thus, vision claims the merit of being intended not merely for the direction and guidance of our bodies, or the contemplation of terrestrial objects alone; it requires not immediate contact like the touch, nor, like smell and hearing, maintains a communication with bodies placed within limits comparatively narrow; no! vision, overleaping the bounds of the world we inhabit, brings us information from distances scarcely finite, ranges from planet to planet and from star to star, and seems peculiarly intended by the Creator to intimate to us the infinity of His works.

But let us not, therefore, inconsiderately depreciate the intellectual value of the other senses, or forget what we owe to reason—a gift of the Creator still more precious than even sight. Has the mind of Man in its conversation with the heavenly bodies been limited to the sense of sight? Because we have not touched or felt, are we ignorant of all other physical properties of heavenly bodies, except their form as disclosed to us by vision? Has not our reason supplied the place of contiguity, and enabled us to estimate the distance, the relative size, the weight and density of these remote worlds? Do not many other animals possess senses as numerous as Man, and do not several enjoy a higher development of particular sensual organs, and possess finer and more numerous instincts than have been allotted to the human species? Let us not, therefore, attribute solely to these senses the intellectual pre-eminence of the human race. The sun is not invisible to other animals, nor are the countless stars of the firmament hidden from their view. These objects are seen by them but not understood; they make an impression on their senses, but this impression not becoming the subject of reasoning and reflection, the perceptions admitted through the agency of the senses serve merely for the guidance of their bodies, and are scarcely converted into food for the intellect. And so it was with Man in the infancy of the human species, before his reflective powers, aided by experience, enabled him to avoid the errors his sensations would have led him into, if implicitly relied on. Although Man in his primitive state stood erect, and seemed, from the very position of his body, formed to contemplate the heavens, yet, for ages, his notions concerning what he saw were confined to direct deductions from the testimony of vision. The shepherd remained as ignorant of the distance or size of the heavenly bodies as the flocks he tended: and century after century passed away before Man became aware that the stars are not small lucid points fixed on a solid vaulted firmament; before the science of astronomy, while it proved the immensity of the sphere of vision, proved likewise the fallacy of that sense. And so it is also with our other senses, for, although they are the original sources of all our acquired ideas, and, consequently, of our knowledge, yet, in the first instance, they are the most fruitful sources of error. Many of the deductions we appear legitimately to draw from their evidence, are afterwards detected to be erroneous, by a persevering application of our reasoning powers, guided by further experience. Yet (as in the instance already referred to with regard to vision) so strong and so intuitive appear those primary deductions, that they have in many instances survived for ages. Had not Man been created a social being, capable of communicating his ideas to his fellow men, it is more than probable he never would have emancipated himself from the erroneous thraldom of his senses, and thus the natural springs of intellectual light would have been converted into sources of intellectual darkness. Happily, however, the power of inventing sounds to communicate his ideas, and signs to record them—Language and the Art of Writing, have extended the sphere of mental exertion, from the narrow limits of individual minds, to the collective intellect of the species.

In order justly to appreciate the intellectual importance of the sense of hearing,—in order to estimate how much the human intellect owes to language, and to the collective exertions of which language is the instrument, it is merely necessary to study the progress in knowledge that one individual, unassisted by this instrument, is capable of attaining. We need only refer to the intellectual condition of him who, being born deaf, is thus separated from the rest of his species by a double barrier, which, on the one side, prevents him from communicating his own ideas and sensations to his companions, and, on the other, shuts him out from the benefit of their reflections and experience. It is true he has the use of all his other senses, the other inlets for sensations and ideas are all open; he *sees*, but the various objects which attract his regards and fix his attention, are to him a vain and useless show, of which no voice affords an explanation. When a child, the deaf man labours under all the errors of childhood; and, when he has become a man, few of these errors have been removed; he scarcely knows that he had a beginning, for this knowledge he could receive only on the testimony of others, and suspects not that he is to have an end. The awful word *death* has never sounded in his ear, nor do the forebodings of a future state awaken in him any anxiety. He has feelings, sensations, and some ill-defined, indistinct, natural emotions, but he knows not that others have similar feelings or ideas. He consequently can feel neither the pangs of sorrow nor the consolations of sympathy; he shares not the griefs of his companions, nor unloads his own breast by imparting his misfortunes to a friend. In short, he is completely insulated, his sensations and ideas have reference to himself alone; and, thus circumstanced, he presents the extraordinary spectacle of one externally conforming to the manner and usages of refined society, but who is completely ignorant of human laws, customs, and religion; and what is still more remarkable, he is almost completely insensible to all those affections, which form the golden links of the social chain. Compare the condition of the uneducated deaf and dumb with that of the tribes which occupy even the lowest scale among barbarians: compare them with the Guaranis of South America, who, as the apes of their native forests, live in trees, from which, like parasitical animals, they derive both habitation and nutriment, and the comparison will be much in favour of the latter.

Before we turn from this humiliating picture, it may be remarked that it ought to afford an instructive lesson, not only to the metaphysician and philosopher, but to him also, who, foolishly proud of his own intellectual powers, forgets what a vast portion of his knowledge he owes to one frail sense, by which he has been enabled to borrow from others. It has been truly observed, that the senses of smell and taste seem more subservient to the body than to the mind. A man might be born without either, and yet grow up to attain the most extensive range of human knowledge; whereas, were he born at once destitute of sight and hearing, his body might be matured, but in his intellectual attainments he would scarcely exceed the lowest order of animals. The loss of these senses in old age may be partly recompensed by the memory or imagination; but the want of them in infancy almost totally prevents even the dawning of the mental faculties.

In the human subject we sometimes meet with instances of malformations, by means of which one or more senses are absent. Thus, in a curious case by Mr. Davies Gilbert, late President of the Royal Society, it is related of a young lady who had attained the age of seventeen years, but who, shortly after birth, became perfectly deaf, and also blind, that she never acquired anything like the power of voluntary motion. She had never held up her head, raised her hand to her mouth, or set her foot on the ground. Although lean, still she was of good stature. She was never heard to utter anything like an articulate sound, and a feeble cry or whine, the only sound heard from her, was believed to indicate the want of food. In fact, she exhibited proofs of possessing only two out of the five senses—taste and touch—and the latter very imperfectly. Thus, all the avenues to knowledge being closed, her mental development was completely prevented, and she afforded the miserable spectacle of a human being, endowed with animal life and perfect to the eye in bodily conformation, but totally destitute of intellectual development.

Having stated the obvious proposition, that in Man the want of the more important senses, as the sight and hearing together, will cause the human mind to sink in the intellectual scale even below many of the lower animals, we should not forget the equally obvious truth, to which, indeed, I have already adverted, that many animals have their senses as perfect as Man; and, nevertheless, in mental powers are so far inferior, that they may be considered as placed at an almost immeasurable distance below him. This observation applies to the whole class of mammalia, in many of which the hearing is more acute, the sight sharper, and the smell more perfect than in the human being. The only senses Man seems to possess in a greater degree of development than all the rest of the mammalia, are the senses of taste and touch; but we have already seen that this superiority, when considered with reference to the intellect, can be of little importance. Happy had it been for Man had this intellectual progress been interrupted only by those natural difficulties that for a time impede, but finally strengthen, the powers of the common intellect. But Man is social in his passions as well as in his reason; and the frame of society has been at times so fearfully convulsed by the baneful influence of the former, that more than once has the human mind retrograded, more than once has night suddenly and unnaturally reappeared, and more than once have ages of darkness returned to brood over the intellectual world, after a period when the daylight, though young, seemed firmly established.

To the historian belongs the interesting task of reviewing the different causes which have contributed to produce the ebbings and flowings, the manifold retardations, and the varying phases of the human mind. It will be sufficient to remark here, that its progress, since the invention of the art of printing, has become steady and uniform. The stream of knowledge, which not many centuries ago, shallow and narrow, toiled painfully to wear away or avoid the obstacles that impeded its course, now fed by a thousand new sources, flows along deep and rapid, sweeping away every obstruction, and defying all human opposition. Mankind being thus arrived at the maturity of collective intellect, we are every day surprised at the results obtained by the vast mass of mind now diligently employed in the acquisition of knowledge. What was formerly the termination of a science is now but its commencement; what was formerly deemed unattainable is now elementary; so that it is impossible to foresee how far improvements may be carried. A short and transitory existence has been allotted to our bodies; individuals die, and generations pass away, but the common intellect of mankind fears not the same fate, nor shares the same brief mortality.

THE INFLUENCE OF LIGHT.

PHYSICAL agents which affect life may be divided into two classes; first, those which always exist and are termed constant, from whose influence living bodies cannot be withdrawn, and which act also on dead matter. We find that beings endowed with life are subject to the influence of laws which regulate the condition of dead matter; thus we find that solidity, fluidity, cohesion, gravity, and the laws called chemical, are always in operation. These are the constant physical agents, the principal causes always at work, and never ceasing in their action. The second class of physical agents are those which act with not less power than the former, but which vary in their intensity, and from one of which, as for instance, Light, the body may be subtracted altogether. As to the remaining agents, namely, heat, electricity, and air, no human body can be wholly removed from them without danger. On a general view of the subject, the operation of the first of these influences seems to have limited life to the surface of the earth, the outer crust of which is its sole habitat, the remaining solid matter of the earth being, with regard to the support of life, totally useless.

The physical agents which do not vary are the same in all climates. Their influence, which is so permanent, seems also to be so necessary, that were any one of them to be altered, the whole living machinery of the earth would stop, from the animalcule to the whale, and from the byssus to the oak. If water were to become solid at 100° instead of at 32°, no living being as now constituted could exist. If gravity were diminished on the earth, a thousand inconveniences would be felt by all, and though we do not see any reason why life should cease at once, as in the former instance, still the amount of inconvenience would be enormous and intolerable. Thus if it were suddenly reduced to the force which it exerts on some of the ultra-zodiacal planets, as Ceres and Pallas, "a man," says Herschel, "could spring with ease sixty feet high, and sustain no greater shock on coming to the earth than he does now from leaping a yard. Giants might exist, and that enormous animal the whale, which now requires the buoyant power of water to counteract its weight, might then be a denizen of the land." I might bring forward many other illustrations, but shall not dwell on these matters, as they are sufficiently obvious and generally known.

With regard to living beings, it may be observed, that, as a general law resulting from the constitution of the terrestrial surface and of matter, animal life must, as to date, follow vegetable. Some think there are exceptions to this law in the case of carnivorous animals who do not subsist on vegetable productions. But these live upon other animals, which, however, are found to live on vegetables. Vegetables always constitute the last link of the chain of nutrition, and are the chief laboratories used by nature for the support and reparation of living matter. Many of the lowest grades of animals seem to possess a power similar to that of vegetables; thus we find that some species of the mollusca appear to be capable of feeding on rocks composed of carbonate of lime. But this power ceases as we ascend in the scale, and the more perfect animals subsist only on matter that has passed through a system of other living beings. This appears to be the law which regulates not only the comparative dates of animal and vegetable life at present, but which seems to have existed since the creation; for, on examining the strata of which the earth is composed, we have abundant and satisfactory proof that vegetable preceded animal life by many centuries, and that it flourished in full luxuriance long before animals were called into existence. As to extent, it is obvious that vegetable life, constituting the food of animal, must exceed it in extent, and if all the animal matter existing in the world at any particular period were weighed, it would be found inferior in weight to the vegetable matter existing at the same time.

Let us now consider life as existing in the air, the waters and on the earth, so far as the varying physical influences will permit it. First, with respect to light. We know that the permanency and integrity of those physical influences which are constant, and always act with the same degree of intensity, are essentially necessary for the existence of living beings, but it becomes a question whether the varying influences, as, for instance, light, be equally indispensable. Can any living thing, animal or vegetable, subsist in utter darkness? Some, perhaps, would answer, no doubt there may; and would cite the example of the seed buried under ground, so that no light can possibly approach, and yet the process of germination goes on;* or would refer to the fœtus in utero living and growing in utter darkness. But we should recollect that the seed has received a certain stock of food and latent life from the parent plant, and that the fœtus is ultimately connected with the system of the mother. It might be urged that animals have existed for a very considerable period without light, as toads in wood and certain kinds of rock, in which it has been proved that they must have remained for a long time in darkness. This

* "It is well known, indeed, that seeds will not germinate in the light; this is caused by light decomposing the carbonic acid gas, expelling the oxygen, and fixing the carbon, whence all the parts become hardened, a condition under which vegetation cannot proceed."—*Lindley's Introduction to Botany.*

certainly is the case, and it is true that those animals were alive though long deprived of light, but it was only a suppressed kind of vitality; life was preserved, but not in its natural state of intensity. There are but very few facts to prove that any animal or plant can or does exist in places totally destitute of light. In perfectly dark caves, though moist, ventilated, and affording, by the streams which pass through them, entrance to seeds, we never find anything but the least organised cryptogamic plants, such as Byssus evanida, Mucor decumanus, and very often not even these or any other species of vegetable. It is true that Humboldt asserts that lichens have been found even in caverns which have been closed up, and have had no communication with the surface. Thus he saw, in a cave which had just been broken into at Muggendorf, the beautiful stalactites covered with Lichen tophicola. The occurrence of byssus in perfectly dark places, as seen by Pallas in a cave in Siberia, is not so conclusive, for such matters seem to be more the result of new arrangements among the particles of previously organised and living animal and vegetable matter, than new, and individual forms of vegetation. Their life appears to be traditional and limited, and the stock seems to depend on that laid up by the previously living plant or animal. Hence it is that we so often observe the byssus on the fæces of different animals.

But next comes the question with respect to the animal and vegetable tribes that inhabit the deep. It is a fact acknowledged by those who study physics, particularly the laws which regulate the transmission of light, that the rays even of a vertical sun do not penetrate more than one hundred fathoms below the surface of the sea. If, then, we assume, as there is reason to bel eve, that the ocean is several miles in depth, some thinking it to extend to ten, others, nearer the truth, limiting it to three or four, what a striking image it suggests to the mind; a vast portion of the surface of our globe covered by waters which light never penetrates, where a fluid black as night has for ages brooded over its bed in unbroken darkness! If to this idea, so well calculated to heighten the horrors of the deep, we add, that if light be necessary for the existence of animal and vegetable life, we have the equally awful idea of an immense tract of ocean-depths, whose loneliness is undisturbed by the presence of any living being, and where the eye of the imagination can picture to itself only a black and desolate mass of fluid, not only uninhabited but uninhabitable.

When we examine the ocean more attentively, and with a view of discussing the question, whether any of its countless inhabitants are tenants of that portion of the black abyss where daylight never enters, we find reason to believe that the great majority of marine animals inhabit the upper portion of the deep, or those shallower parts which lie in the vicinity of continental or island shores; in fact, that by far the largest quantity of life courts the surface, and that a very small proportion dwells beyond the utmost point to which the rays can penetrate. But with respect to the question before us, there can be no doubt that the absence of light is unfavourable to vitality, and this appears to be the reason why we observe life so abundantly diffused in the neighbourhood of coasts, where nature has spread out a considerable extent of sea within soundings, and rarely amounting to one hundred fathoms in depth. If we take that portion of the sea surrounding Great Britain, the depth of which is within one hundred fathoms, we shall find it to extend from Norway over the German Ocean, and so on by France to the coast of Spain, which, with the quantity of sea within the same depth encompassing these islands, will give an extent of surface as large as all Europe, the greater part of which receives some portion of light, and is consequently a fit habitat for living creatures. Hence it is, too, that shoals and sandbanks, such as we find near the coast of Newfoundland, teem with millions of living beings, furnishing, year after year, those inexhaustible swarms of fish, which afford employment and food to so many thousands of our countrymen.

I regret that the data in my possession do not enable me to answer the question directly, as to whether the dark and rayless regions of the deep are wholly tenantless. It is true, that Biot, as quoted by Pouillet, speaks of fishes which usually live at a depth of from five to six hundred fathoms. It is perfectly obvious, that if any species of fish were destined to live in darkness, it would be quite contrary to the economy of nature to give them eyes, and as all known fishes have eyes, their natural abode must be far above this depth, and within the zone of light to which the red rays penetrate, and this we have already seen does not exceed one hundred fathoms. Wherefore, until such fishes are discovered, and it has been established that they are without eyes, I should be unwilling to admit that any species of fish are inhabitants of the dark abyss. The assertion of Biot is also disproved by the fact, that fishes which live at a great depth from the surface, are generally furnished with very large eyes; thus we find, that the Pomatomus telescopium, which is fished up from a great depth near the coast of Nice, possesses a very large visual organ. If any thing further were necessary to show that this position was untenable, it would be the palpable absurdity of nature giving unusually large eyes to fishes inhabiting low situations, and merely ordinary eyes to those which dwell in parts far deeper and darker.

"It is a curious fact," says de la Beche, "that all the mollusca known to us have been found, with perhaps a few rare exceptions, with living animals in them, at depths less than one hundred fathoms." This furnishes a new and interesting subject for investigation, for it would seem to show that the depths of the ocean are untenanted, and that there is a vast space of it solitary and uninhabitable.

Other circumstances besides the absence of light are supposed to limit the depths at which animals and vegetables may exist. Thus it is said, that at great depths there is not a sufficient quantity of air combined with the water to answer the purposes of respiration. On this point, however, nothing certain can be affirmed, and those who imagine that air does not pervade the deeper parts of the sea, confine themselves to mere assertion. If the water in such situations was entirely devoid of air, neither fishes nor any other thing endowed with life could exist, for respiration is common to all. It has been inferred, indeed, from the composition of the air in the swimming bladders of fishes, that the oxygen of the atmosphere penetrates deeper into the ocean than the nitrogen, for the latter is found to be almost entirely absent, or only in the small proportion of one-tenth, in the bladders of those taken from a great depth, while in the bladders of those which inhabit shallow waters, we find the air to consist of nearly pure nitrogen. With respect to this it may be observed, that the facts brought forward are quite insufficient to authorise us to draw any such inferences, and I think we should rather attribute the relative proportions of the constituents of air as found in the swimming bladders of fishes, not to the composition of the air combined with the water at any given depth, but to the secreting power of the air-bladder itself.

But, in addition to the absence of light and the supposed want of air combined with the water, it is plain that animals, living at great depths, must be calculated to bear enormous pressure from the vast mass of superincumbent fluid, and must therefore be of a different structure from land animals. Bodies on land are subject merely to the weight of the atmosphere, but if a man descends in a diving-bell to any depth, he finds that he has become subject to a new and very considerable inconvenience from the increased pressure. At the depth of thirty-two feet he bears a double atmospheric pressure. Again, if he ascends a high mountain, such as Mont Blanc, his physical powers are much weakened by the diminished atmospheric pressure, and dangerous consequences are apt to ensue. "A creature (observes de la Beche) living at a depth of one hundred feet, would sustain a pressure (including that of the atmosphere) of about sixty pounds on the square inch; while one at 4,000 feet, a depth by no means considerable, would be exposed to a pressure of

1,830 pounds on the square inch. It will be obvious, from our knowledge of the structure of animals generally, that we cannot, with any reference to that structure, more particularly to that of the delicate vessels, suppose any one creature capable of sustaining such enormous differences of pressure with impunity. We cannot conceive that the same animal could live equally well near the surface, and at a depth of 1,000 fathoms, more than we should consider that a man would feel himself equally comfortable at small heights in the atmosphere, and at an elevation of 30,000 feet above the level of the sea." We may, therefore, safely conclude that all marine animals which are furnished with eyes, live habitually within the depth of 100 fathoms; their organs of vision indicate the luminous upper stratum of the ocean as the usual place of their residence, beyond which the increased pressure they encounter in passing downwards, must prevent them from proceeding, except occasionally, and for short spaces of time. "Creatures living in the atmosphere," continues de la Beche, "all other things being the same, would, however, suffer less in proportion from a given amount of vertical change of place, than creatures living in the sea." Thus we find that the condor of the Andes darts from one of the highest peaks, along the western declivity of Pichincha to the very brink of the sea, thus traversing all climates in a few seconds, from a barometric pressure of twelve, to one of twenty-eight inches.

Lyell mentions that when companies were formed in England to work the mines in Mexico, some of the English miners who were sent out, being fond of field sports, brought greyhounds with them, to have the pleasure of coursing on the Mexican mountains, which abound in hares. They found, however, to their great mortification, that the dogs were quite unable to come up to the hares of Mexico. This is explained by recollecting that these greyhounds, being transferred from the low and flat lands of England, to a mountainous country raised several thousand feet above the level of the sea, and thus experiencing a considerable diminution of atmospheric pressure, became short-winded, and incapable of running down their game. But in the course of a few years, their offspring, which were born and brought up in the new country, having their chests and respiratory systems adapted to this elevated situation, proved themselves in running down hares, fully equal to their parents in England.

I may observe here that some marine animals appear to possess the power of bearing enormous pressure. Thus the whale when harpooned, or when pursued by his enemies the narwhal and sword fish, dives to a vast depth in attempting to effect his escape. The sword-fish which has harassed him near the surface, follows until he can go no further, and then rising to the surface awaits the return of the whale, who, being placed by his deep descent in an unnatural condition, becomes so weakened by it, that when he again rises he falls an easy prey to his enemies. Captain Scoresby observes, p. 135 of his work, that when attacked, the whale generally dives at once to an immense depth. "It may assist," he says, "our comprehension of the enormous load that the whale endures, when it descends to the depth of 800 fathoms, which it is often known to do, to be informed, that the pressure of the water at this depth on the body of a whale must sometimes exceed the weight of sixty of the largest ships of the British navy, when manned, provisioned, and fitted out for a six months' cruise."

Such are the most interesting facts connected with the question, whether animals can exist at great depths of the ocean, and far beyond the limits of light. On the whole, it would appear that we have not a sufficient number of data, to enable us to determine the depths at which living animals may exist. I have expended much labour on this subject, for it is by no means beneath the notice of the physiologist, but have not yet been able to satisfy myself, as to the lowest situations in which invertebrated marine animals may exist, or whether those found at great depths be merely temporary sojourners, or constant inhabitants of such localities. That some invertebrate animals live beyond the extreme limits of light, would appear from an observation made by Captain Scoresby, while on the coast of Greenland. He says:—"The sea here not being unfathomable, as in the more eastern fishing stations, the line of the first fast boat had lain for some time on the bottom; on its being hauled in, several fine specimens of the beautiful species of star-fish, *Asterias caput Medusæ* (*Astrophyton scutatum*) were found clinging to it. The depth of water here was about 250 fathoms." It is to be observed here, that these specimens of star-fish are described as being extremely beautiful, that is to say, their colours were strongly marked, and of great brilliancy. Now, reasoning from analogy, it would appear to be very unlikely that such distinct and brilliant colours would be met with in these animals, if they had been born and spent their lives at so great a depth from the surface as 250 fathoms. We know that plants reared in darkness lose their colours, and we are also aware that the absence of light, has a somewhat similar effect on animals, and therefore it is very probable that these star-fish were only temporary sojourners at this depth.

We may now refer to the influence of light on the vegetable world. We all know what delicate indices plants are of the different atmospheric changes connected with light; many of them unfold their beautiful flowers to the warm sunshine, but close them up so soon as the sun has been obscured by clouds. We are also acquainted with the fact that some plants open their flowers in the morning, others at noon, and others again in the evening, so that a person may thereby almost guess the hour of the day.

It was long since remarked by Priestley, that if leaves are immersed in water and placed in the sun, they part with oxygen. This fact has been subsequently demonstrated by a great number of curious experiments made by Ingenhouz, Saussure, and Linebier. Saussure found that plants in cloudy weather and at night inhaled the oxygen of the surrounding atmosphere, but as soon as they were exposed to the rays of the sun, they expired the oxygen they had previously inhaled, in about the same quantity as they had received it, and with great rapidity. Dr. Gilly found that grass leaves exposed to the sun in a jar for four hours exhaled a considerable quantity of oxygen. Heyne tells us that the leaves of *Bryophyllum calycinum* in India are acid in the morning, tasteless at noon, and bitter in the evening. Link found that they quickly stained litmus-paper red in the morning, but scarcely produced any such effect at noon. The same phenomenon is also said to occur in other plants, as *Cacalia ficoides, Sempervivum arboreum*, &c. This stain of the litmus-paper could not have arisen from the presence of carbonic acid, as that gas, when dry, will not alter blue paper, but must have been connected with the inhalation of oxygen at night. It has been found that this last power is retained even at noon, if the plant is not exposed to the sun. The phenomenon, remarked by Pagot de Charmes, who found that the flowers of the *Cichorium intybus* were daily changed from blue to white, according to the action of the light, would admit of a similar explanation.* It is well known that fruit is more acid in the morning than in the evening.

I need not observe that the flowers and leaves of all plants court the light; indeed this tendency is manifested sometimes in a very curious manner. This is exemplified in the various flowers which adorn the dark and comfortless abodes of the tradesmen in the Liberties of Dublin. These poor creatures (for however poor the being is, or however confined by the nature of his employment, he never forgets the green freshness and living loveliness of nature) delight in flowers and birds,† and in their windows will

* I have nowhere seen an explanation of the very singular change of colour produced by heat in common fuci; I remarked it many years ago when employed in preparing an *hortus siccus*. When a hot smoothing iron is passed over the fronds of the *fucus serratus, f. vesiculosus*, or, indeed, of any of the common reddish-brown sea-weeds, their natural colour is instantly changed to a bright green, which is permanent; hot water effects the same change.

† The sale of caged singing birds is very considerable in Dublin, and, it is remarkable, that the greater number are bought by the room-keepers who live in the narrowest lanes and alleys of the city.

frequently be seen a geranium, almost as sickly as its owner, turning its lank and stunted leaves with unvarying constancy towards the light. It is a curious fact, that if these plants be harassed, or, if in other words, their position be continually changed, after they have arranged themselves for enjoying the light, so as to oblige them to do the same thing over and over again, the constant expenditure of vitality necessary to accomplish these changes, wears out the plant, and prevents its proper development.

Dutrochet seems to think that it is only in the coloured parts of plants that we find this tendency to seek the light. "Stems," says he, "are generally directed towards the light, and this is in accordance with their colour, which is usually green, while the roots have a tendency to avoid the light, coinciding with their want of colour. The colour of the roots is, in fact, nothing but that of the vegetable tissue, and can by no means be compared to that of the petals of some plants, which arises from the presence of a white colouring matter. Light, the principal but not the sole cause of the colour of stems and of their organs, has no power of infusing colour into the roots, as may easily be seen in roots growing in a glass of water. Here, in spite of the influence of light, the latter constantly remain colourless, and this does not depend upon immersion in water, because leaves immersed in that medium are nevertheless green. Although roots in general have no tendency towards the light, yet such a disposition does become manifest, *provided the terminal shoot of a root becomes slightly green,* as occasionally happens.

"Having induced some seeds of *Mirabilis jalapa* to germinate in damp moss, I remarked that the young roots, when about as long as the finger, were terminated by a shoot of slightly green colour. Wishing to know whether these roots would turn towards the light, I placed them in a glass vessel filled with water, having a wooden cover pierced with holes to receive the roots, and then enveloped the vessel in black cloth, leaving only a narrow vertical slit through which light could enter the interior. This slit was exposed to the rays of the sun, and a few hours after I found that all my roots had bent back their points towards the slit, through which the light was introduced. The same experiment was tried with colourless roots, but no alteration in their direction was produced. From this it appears evident, that colour is one of the conditions which determine the direction of vegetables and their parts towards the light, and consequently towards the sky.

"This is so true, that colourless stems are known to assume the direction of the roots. In the *Sagittaria sagittifolia* this is particularly obvious. Shoots are produced from the axillæ of all the radical leaves which grow at the bottom of the water; these shoots have their points directed towards the sky, like those of all vegetables. The young stems produced by these shoots are entirely colourless, like roots, and instead of taking a direction upwards towards the sky, as coloured stems would do, they turn downwards, pointing towards the centre of the earth. These subterranean stems next take a horizontal course, and do not assume any tendency towards the sky, until the points become green."

Dutrochet has remarked a similar phenomenon in roots. "It is well known," he says, "that the exposed stems of many plants produce roots. When green, these turn upwards, as in the *Pothos* and *Cactus philanthus*; when colourless, they point downwards. Hence it is to be inferred, that stems do not ascend merely because they are stems, but because they are coloured; and that roots descend not in their quality of roots, but because their parenchyma is colourless."

So far Dutrochet. It appears to me, however, that this argument is fallacious. The facts adduced merely prove that the parts which are attracted by light are also generally coloured, or, in other words, that colour and irritability to light commonly go together. But it might as well be said that the irritability to light was the cause of colour, as that the colouring matter was the cause of irritability. These properties are both related to light; both, too, are equally useful, but there is no necessary connexion as cause and effect between them, as is evident from a fact adverted to by Dutrochet himself. The radicle of the parasitic mistletoe is of a paler green than the outer parts, and, instead of turning towards the light, it avoids it with so much pertinacity, that it is impossible to induce it to take such a direction, so that it seems to be repelled by the light.

This theory, however, has met with a very favourable attention; it has been adopted by Lindley and some others, and it may not be amiss to trace it further. Dutrochet says that "the action of light is so powerful on the leaves of plants, that not only does the upper surface of the leaf turn towards the sky, and the lower towards the earth, but that, if the position of the leaf should happen to be inverted, this disposition causes the petiole to twist round, so as to enable the deranged leaf to recover its former aspect. Here we have the theory exemplified in the fact, that the deeper colour turns towards the sky or light. And this is so constant a law, that it will be found that if that surface of the leaf, which is naturally inferior, is more deeply coloured than the superior, the petiole will be twisted round by the greater affinity of the lower surface for the light, which will thus become uppermost, the leaf presenting the appearance of an inverted leaf. This may be seen in many grasses, but particularly in the *Zea mays, Triticum repens*, and *Agrostis rubra*. Hence it is to be concluded, that the upper surface of the leaf is not turned towards the heavens, merely in consequence of its quality of being the upper surface, but because it is generally most deeply coloured."

Here it will be necessary to inquire, in the first place, whether the proper under surface of such leaves was of a deeper colour before it turned upwards. In the next place, the fallacy of this conclusion is clearly proved by a fact that Dutrochet has entirely overlooked, viz., that while rolled up in the bud, and while very young during the process of unfolding, most leaves exhibit little or no difference of colour on their surfaces. The shape of the petiole, and its mode of attachment to the stalk, would appear to be the cause which first determines the relative position of the surface of the leaves. At the very first moment when the bud begins to expand, the central leaflets exhibit the proper direction of their upper and under surfaces, and this occurs at a time when both are equally shaded from the light. Again; according to this theory, we should have the leaves of plants growing in the dark with their upper surfaces turned in every direction,—some upwards, others downwards. This, however, is not the fact. If, according to Dutrochet, it is depth of colour which determines the position of the surfaces of leaves, it would be natural to infer, that here, where there is an absence of colour as well as of light, and consequently nothing to regulate the relative positions of the leaves, we should find their surfaces taking every direction indiscriminately, which is contrary to the fact, plants in this condition, being known to arrange their leaves in the same way as if they had been constantly exposed to the full glare of day.

The following observation, from *Silliman's Journal,** affords a strong proof of what I have stated:—"It frequently happens in America, that clouds and rain obscure the atmosphere for several days together, and that during this time the buds of entire forests expand themselves into leaves. These leaves assume a pallid hue until the sun appears, when, within the short period of six hours of a clear sky and a bright sunshine, their colour is changed to a beautiful green. One writer mentions a forest on which the sun had not shone for twenty days. The leaves during this period were expanded to their full size, *but were almost white.* One forenoon the sun began to shine in full brightness; the colour of the forest absolutely changed so fast that we could perceive its progress. By the middle of the afternoon the whole of this extensive forest, many miles in length, presented its usual summer dress." Here, according

* No 13, p. 193.

to Dutrochet's theory, previously to the appearance of the sun, many of the leaves ought to have been turned upside down.

Dutrochet has also endeavoured to establish the same law with respect to the petals: but here there are obvious difficulties to contend with. Thus he has not been able to account, in anything like a satisfactory manner, for such exceptions as are presented by the *Digitalis purpurea* and *Fritillaria latifolia.* His next observation is more interesting. The part I quote is taken from Lindley's *Botany.* "From the following and some other experiments, M. Dutrochet infers, that the direction of leaves to the light is not mechanically caused by the operation of an external agent, but is due to a spontaneous motion put in action by the influence of external agency. He took a leaf and cut off the petiole, the place of which was supplied by a hair hooked by one end upon the leaf, and having a piece of lead attached to its opposite extremity. They were then plunged into a vessel of water; the weight of the lead carried the leaf to the bottom of the water, where it stood erect, in consequence of its lightness inducing it to attempt to ascend. Being exposed in a window, so that the under surface was turned towards the light, no alteration in its position took place. Now, as from Bonnet's experience, it is certain that leaves immersed in water act exactly as if surrounded by air, it is to be inferred that the external influence of light is of no effect, unless aided by a spontaneous power within the vegetable, which was destroyed in this instance by the removal of the petiole. Leaves, immersed in water with their petioles and stem uninjured, under similar circumstances, turned towards the light as they would have done in the open air. The power thus supposed to exist, in all probability depends on the same nervous matter which has elsewhere been shown to exist in all plants, and especially in those called *sensitive.*"

I shall conclude my quotations from Dutrochet's work with the following observations:—"On the other hand, many of the plants and zoophytes which inhabit the salt or fresh waters, manifest an aversion to a strong light, and seek to maintain themselves in a moderate degree of light. They rise towards the surface of the water during the morning, retire again to the depths during the mid-day glare, and again approach the surface in the evening. Many species of the confervæ, for instance the *Conferva amphibia* and the *Conferva frigida*, grow only during the autumn, winter, and spring, and disappear in summer, when the water is no longer in sufficient quantity to protect them from the perpendicular rays of the sun. Mosses and ferns endeavour to defend themselves from too much light by selecting the north and north-west sides of trees, hedges, or rocks." This is well seen on visiting the Irish round towers, the northern and north-western surfaces of which exhibit, in many cases, as at Cloyne, a luxuriant growth of cryptogamic vegetation, while the opposite parts are comparatively bare. It is well known that the Indians and backwoodsmen of North America are frequently assisted in finding their way through the forest by examining the trees, which indicate the north, by means of the greater quantity of mosses, growing up on that side of the trunks. In fine, several of the algæ are to be found only among the most shady woods, or within the recesses of caverns, where they enjoy the almost total absence of light.

So much concerning the action of light on plants. I shall now speak of the remarkable manner in which it modifies the phenomena of animal life. Before I enter on this subject, however, I may remark, that the life of plants is affected in a very remarkable manner by external agents, and hence it is, that even trees of the same species sometimes differ very much in their texture. The hardness of the wood of trees varies greatly in different situations, and this depends not only on the peculiarities of the soil and the presence or absence of a humid atmosphere, but also on the quantity of light to which the tree is exposed, and the exercise it takes during its life. It seems an odd thing to talk of the exercise of trees, but this is only an expression of the fact. In this country, but particularly on the western coasts, where the Atlantic blasts sweep roughly over the land for many months in the year, the trees have too much exercise, and are consequently somewhat stunted in their growth. Homer tells us, that the heroes of old used to cut the wood for their spears from trees growing in an exposed situation, from a conviction, and it was a just one, that the toughest wood is to be obtained from trees constantly exposed to storms. Trees which grow in thick groves, as beeches in some parts of America, may present a very fine appearance, but they are good for nothing but firewood. Speaking of such trees, a recent author observes:—" These trees are so close together, as to exclude every ray of the sun, as well as to impede the action of the atmosphere; and the consequence is, that when a log of beech-wood is brought out of the forest into the open air, it rives and splits in a most extraordinary manner. This is, indeed, the case with most other wood; and it explains why hedge oaks, or trees that have grown singly and been thoroughly exposed to the air, are less liable to split, and therefore preferable in ship-building to those which have grown in a wood." This may explain the preference given to the hill-grown pines of Norway over those of Canada, and to the British over the American oaks.

I may here allude to the interesting experiments of Edwards, made many years ago, and now pretty generally known, in which he has shown in what a remarkable manner light modifies the development of animals. The want of light may explain the peculiarities of some animals, such as the *Proteus anguinus,* which have been looked upon as anomalies in nature.

Edwards has pointed out the curious fact, that, in France, persons who live in caves or cellars, subtracted for a great portion of their existence from the influence of light, are apt to produce children wanting or deformed in the upper and lower extremities, and similar examples have been met with in Dublin. Here we observe a singular arrest of development in the offspring of persons who spend the greater part of their time in the dark, a fact analogous to that brought forward by Edwards respecting tadpoles reared up in a total deprivation of light. Linnæus, in his account of his tour through Lapland, enumerates constant exposure to solar light, as one of the causes which render a summer journey through countries situated in high northern latitudes, so peculiarly healthful and invigorating. I have remarked that scrofula is a frequent inmate of porters' lodges in the country. These are often nearly overshadowed by a dense foliage, which may contribute to produce disease, by excluding both light and ventilation.

When light is brought to act fully and forcibly on an organ fitted for its concentration, it exerts a very considerable energy in modifying the functions, not only of the organ immediately acted on, but also of those which are closely connected with it by sympathy. Hence the reason why a glaring light gives exquisite pain to a patient labouring under ophthalmia, and hence it is, also, that light, in cases of cerebral fever, which disposes the patient to suffer acutely from its influence, may, through the medium of the eye, bring on violent paroxysms. There can be no doubt that, in most of the inflammatory affections of the brain and eye, light is highly intolerable and injurious, and, even in the healthy state of the eye, we frequently observe that a ray of sunshine suddenly falling on the organ, will produce the strong convulsive action of the expiratory muscles which we term sneezing. In fact, exposure to more than a certain quantity of light, for any length of time, proves disagreeable to man, as well as to all other animals. On the other hand, I need not say how necessary light is to the health and existence of human beings. Plants growing in dark places are meagre and sickly; so are animals, and modern pathologists have assigned to this cause its full agency in their enumeration of the predisposing causes of scrofula, one of the most widely diffused and pernicious of human maladies. The development of scrofula depends not so much on the nature of the climate, as on the mode of life, and hence we find that, *ceteris paribus*, scrofula is more prevalent in dark and narrow, than in open and well ventilated streets; in crowded cities than in the country. This is to be accounted for, not only by the numerous causes which tend to weaken the constitutions of persons living in towns, but also by the want of a proper exposure to light.

It appears that most animals are intended by nature to be abroad and active during the day, and to repose by night. Some, however, court a moderate light, and are chiefly seen abroad during the evening, while others sleep or remain concealed during the day, and seek their subsistence by night. The first are termed diurnal, the second crepuscular, the last, nocturnal. The crepuscular animals have their eyes adapted for seeing with a small quantity of light, and the nocturnal are capable of exercising their power of vision when every thing appears to us dark and undistinguishable.

When we compare the eyes of man with those of animals intended by nature to be active during the night, we find that he is destined to be a diurnal animal, having the day alloted to him for employment and exercise, and the night for refreshment and sleep. Consequently any departure from the course marked out for him by nature is wrong, and hence the habits of those persons, who reverse nature's law by turning day into night, are calculated to do them an abiding injury. It has been frequently observed by military men, that in warm climates, where it is often necessary to march by night, in order to avoid the intense heat of the day, the soldiers suffer severely, and that none of the laborious duties incidental to a military life, cuts them up so rapidly as this night marching. Persons whose employments keep them up at night, as watchmen, bakers, printers, and glass-blowers, and those who follow dissipated habits, or pursue the pernicious absurdities of fashion, always exhibit, sooner or later, a marked decay of the vital powers. I do not mean to bring this forward as the sole cause of the premature debility and anticipated decrepitude of such persons, but it is reasonable to suppose that, *ceteris paribus*, an early breaking up of the constitution will occur in those, who resist the law which ordains that man shall repose by night.

It is a matter of some curiosity to enquire whether all the human species are alike destined to sleep by night. It would appear from the accounts given by various travellers, that many of the negro tribes differ very much in this respect from other nations. Thus Hanno, the Carthaginian, in attempting to circumnavigate Africa, was astonished at the tumultuous shouts, which, joined to the sound of the trumpets and musical instruments of every description, were continually heard during each night. Park, Clapperton, Denham, and Lander, and all modern travellers, agree in stating that it is almost impossible to sleep at night among the negroes, and Murray, in his *Historical Account of Discoveries and Travels in Africa*, observes, that "repose during the day, music and dancing prolonged through the night, form the usage prevalent in all the negro states." The same tendency is likewise observed in the descendants of negroes, who have been brought over to the West Indian plantations. Among the Albinos of the Isthmus of Darien, the practice of sitting up at night and sleeping in the day is also prevalent. Speaking of them, Wafer, an old traveller, says: "they see not well in the sun, their eyes being weak and running with water if the sun shines towards them, so that in the day time they care not to go abroad, unless it be a cloudy dark day. But, notwithstanding their being thus sluggish and dull in the day time, yet, when moon-shiny nights come, they are all life and activity, running about in the woods, and skipping about like wild bucks, running as fast by moonlight, even in the gloom and shade of the woods, as the other Indians do by day."

PHOSPHORESCENCE.

Having said so much with respect to the influence of light on man, we come next to enquire whether light can be given off by animal bodies, including the human. It has been observed that light is generally given off in consequence of a chemical action not slow and feeble, but sudden and violent. Now, in living bodies, although they are most extensive laboratories, chemical action is never violent, and hence they are rarely the cause of light. However, we find that some animal bodies do actually give off light, but this is in consequence of the secretion of a phosphorescent matter. Animal bodies, and among them, the human, abound in phosphates, and hence they occasionally present luminous appearances. Among plants the phosphates are wanting, except in some of the cryptogamia, and of these, though several are known to emit phosphorescent light when dead or decaying, yet very few species are proved to exhibit true vital phosphorescence. In like manner, the phosphorescence sometimes observed in wood is owing to the presence of foreign matter, and not to any inherent property of the wood itself.

Vital phosphorescence, though rare in animals generally, is found to exist in some in very great quantity; thus the quantity of luminous matter given off by the glow-worm and fire-fly is very considerable. Most animal bodies, however, emit another kind of light in great abundance, when under the influence of chemical action after death. The formation of this species of light takes place during the decomposition of many animal substances, and is sometimes connected with peculiar states of the atmosphere. Thus I recollect, when I was one of the teachers in the School of Anatomy and Medicine at Park-street, our subjects in the dissecting-room presented, for one or two nights, a very singular and somewhat startling appearance, being covered all over with a phosphorescent effulgence. I remember also, while a student, being induced by curiosity to accompany some of the so-called "resurrectionary" expeditions to the grave-yard, where I was frequently struck with the luminous appearances produced by the adhesion of phosphorescent matter, to the old coffin boards which were turned up in opening the graves.

It is interesting to go back a few centuries and to see how much ignorance prevailed, even among the learned, with respect to the nature and cause of this light. The first distinct account met with of light proceeding from putrescent animal flesh, is that which is given by Fabricius ab Aquapendente. It is related, "that when three Roman youths, residing at Padua, had bought a lamb, and had eaten part of it on Easter-day, 1562, several pieces of the remainder, which they kept till the day following, shone like so many candles, when they were casually viewed in the dark. Part of this luminous flesh was immediately sent to Aquapendente, who was professor of anatomy in that city. He observed that both the lean and the fat of this meat shone with a whitish kind of light, and also took notice that some pieces of kid's flesh, which had happened to have lain in contact with it, were luminous, as well as the fingers and other parts of the bodies of those persons who touched it." After this, we find no account of any other similar appearance until that observed by Bartholin, and of which he gives a very pompous description. This happened in Montpellier, in 1641. "A poor woman had bought a piece of flesh in the market, intending to make use of it the day following, but happening not to be able to sleep well that night, and her bed and larder being in the same room, she observed so much light to come from the flesh as to illuminate all the place where it hung. A part of this luminous flesh was carried as a curiosity to Henry of Bourbon, Duc de Condé, the governor of the place, who viewed it for several hours with the greatest astonishment. The light was observed to be whitish, and not to cover the whole surface of the flesh, but certain parts only, as if gems of unequalled splendour had been scattered over it. This flesh was kept until it began to putrefy, when the light vanished, which, as some religious people fancied, it did in the form of a cross."*

In 1668, the celebrated Boyle gave an account of his experiments on shining wood, fish, and meat. This was the first scientific inquiry on the subject, and some time afterwards, the discovery of phosphorus served as a basis for all future explanations of this and similar phenomena.

Occasionally the renal secretion has been observed to be phosphorescent, and in some still rarer instances the sweat. Thus it is related, that a person who used to eat great quantities of salt, and who was a little subject to the gout, happening to to take off his shirt after violent exercise, the shirt seemed to be all on fire, which surprised him much. On examination, red spots were found on the shirt, and a physician who was present perceived an acrid sour smell.

It may not be amiss to make a few observations here on the phosphorescence of sea-water. On a calm evening it presents a very beautiful appearance; each dip of the boatman's oar is accompanied by a brilliant flash, a tremulous radiance plays round the sides of his little vessel, and a long stream of light follows in her wake. In rough weather it exhibits a spectacle of awful grandeur, each wave appears crested with light, and, as it breaks against the sides of a ship, looks like broken masses of liquid fire. It has been observed that the sea will present this singular appearance

* *Encyclopædia Britannica*, art. "Light."

for one night, and then the phosphorescence will disappear for five or six, and return again. This was shown by Rigaud, in the year 1770, to depend frequently on the presence of living Noctiluca (a species of Medusa), about a quarter of a line in diameter, and which exist at certain times, in sea-water in enormous quantities. The Abbé Nolet has attributed it to electricity. Others have referred it to large quantities of matter derived from animal bodies decaying in the ocean. Thus so long ago as 1665, Dr. Beale observes: "Having put some boiled mackerel into water together with salt and sweet herbs, when the cook was, some time after, stirring it, in order to take out some of the fishes, she observed that at the first motion the water was very luminous, and that the fish, shining through the water, added much to the light which the water yielded. The water was of itself thick and blackish, rather than of any other colour, and yet it shined on being stirred. Whenever the drops of this water fell to the ground, they shined, and the children of the family diverted themselves with taking them, and running with them about the house."

Thus we perceive that, leaving electricity out of the question, the luminous appearance of the sea at certain times may be attributed either to great numbers of living animals, capable of giving off light under peculiar circumstances, or to the presence of large quantities of matter derived from animal remains decaying in the ocean. I am inclined to adopt the former supposition for these reasons:—there are circumstances connected with this phenomenon which would appear to prove, that the production of light depends upon a vital action, for when a slight electrical shock or voltaic current is passed through the water, or when it is agitated or struck, there is an evident increase of the luminous appearance; and we perceive, moreover, that the water does not emit an uniform and steady light, but undergoes various phases of darkness and light. Humboldt, in his *Tableaux de la Nature,* thinks the water of the sea owes its occasional luminous appearance to this cause, but he also maintains that it is sometimes derived from a true post-mortem phosphorescence. That light is sometimes produced as a vital secretion by living animals, is proved from the sudden obscuration it undergoes in certain insects, and from the fact that a board rubbed with a living specimen of a Medusa, becomes luminous when you pass your finger over it.

But is light never emitted under any circumstances from the bodies of the higher animals? We have already seen that some species of medusæ, and of worms and flies possess this property, and we are led to inquire whether any of the mammalia ever exert a similar power. When we examine the structure of the mammalia, we find that they possess all the tissues discoverable in lower animals, and hence, reasoning from analogy, we should not be surprised to find also that they perform similar functions. Looking on the subject in this point of view, it is not exceeding the bounds of possibility to suppose that they possess those tissues which are engaged in the secretion of luminous matter; and therefore I am inclined to believe that the eyes of some animals may be endowed with a phosphorescent quality, and be capable of emitting light. A phenomenon of this kind is very rarely witnessed in man, although Homer tells us that the eyes of his hero, Achilles, when under the influence of strong passion, blazed like stars; and Sir Walter Scott represents some of his personages as emitting a living light from their eyes under similar circumstances. Something like this I have seen in a gentleman, who at present does not manifest any such peculiarity, but in whom when young it was remarkably distinct. In some of the mammalia, however, there seems not to be the slightest doubt of the existence of this power in the eye. Thus we find in Loudon's *Magazine of Natural History*, vol. i. p. 209, that William Baird, in a descriptive notice of a species of monkey, the *Lemur tardigradus*, which was brought to Scotland by a friend and presented to him says:—"His eyes are large and very prominent, almost hemispheres in shape, and very much approximated. They are of a yellowish-brown colour, and are surrounded by a circle of dark-brown.

They shine brilliantly in the dark, especially when animated, glowing like heated furnaces." Rengger, a German naturalist, has proved that this power exists in the eyes of certain mammalia. Thus, in the night ape, *Nyctipithecus trivirgatus,* he remarked the effulgence from the eyes only in the most complete darkness, and then it was so brilliant as to throw a sensible light around, rendering objects at a distance of a foot and-a-half, visible. Now the eye of this ape is very small, and it is impossible to conceive how the phenomenon in question could be merely the result of reflected light. In the *Cebus azaræ* also, he found that the effulgence ceased immediately on dividing or wounding the optic nerve; and he observed that it was always particularly distinct and brilliant when the animal's attention was roused by some unusual noise, or by the sight of strange objects, or when agitated by some desire. I need not instance the flashes of light occasionally emitted from the eyes of cats, lions, tigers, and other animals of the same description, as this is a fact with which almost every one is familiar.

In the eyes of these animals there generally exists a particular structure, called the tapetum, which has been thought capable of aiding them to see in darkness. It is held that the tapetum forms a reflecting surface, which causes the rays admitted into the eye, and derived from external objects, to converge in such a manner, that, passing out of the eye, they are so concentrated as to produce the appearance of a flash of light emitted from that organ. It is strange that an explanation, not merely inadequate, but optically untrue, should have been generally received without a more accurate investigation. The truth is, that all the rays admitted into the eye from objects seen with any considerable degree of obliquity, after their convergence on the retina has been effected by the refracting powers of the lens and humours of the eye, are mostly extinguished within that organ, and do not find their way outwards through the lens. On the other hand, the rays derived from objects seen directly, and which are in the axis of vision, will be reflected (supposing the tapetum to resemble a concave mirror placed around the extremity of this axis) in such a manner that, after refraction by the lens, they will converge to the point external to the eye, from which they had originally set out, and their tendency, after reaching this point, would be to diverge; so that in no case will the eye of a spectator see flashes of light issuing from the eye of an animal, in consequence of the internal reflection of rays derived from without. If, on the contrary, certain portions of the internal surface become luminous, as, for instance, that covered by the tapetum, then the rays derived from each luminous point will become parallel, in consequence of refraction by the lens, and so the appearance of flashes can easily be accounted for. Again, it is certain that this light depends chiefly on the state of the animal, and is most apparent when its attention is roused, or its passions are excited. It does not appear to be possible to account for the flashes of light emitted from the eyes of several animals in the dark, by merely saying that the light has entered the eye from without and is again reflected, for we observe the light emitted to be of quite a different colour from that which is supposed to enter the eye from without. I am therefore of opinion that the power of generating phosphorescent light, enjoyed in such a remarkable degree by some of the lower animals, is also shared by those of a higher class, particularly where the tapetum exists.

There is also reason to believe that plants sometimes give off light, although from the absence of phosphates in their composition, this circumstance must be of very rare occurrence. The strongest facts in favour of it have been put forward by Haggern, a Swedish lecturer on natural history. One evening he perceived a faint light darting repeatedly from a marigold. Surprised at such an uncommon appearance, he resolved to examine it with attention; and to be assured that it was no deception of the eye, he placed a man near him to make a signal at the moment he observed the light. They both saw it at the same moment.

The light was most brilliant on marigolds of an orange or flame colour, and was scarcely visible on pale ones. The flash was seen on the same flower two or three times in quick succession, but more commonly at intervals of several minutes; and when many flowers in the same place emitted their light together, it could be observed at a considerable distance. This phenomenon was remarked in the months of July and August at sunset, and for half-an-hour, when the atmosphere was clear; but after a rainy day, or when the atmosphere was clouded and loaded with vapours, nothing of the kind could be perceived.

Haggern observed the same phenomenon in the monks-hood, orange lily, and Indian pink, and thinks it is connected with electricity, developed at the moment the pollen bursts from the anthers to impregnate the pistilla. Treviranus is of opinion, however, that the flashes of light, supposed to have been seen in this and similar cases, arose from the contrast exhibited by the fiery red colour of the petals, when viewed amidst objects feebly illuminated in the dusk of the evening, and this opinion is supported by the results of many experiments. He says that some of the *subterraneous* cryptogamic plants are the only vegetables which emit light when living, although several, such as the *Byssus phosphorea*, *Schistosega osmundacea*, &c., also emit a phosphorescent light when in a state of putrefaction.

EFFECTS OF TEMPERATURE ON ANIMAL AND VEGETABLE LIFE.

Having said so much with respect to the influence of light on the animal and vegetable kingdoms, and having made some few observations on the production of light by both, we come now to inquire into the effects of temperature on animal and vegetable life. I shall necessarily be brief on this part of my subject, as I have already dwelt at some length on the manner in which both animals and vegetables struggle to avoid the injurious effects, arising from extremes of heat and cold. Such remarks as I shall at present make, are intended chiefly to illustrate the influence of temperature in limiting the range to which living bodies are confined.

It is unnecessary to speak here of the power which animal bodies possess of accommodating themselves to the different varieties of temperature, or of the degree in which this power is enjoyed by different animals. Neither is it requisite to state that temperature, considered with reference to its effects on bodies, varies very considerably on different parts of the surface of the earth. The two principal circumstances, upon which the degree of temperature depends, are, first, the height of any particular place above the level of the sea, and, secondly, its distance from the equator. The first is measured by a line perpendicular to the surface of the earth, and we find that as we ascend a lofty mountain, or rise into the air in a balloon, for every hundred yards of elevation there is a given decrease of temperature, and if it were possible for us to continue our ascent, until we rose above the atmosphere which surrounds us, we should (it is said) meet with the fixed and uniform temperature of the interplanetary space. This decrease of temperature, according to the height above the level of the sea, will explain why, even in the hottest countries, we find the summits of lofty mountains covered with vast masses of perpetual snow, and their sides presenting, in succession, the products of all climates from the poles to the equator. The other cause of a decrease in temperature, connected with the distance of the place from the equator, depends on the obliquity of the sun's rays, and the length of time during which he is either wholly absent, or visible only for a short period. Hence the immense district around the Poles, where perpetual congelation has bound up both sea and land, and where nature presents for ever to the eye a chill and lifeless waste.

We have, then, two great circumstances influencing temperature, the distance of a place from the equator, and its elevation above the level of the sea. In studying the climate of any particular region we must therefore, take into account, not merely its latitude but also its elevation. This is a matter of important consideration for persons who have gone from a cold, or a temperate, to settle in a hot climate, for by choosing situations, frequently in the vicinity of their residence, but more elevated and approximating in its character to the climate of their native countries, they may be enabled to enjoy a temperature more congenial to their feelings. This principle has been lately acted on in the East and West Indies, and many persons, who before found a residence there almost insupportable, are now quite reconciled to it.

These are the chief agents in the modification of temperature, viewed in a general way, but if we come to form an estimate of the temperature of any particular place, we find that other circumstances tend to produce a considerable variety of climate, even in the same parallel of latitude. Many causes, at present not well understood, exert a very remarkable influence in producing this diversity. Compare the temperature of Ireland with that of Canada, or of any other place in the same latitude, in North America, or in Europe, and we find the difference to be very great. Here we have temperate summers and mild winters, while in those places there is a burning sun in summer and intense cold in winter. The varieties of temperature present an important subject of investigation to the physician, and it is incumbent on every man, engaged in practice, to be well acquainted with the various climates of his own country. I say climates, for not only in the same country, but even in the vicinity of the same town, a diversity of climate and of temperature may be observed.

As a certain degree of temperature is essential to the support of animal and vegetable life, we perceive that nature has adopted provisions to moderate excessive heat. Air heated by the scorching rays of the sun, is, by a law originally impressed upon matter, carried up into the higher regions of the atmosphere, while its place is supplied by cool and refreshing breezes. Chemistry shows that there are certain conditions in water, which tend to produce an equality of temperature, and hence the cause of those remarkable currents which are almost constantly observed in various parts of the ocean. On these and other similar points it is unnecessary to dwell, as they are sufficiently obvious, and are extensively detailed in the systematic works on chemistry.

Nature has taken extraordinary pains to protect both plants and animals from the extremes of heat and cold. With respect to plants, the precautions which are taken to avoid cold are much more remarkable than the means adopted to guard against heat. Under the influence of cold the vegetation of plants generally shrinks, and vitality concentrates itself about the roots or stem, where it is more or less protected from the influence of a chilling atmosphere. Hence in this climate, where the revolution of the seasons produces, at a certain period of the year, a considerable reduction of temperature, most plants (with the exception of several mosses and others which delight in a low temperature) cease to grow during the winter. Analogous to this periodic state of suppressed vitality, manifested by plants, is the hybernation of certain animals, which, during the winter season, retire into caverns, or sheltered situations, where they cover themselves up and fall into a state of torpidity, in which all the vital actions are carried on with diminished energy. In the arctic regions, where the cold of winter is intense, nature has furnished most animals with an efficient protection against its influence. She has given its warm coat of fur to the bear, and has provided the whale and walrus with a stratum of blubber, whose non-conducting powers enable these animals to retain their vital warmth in a medium which would seem to be inconsistent with life. All animals, except Man, in fact, are provided with more or less covering to enable them to resist cold, and accordingly we find that where they are naturally the inhabitants of countries exposed to considerable varieties of temperature, they appear to suffer very little inconvenience during the winter. Not so Man,—unprovided with any natural covering to shelter him from the chilling influence of a wintry atmosphere, he must have become,. to a certain extent, an hybernating animal, had not his reason and his industry supplied him with clothing and fire to protect him from cold. Nature, for this purpose, was content with bestowing on him the compensating faculty of reason, leaving the rest to his own ingenuity and diligence.

Still, even the body of Man, though unprotected by warm covering, is, when fortified by habit, capable of bearing a great degree of cold. If we can believe history, many nations, living in countries subject to a great reduction of temperature during the winter, were in the habit of going almost entirely naked. Such is the history of the early inhabitants of Great Britain, according to the accounts given by Julius Cæsar.

We are told by travellers that the naked New Zealander will rise in the morning from his lair, leaving the green print of his body on the grass, all around being whitened with hoar frost. A few similar instances of the power of habit in resisting cold are still met with, but these occur chiefly among barbarous tribes. The necessity of clothing is now universally felt by civilized Man, whose reason and industry enable him to people the whole surface of the globe, as far as the limits of the arctic and antartic circles. The negro of Africa exhibits a striking contrast to the New Zealander, for we are told by Clapperton that the blacks appeared chilly and suffering, whenever the thermometer sank to 70 degrees, and on such occasions they betook themselves to the aid of clothing, to guard against the effects of so unusually low a temperature.

Some countries are fortunate in the enjoyment of a climate exempt from remarkable vicissitudes of temperature; there are no sudden transitions from heat to cold, nor does the summer differ much from the winter. Here it is natural to expect that animal and vegetable life will flourish, and that diseases connected with atmospheric changes will be few in number and mild in character. Of this New Holland, which enjoys a very uniform temperature, furnishes an apt illustration. Vegetables and shrubs are here evergreen, and the groves and forests are clad in a perpetual verdure. There is no shedding of leaves in winter, and nature presents the whole year round all the luxuriance of summer. Another peculiarity also distinguishes this country; its inhabitants enjoy a total immunity from measles, hooping-cough, and scarlatina. None of these disorders have as yet penetrated into New Holland. Where they exist among emigrants at their departure from Europe, the length of the voyage is so great, that they appear to die away completely before their vessel reaches its destination. It is, however, probable, that if the rate of passage be accelerated by means of steam-vessels, the New Hollanders will not long enjoy this immunity.

There is no subject so interesting, or so abounding in curious facts, as that connected with the various provisions nature has made, to enable animals to subsist in different climates, and in a great variety of situations. Although the facts connected with this topic belong to the natural historian rather than to the physiologist, yet there are a few considerations which suggest themselves to the latter, as particularly deserving of notice.

He who has contemplated the more fertile regions of the earth, their luxuriant productions, and dense population, must be struck with horror when he beholds the deserts of Arabia and of Africa, and sees around him a vast extent of dry and burning sand, unfavourable alike to animal and vegetable life. But when he comes to examine the structure of the camel, he finds, in the peculiar conformation of its foot and stomach, a beautiful illustration of the care which nature has taken in adapting animals to particular localities. Again, in the Llamas of South America, he finds a variety whose structure is as evidently fitted for another kind of dry and arid soil; hence he is led to the inference that the sandy deserts of Africa, as well as the steppes of America, not only existed before the camel and the llama were created, but were formed with such a relation to these animals, that each is mutually adapted to the other. From this it may be inferred that the desert is not an accidental defect and unplanned eyesore on the earth's surface, owing its existence merely to the effects of a destructive power defacing the fair form of nature, but is a settled part of the great scheme of creation.

Were we to speak on the subject of animal function, facts might be brought forward with respect to the difficulty or facility which different animals have, in accommodating themselves to varieties of temperature. It would appear that some animals, particularly those which inhabit the colder latitudes, enjoy a very limited range. Among these may be mentioned the reindeer, the Esquimaux dog, and the arctic or great white bear. All the Esquimaux dogs brought to this country have perished. Arctic bears when imported suffer very much from the change of temperature, and, in order to keep them alive for any length of time, it is necessary to maintain a certain degree of artificial cold in the places where they are kept. We are all aware that Captain Ross, after having spent four years in the arctic regions, became so habituated to cold, that on his return he found it quite impossible to bear the warmth of a London winter, and was forced to remove to a colder and more congenial situation. Every attempt to introduce that beautiful and useful animal the reindeer into England or Scotland, has invariably failed, though in the latter country the moss which constitutes the principal part of its food grows in great abundance. About fifteen years ago I dissected two reindeer that died here, and found that in both inflammation and enlargement of the liver was the cause of death. On the other hand, it is equally curious that most animals brought hither from tropical climates die of some form of scrofula. Monkeys die of consumption; so do lions and tigers. The dromedary which died in Dublin some time ago, and which was dissected by Dr. Houston at the College of Surgeons, had tubercles developed in almost every organ of the body. This is a very important fact in the pathology of phthisis, as tending to prove that although phthisis is in many instances distinctly hereditary (for tubercles have been found developed in the lungs of the fœtus), nevertheless it may be, and is, frequently acquired. Nothing can furnish a stronger proof that phthisis may be acquired than the instances I have adduced, for I need not tell you that no lion or tiger is ever born in warm climates of a consumptive sire, or ever dies there of tubercular disease. An additional illustration of the influence heat exercises on the size of the liver is afforded by the celebrated Strasburg geese. By feeding these birds in a particular way, and keeping them in artificial heat, the liver becomes diseased, grows to an enormous size, and in this state furnishes the materials of a *paté*, much sought after by the scientific gourmand. How many instances occur where our citizens, exposing themselves to the long-continued operation of the very same causes, confinement, overfeeding, heat, and want of exercise, are affected by them in exactly the same way. How slight the difference between the morbid phenomena, displayed in the *post mortem* of a city feaster and the *autopsy* of an overfed goose! We observe also, that the English in India suffer greatly from liver disease, while on the other hand, negroes and natives of warm countries frequently die of phthisis in England.

I may here observe that plants and animals exhibit very striking analogies as to the manner in which they conduct themselves with respect to change of climate. It is, however, well known that animals are in general better adapted to bear the vicissitudes of temperature and change of climate, than plants. Take the whole vegetable kingdom and we do not find any individual of it so extensively diffused as some animals appear to be. Man is found in every part of the habitable globe, crows also extend over the earth, several birds, and some of the mammalia, as the sheep, dog, &c., have a very extensive range. Among the individuals composing the vegetable kingdom we do not meet with examples of this general diffusion, and we observe that many are limited to inconsiderable districts, or peculiar localities. Generally speaking, it is much easier to introduce a plant or an animal, from a hot into a cold, than from a cold into a hot country, because our means of producing heat far exceed those we possess for generating cold. Thus we are enabled, by artificial heat, to keep tropical birds, lions, and tigers in in this country, and by means of stoves and glass houses to preserve plants from the hottest countries, but we find it extremely difficult to rear the plants or animals of high northern latitudes.

ELECTRICITY IN RELATION TO PLANTS AND ANIMALS.

ELECTRICITY is an agent, whose influence is more closely connected with the phenomena of life than any other, and to it, as well as to galvanism and magnetism, there is every reason to believe that vitality bears a very intimate relation. Thus we see that electricity exerts a very powerful action, not only on animal bodies but also on plants and vegetables. If we pass an electrical spark through the leaves of the sensitive plant, it will exhibit a considerable degree of irritability, and will continue to move so long as it is acted on by the electrical stimulus. We are all aware, that trees are frequently killed by lightning. The common opinion on this point is that they are burnt, and so they are when the shock is intense; but we have reason to believe that trees are often killed by degrees of lightning, sufficiently intense to produce an impression on their vitality, and that they die not from any scorching or burning, but from the violence of the shock given to their living systems.* Various experiments have been made

* It has been more than once remarked, that a tree, whose shade had afforded shelter to cattle, and to which they resorted for protection during the heats of summer, is avoided by them with the greatest caution when it has been blasted by lightning.

with the view of investigating this point, and the result has been that an overdose of electricity will destroy the life of any plant. Carvalho killed the *Balsamina impatiens* by shocks too slight to impair its structure. A branch of this plant died the day after receiving the shock, the rest of the plant lived for a few days longer. The branches of other plants survived for a greater length of time; thus, those of a laurel lived fifteen days, and of a myrtle thirty. Van Marum and Nairne confirm the fact of the deleterious effect produced on plants by strong electrical shocks, showing that they kill plants and prevent slips from taking root, or budding. On the other hand, small amounts of electricity are said to exercise a favourable influence on plants, accelerating their growth, and making vegetation more luxuriant, but it must be confessed that this is by no means certain.

It has been believed that plants are furnished with contrivances to enable them to preserve the electrical equilibrium. Dr. Prout supposes that the down, which covers plants so copiously, has a relation to electricity, and is destined to act by means of its numerous points in restoring and maintaining the electrical balance. We are not, however, acquainted with any plants which give out spontaneously, electrical sparks, nor have we as yet been able to detect in them the existence of an apparatus, destined to accumulate electricity.

M. Pouillet has made some very interesting experiments on the development of electricity by growing vegetables, from which it appears, "That the action of vegetables upon the oxygen of the air is one of the most prominent and powerful causes of atmospheric electricity. If, indeed, we consider that one *gramme* of pure carbon disengages, in the act of passing into carbonic acid, electricity enough to charge a Leyden jar, and that, on the other hand, the carbon, which enters into the constitution of vegetables, does not disengage less electricity than pure carbon when burned; if we take this into account, we might, *à priori*, arrive at the conclusion pointed out by my experiments, viz., that a vegetating surface, one hundred mètres square in extent, produces in a day more vitreous electricity than would be sufficient to charge the strongest electrical battery."*

Some difficulties attending the manipulation and management of so very delicate a series of experiments, prevented M. Pouillet from observing whether the electricity evolved by day differs, either as to quantity or quality, from that disengaged during the night. Were these difficulties overcome, it seems more than probable that an interesting confirmation of the facts observed by Priestley and Ingenhouz, would be obtained; for as plants are found during cloudy weather, or at night, to exhale carbonic acid, and during exposure to the rays of the sun to exhale oxygen (instead of absorbing it, as they do in the dark, to form carbonic acid), it is obvious, that these two contrary processes will be attended with opposite effects upon the electricity of the air. Now, as on the one hand, Pouillet found that carbonic acid, at the moment of its formation, is always positively electrified, it follows that plants must produce, by means of the expiration of this acid, a quantity, more or less considerable, of positive electricity, which they thus impart to the surrounding atmosphere. So long as night continues, or the weather is cloudy, this process is carried on, and that with considerable energy, by the whole surface of vegetation in every country, and therefore this period of the twenty-four hours, exercises an influence on the electricity of the atmosphere, tending powerfully to augment the quantity of positive electricity it contains. Where, however, this same surface of vegetation is exposed to the bright light of day, or to the direct rays of the sun, oxygen is no longer absorbed; it is now exhaled, and consequently negative electricity is evolved. When we recollect the prodigious activity of vegetation in tropical climates, where day and night differ comparatively little in duration, we at once perceive that we have discovered the existence of causes, whose effects must be most powerful on the electrical relations of the atmosphere.

* *Annales de Chimie et de Physique*, tome xxxv. p. 420.

Again, when we call to mind the researches of Pouillet on the effects of evaporation, we find that this process, as it takes place from the surface of the sea, must tend to render the superincumbent atmosphere positively electrical, and that too with most intensity during the day, at the very time when the agency of terrestrial vegetation is rendering the air over the land negatively electrical, we get as it were a glimpse at the reason why tropical islands, such as those of the West Indies, must necessarily become the scene of violent electrical phenomena. The period of the day, at which hurricanes and thunder storms occur in these localities, strongly favours this explanation. The sun rises unclouded, and both land and sea, exposed to the full power of its rays, discharge from their respective surfaces vapours loaded with opposite electricities. This process continues during the whole forenoon, and until two or three o'clock in the afternoon; about that hour the encounter generally commences, when the vapours form clouds, charged with opposite electricities, which mutually attract each other, until, finally, the sudden union of their electric fluids gives rise to phenomena, of which our most violent storms are but feeble representatives. How wonderful are the operations of nature! The peaceful and silent growth of a vegetation, whose splendour fascinates the eye, develops an agency, which, opposed to that produced by a rapid but unobserved evaporation from the surface of the surrounding ocean, tends to load the atmosphere with conflicting elements, from the depths of whose strife issues thunder, proclaiming the approach of the hurricane and the tornado.*

* The above theory suggested itself to me when considering the effects of vegetation in developing electricity. M. Auguste de la Rive, however, is not inclined to allow that the electricity of the atmosphere, of its vapours and its clouds, can be derived chiefly from vegetation, and the chemical actions (including evaporation) which take place on the surface of the land and waters. These causes he thinks insufficient to account for the great quantity of electricity the atmosphere contains. In this opinion Becquerel concurs. I am nevertheless induced, by what Pouillet says, to think that the quantity of electricity thus developed must be enormous, particularly in tropical climates.

The effects of electricity on animal bodies are equally remarkable, but, as they are generally known, I shall advert to them briefly. Dead animal flesh, when exposed to strong and repeated electrical shocks, putrefies rapidly. Living animals, even the largest and most powerful, are instantly destroyed if the electrical fluid be administered in sufficient quantity. The shock produced even by a moderate amount, is generally ungrateful to the feelings, and hence it is that some sensitive persons suffer great bodily distress during a thunder-storm. This is attributed by those ignorant of the intimate connexion between electricity and the nervous fluid, to fear or fancy, but in some cases with little justice, for the bodily inconvenience felt under such circumstances is sometimes extreme. "During a thunder-storm the air is generally loaded with a great excess of electricity, which cannot escape into the earth on account of the want of moisture. The consequence must naturally be the appearance of various electrical phenomena. Thus, on the 8th May, 1831, the whole atmosphere appeared on fire after sunset in the neighbourhood of Algiers. White flames were seen at the points of the flag-staffs on the ramparts for the space of half-an-hour, and the ends of the hair of some officers who were walking, seemed to be tipped with a similar luminous appearance. These officers, on raising their hands, were astonished at perceiving similar points of light issuing from the tops of their fingers. *All the persons who were exposed to the influence of this highly electrified air, experienced spasms in their limbs, and an extreme feeling of lassitude.*"* On the other hand, artificial repletion with the electrical fluid is known to produce in many persons an exhilaration of spirits. Mr. Smith, of Fordham, states, that in eight persons through whom the electrical influence was passed, the frequency of pulse thus produced did not subside until after the lapse of fifteen minutes.

The effects which electricity produces on the economy in

* *Voyage dans la Regence d'Alger*, par M. Rozet.

various forms of disease are remarkable. Tumours have been absorbed, dropsies cured, asthma relieved, and paralysis removed. Electricity also manifests its effects in a more uniform and constant manner, as shown by the sensation of heat and muscular contraction to which it gives rise, and these effects may be produced by shocks, sparks, or through the medium of the electrical aura. It has been related by Mr. Smith, of whose experiments I have already spoken, and the facts are referred to in the last edition of Edwards' work on the *Influence of Physical Agents on Life*, that ague has been cured by electricity, which has reduced the pulse thirty beats, stopped the cold stage, and prevented the paroxysm altogether. But a more curious fact than this, and one which, if confirmed, would be deserving of the most accurate investigation, is that the vaccine virus, by means of a current of the electrical fluid, may be made to pass from an infected person along a wire, so as to convey the infection to a scratch or abrasion of the skin, in the arm of another individual, to whom the end of the wire is applied.

The passage of the saline constituents from one vessel to another, through the medium of the connecting wire, in cases of chemical decomposition, effected by means of electricity, is a very remarkable phenomenon, and one which affords some reason to suppose, that the foregoing statement respecting the transmission of the vaccine virus may be true.

Dr. Wollaston, having observed the great rapidity of chemical decomposition produced by this agent (and, indeed, at present chemical and electrical action are considered to be very analogous, if not exactly the same), was led to think that all the secretions of the body were the effect of electrical action operating in various modes, and producing from one organ a serous, from another a mucous, from a third a salivary secretion, and so of the rest. In order to prove the possibility of chemical decomposition being effected by very weak electrical agency, he made an experiment, by which it appeared that a solution containing muriate of soda was de-composed by a single pair of plates. He was of opinion that the qualities of each secretion pointed out what species of electricity preponderated in each organ. Thus he concluded, as Napoleon * had already done, that the superabundance of acid generally present in the urine, proves that positive electricity prevails in the kidneys, while the alkaline nature of the bile marks an excess of negative electricity in the liver. The minute anatomy of glands has of late received most valuable additions from the labours of Müller and other German physiologists, but as yet no one has attempted to prove, that there is anything in their structure evidently designed for the accumulation of electricity. Wollaston's hypothesis appears to me, notwithstanding, the most probable explanation of secretion which has been yet advanced. Future investigations may succeed in detecting something of those physical differences, which enable glands to act upon the blood in so many ways through the agency of electricity of various intensity and combination. That this agency is the means employed by nature for separating from the blood the elements necessary for each secretion, seems the more likely, when we recollect that the excretory ducts in every gland terminate in *culs de sac*, through whose parietes these elements must transude. Electrical endosmosis alone seems capable of accomplishing this task.

The effects of electricity in curing or relieving certain diseases have been already mentioned, and we shall find, hereafter, that galvanism and magnetism have a similar power. One of the modes of applying electricity or galvanism lately resorted to is acupuncturation. Acupuncturation, in the common meaning of the term, has long been in use among the Chinese, and particularly among the Japanese, with whom the whole art of medicine seems to consist in teaching the names of diseases, and the number of needles to be employed in the cure of each. Its introduction into Europe is comparatively recent, and within my own memory.

* Becquerel. *Traité de l'Electricité et du Magnétisme*, tome 1, p. 164.

It has been found useful, and its efficacy seems to have been very considerably increased by passing an electrical current along the needle. There can be no doubt that, considering the nature of which the materials of the needle are composed, the principal value of this application depends upon electrical influence, and that acupuncture is to be regarded chiefly as affording a means of applying it more conveniently and directly to the part affected.

Another mode of applying electricity, by means of the magnet, has been introduced by Dr. Blundell;—I say a mode of electricity, for it is now proved that the magnetic and electrical influences are identical. I cannot say much with respect to the particular value of this mode as a means of curing or relieving disease. Shortly after the publication of Dr. Blundell's experiments, two or three of my patients, who were attracted by the novelty of the results, and entertained very sanguine expectations of receiving benefit from the application of the magnet, made several experiments on themselves, but without any decisive result. One of them in particular, a lady of a literary turn, got a powerful magnet, in the hope of obtaining some alleviation of her complaint (tic douloureux), but, unfortunately, she did not receive the slightest benefit after a long and persevering trial. I would not, however, prejudge the utility of the magnet, or reject its use, on this account, as I feel convinced that it may be found applicable to the cure or relief of other affections, although, in many of those complaints in which much has been expected from its influence, it has proved inefficacious. It has been asserted in the *Lancet* (the Journal in which Dr. Blundell's experiments first appeared), that one pole of the magnet produced a cessation, while the opposite one caused an increase of pain.

I had lately an opportunity of witnessing a case in which the patient, an exceedingly irritable and nervous gentleman, asserted that he could always distinguish one pole of the magnet from the other, by means of the different sensations they produced in the painful parts of his body. If reliance can be placed on the accuracy of the experiments made on the celebrated and unfortunate Caspar Hauser, there can be no doubt that magnets exert a powerful influence on the body, for he is said to have been always aware of the vicinity of a concealed magnet, or even of any common metal, in consequence of the exceedingly uncomfortable sensation it occasioned.

It is remarkable that no land animal, bird, or reptile, is provided with an apparatus for accumulating and propagating electrical influence. Among fishes, however, this is not the case, for we find six different species possessed of this provision, viz. the *Torpedo ocellata, Torpedo marmorata, Silurus electricus, Gymnotus electricus, Trichiurus Indicus,* and *Tetrodon electricus.* In all there are electrical organs, which are charged and discharged at the will of the animals. These can also regulate the quantity of the electrical fluid discharged, and give a slight or strong shock according to their pleasure. So long as the animal chooses, the organs remain quiescent, but whenever it approaches any object into which it wishes to discharge the electrical fluid, the shock is immediately given. It is in this way that the different species of fish on which these animals subsist, are killed. The shock communicated by some of them is extremely severe. Thus the gymnotus, or great electrical eel, by applying itself along the belly of a horse swimming in the water, is enabled to benumb and drown the animal in the course of a few minutes, by means of a quick succession of shocks, discharged into his body along the region occupied by the heart, the great viscera, and the plexus cœliacus.* The shock is propagated by bodies which are good electrical conductors. Messrs. Humboldt and Bonpland were unable to detect any traces of free electricity in the gymnoti, which Becquerel says may be explained on the supposition, that the shock, like that produced by a Leyden jar, depends on the sudden restoration of the electrical equilibrium. It is stated that the shocks are sometimes sufficiently intense to kill the animal at once. Hence it is

* Humboldt.

a common practice with the conductors of convoys in South America, to collect a number of wild horses and drive them across the rivers, in order to exhaust the gymnoti of their electricity before the convoy passes.

It is a very curious and remarkable fact that the discharge of electrical influence is entirely subject to the will of these animals. This would seem to indicate a very close connexion between electricity and volition, and if there was no other fact to show the intimate relation between electricity and the nervous influence, it would go far towards establishing the analogy. It would appear that this control over its electrical power is necessary for the animal, in order to enable it to destroy its prey more effectually, for if it were obliged to discharge the whole of its electricity at once, or on very small objects, its stock would be too rapidly expended. On the other hand it has been observed, that, by giving out repeated shocks, the animals become exhausted and tired, another point of resemblance between electrical influence and nervous energy. Again, when we examine their electrical apparatus, we find that although it is not an organ of locomotion, yet, like muscles and other organs in which a great quantity of nervous energy is expended, it is furnished with very large nerves. In some of these animals the nerves which supply the electrical apparatus are derived directly from the spinal cord; in most, however, they are derived from the fifth or eighth pair, sometimes from one, sometimes from another, and occasionally from both. This is a very curious and interesting subject for investigation. Indeed, when we remember that in these creatures the electrical influence is under the control of the will; that they can regulate the quantity discharged, making the shock strong or slight according to pleasure; that like the nervous energy it becomes exhausted by being exercised for a length of time; and that the apparatus in which it is contained is supplied by remarkably large nerves; every inquiring mind must be struck with the connexion between nervous and electrical influence.

Thus, the torpedo has three electrical nerves, one derived from the fifth and two from the eighth pair; in the silurus they are derived from the eighth alone; and in the gymnotus from the spinal cord. These nerves divide into several minute branches, each accompanied by an artery and vein, and their ultimate ramifications are distributed over the partitions of the cells, which form the electrical apparatus. In examining these animals the anatomist cannot fail to be struck with the diminutive size of the nerves destined for the common purposes of sensation and volition, compared with those which go from the brain to the electric organs. Thus, in the common torpedo, "the three nerves for each electric machine are of enormous size, each of them being fully equal in thickness to the great sciatic in the human body."* These cells vary as to their arrangement and situation in the different genera. In the torpedo, the electrical organ consists of cells horizontally arranged and containing a fluid of a thick and viscid nature; the cells are about the size of those of an honeycomb, and are arranged perpendicularly, extending from the dorsal to the abdominal surface. In the gymnotus they are somewhat of the same structure, but instead of being perpendicular they are placed parallel to the surface. In the silurus they are formed beneath the skin, in the connective tissue, which is there peculiarly cellular.

The shock from all these animals is completely dependent on the will, and they have the power of modifying it so as to make it slight or intense according to pleasure. It is imparted not only on contact, but also through water, and hence they are enabled to kill their prey at some distance. In the 14th volume of the *Transactions of the Linnæan Society*, Couch remarks, that the shortness of the alimentary canal in these animals seems to require the aid of an electrical apparatus, which not only kills their prey, but also renders

* See the Descriptive Catalogue of the Preparations in the Museum of the Royal College of Surgeons in Ireland. By John Houston, M.D., p. 106, a work of modest pretensions, but which contains a vast store of valuable and original information.

it more easy of digestion. This hypothesis appears very improbable, for we know of no experiments which prove the easier digestibility of flesh killed by so slight a shock. To me it appears quite satisfactory to consider the electric organs as a means of capture and defence, objects accomplished in animals by a thousand different expedients. The system of animated nature seems to be one of compensation, in which as much ingenuity is expended on contriving means to destroy life as to save it. The electric organ of the torpedo is not more cunningly devised to protect the animal itself, than to kill what is destined to become its prey. It is a curious fact, as connected with the intimate relation existing between the nervous and electrical influences, that if we divide the nerves supplying the electrical apparatus, the animal loses the power of generating electricity. It is also remarkable, that the cells are copiously supplied with blood vessels. Girardi maintains that the electrical torpedos are far more abundantly supplied with blood than the other species of torpedo, thus showing the connexion between secretion and electricity.

As the discovery of the galvanic battery is of comparatively recent date, it has been reserved for modern times to understand the electrical apparatus of these animals. Our predecessors, who lived before the brilliant discoveries of Galvani and Volta were made public, might see, but could not comprehend this singular phenomenon. What a triumph for the industry and ingenuity of Man, to explain things whose existence had long been known, but whose nature had not been understood, and to have invented arrangements, which nature herself had not scorned to employ in the production of her wonderful works! The same sort of triumph is apparent when we refer to the construction of optical instruments, and compare it with that of the eye.

DISTINCTIVE CHARACTERS OF MAN.

When we examine the form of Man and compare it with that of other animals, we observe in him this striking and characteristic peculiarity, by which he is distinguished from all the other mammalia, namely, that among the whole class he is the only biped. Of all the mammalia, Man alone walks on two limbs, a posture attended with incalculable advantages, by allowing the free and full use of his upper extremities, in the various and complicated operations of prehension and manipulation. A brief examination of the structure of the human skeleton, and a comparison made between it and those of quadrupeds and monkeys, will be sufficient to show that bipedal progression is in man, the result of structure and not of education, and that Man alone, of all the mammalia, is destined to walk on two extremities. This point has been well discussed by Mr. Lawrence, in his excellent treatise upon the *Natural History of Man,* a work of the deepest interest, and abounding in the most valuable information. The position of the foramen magnum in the human skull, compared with that observed in others of the mammalia, the relative obliquity of the plane by means of which its articulation with the spine is effected, the size and aspect of the pelvis, and the manner in which the latter is related to the longitudinal axis of the lower extremities, are all calculated to enable Man, and man alone of all mammalia, to stand erect and use bipedal progression. Man and monkeys are the only animals which assume the sitting position, if we except some species of squirrel, the kangaroo, &c. This position enables us to use the upper extremities while the remainder of the body is at rest, and, combined with the advantageous structure of the hand, and particularly of the thumb, it gives to man a remarkable pre-eminence as a mechanical animal.

Too much stress has been laid, in my opinion, upon the proud upright position of man, and a great deal has been said and written concerning the sublime aspect of his countenance, and the god-like dignity of his carriage. A moment's consideration will be sufficient to show, that, though he looks upwards with ease and facility, he cannot, in this respect, claim any superiority. The eagle, which gazes on the sun with undazzled eye, and makes his pathway among the clouds, yields not in dignity of appearance or power of locomotion to Man, who merely walks upon the ground. Can Man measure his beauty with the antelope, his speed with the horse, or his strength with the elephant? It is in virtue of his intellect, of his reason, and not of his bodily form, that he ranks above his fellows. It was in mind, not in body, that "God made man in His own image."

Besides his peculiarity as being the only true biped among the mammalia, Man is distinguished from all other animals (even those which approach nearest to him, as the ourang outang and various tribes of monkeys) by the form of his skull. In man the size of the brain is very remarkable. I do not mean to assert, that in him the brain is comparatively weightier than in any other animal, but in the development of that part of it which is considered to be the exclusive seat of the intellectual faculties, the cerebrum, Man exceeds all others. Throughout the whole class of mammalia, the cerebrum is more or less imperfectly developed, and the cerebellum, which is chiefly connected with the faculty of voluntary motion preponderates. The cerebellum, spinal cord, and nerves instrumental in the performance of voluntary motion, are much more developed in other animals than in man, but here the superiority of nervous organisation stops; the cerebrum diminishes in size, and is less complicated in the number and arrangement of its parts.

It would appear that in no other animal is the development of the intellect so slow or so wonderfully regulated as in Man. In the child and infant there are but few faculties of the mind perfect, but these are for that very reason the more undividedly applied. If we examine the intellect of a child, and trace it through its progressive steps towards maturity, we shall find in the order it observes, something very wise and well adapted, to promote the acquisition of knowledge. In the child we find the head larger in proportion than in the adult, the forehead more prominent, and the anterior portion of the brain well developed. This is a wise provision of nature, for the time in which most knowledge is acquired is during the first twelve months. At this period the child learns more than at any other; he is now making himself acquainted with the various objects of the physical world, and for this purpose it is necessary that all the faculties connected with perception should be energetic. A quick and retentive memory, particularly for names and things, an attentive observation of everything passing around him, and an ardent curiosity to obtain knowledge, are peculiar to the child. His imagination also is easily excited, and the warmth of his affections (though these can scarcely be said to be connected with cerebral development), produces a strong tendency to form attachments at this period, and hence it is that the child is so endearing.

With regard to the faculties of growing man, there can be no doubt that those which are most useful, and best adapted for the acquisition of knowledge, are first developed. In considering the successive additions made to the nervous system during fœtal life, and reflecting upon the progress of intellect from its dawn to its maturity, it has often struck me, that if we were better acquainted with the comparative development of the brain at each successive period from infancy to puberty, we should arrive at a series of curious and important facts. If casts were taken every year of the growth of the brain, and afterwards a comparative estimate made of the intellectual character at each of these periods, I feel confident that it would furnish some interesting materials, calculated to throw additional light on the history of the human mind. But, on the other hand, it is evident, as every one who has studied the mind of man must have observed, that the intellect does not *march* or proceed at a steady and uniform pace. Man generally exhibits very considerable variety in the rate of his intellectual advancement, and the ordinary progress of mind is chequered by the occasional occurrence of periods, during which the mental powers appear to remain long stationary, alternating with epochs of sudden improvement. The boy who at twelve or thirteen years of age is desired to read mathematics, will, perhaps, at first find it totally impossible to comprehend the simplest problems, though he manifests sufficient capacity in other matters; yet this same individual, in the course of time, may suddenly acquire what appears a new power of intellect, by which he is enabled to get these studies within the range of his understanding, and to make a rapid and successful progress. Inattention to this circumstance on the part of those to whom the education of children is intrusted, has led to the most pernicious errors. Teachers have too often laboured at the cultivation of faculties, to which the child has not yet attained, and the result of such ill-directed efforts, has been to disgust the mind with subjects where a difficulty appears, which may be, at the time, actually insurmountable. In neither body nor mind is the child a model on the small scale, of the future adult; he cannot become a man intellectually or corporeally by mere increase, for the growth of both mind and body is always attended with the development of new organs and faculties.

With respect to the senses in the infant, we find that the sense of smell is but little developed. The sense of smell, like that of taste, seems to be placed by nature as a guard or sentinel over the digestive tube, to warn the individual of the fitness or unfitness of the matters to be swallowed. In the infant, where the nature of the ingesta is generally regulated by the mother, the sense of smell is scarcely required, and hence we find it more or less imperfect, and the nose very small. We have also reason to believe, from the small size of the mouth, that the sense of taste at this period is by no means acute; in fact, these two senses appear to be developed in a similar proportion. But when we come to examine those of sight, hearing, and touch, we find a very remarkable difference. The infant comes into the world with the eyes, the ears, and the organs of touch fully formed for use. These are the three senses which subserve to the acquisition of knowledge, and it was necessary that they should be well developed; the others, having application chiefly to corporeal wants, do not call for the same precocious expansion. With respect to hearing and touch in the infant, there is no peculiarity deserving of notice; but it is a very curious fact that all children are short-sighted. We can easily perceive this by observing children when they are looking at a book or picture. Whether this arises from the greater convexity of the eye at that age, I cannot exactly say, but I am inclined to think that this is the principal cause. We, however, always observe children keeping their eyes very close to a book; and I do not recollect that I have ever known a child that did not see clearly at the distance of an inch or two less than the adult.

Having made these few remarks on the senses in the infant, let us turn our attention to one of the most curious circumstances connected with the physiological history of man,—his early tendency to form sounds. That man is by nature and physical conformation a speaking animal, is sufficiently obvious to any one who observes attentively the habits of infantile life. Long before the power of uttering articulate sounds is acquired, the infant is indefatigable in exercising and educating its vocal organs, and many months of preparatory practice are spent in crowing, and in the utterance of half articulate sounds, to enable the organs of voice to become gradually accustomed to the finer and more complex movements employed in speaking. Nature has impressed on man an irresistible tendency to acquire the faculty of speech, and hence the exercise and education of the vocal organs commence with the dawn of infantile existence.

Much has been written about the impossibility of inventing language, and the discovery of a means of communicating his thoughts by articulate sounds, one of his noblest prerogatives, has been denied to the ingenuity of Man. I have already stated that the principal part of our knowledge is the result of those advantages which language and the art of writing bestow, and that language, written and spoken, is the mighty instrument which has enabled Man to extend the sphere of mental exertion from the narrow limits of individual minds, to the collective intellect of the species. But it has been asserted that Man cannot invent languages. This does not appear to me to be the truth. Man is by nature a speaking animal; and I will venture to say, that if all the languages at present spoken in the world were annihilated, we should, in the course of twenty or thirty years, have a thousand new tongues, not of course so cultivated and expressive as the present European and Oriental languages, but perhaps sufficiently intelligible for the ordinary intercourse of mankind. If we commence with the most imperfect languages—those of Africa—which, in many cases, consist but of a few guttural sounds, we shall find that the invention of such languages requires no extraordinary stretch of human ingenuity; and as there are between these rude and infant tongues and the most perfect, as the Greek, Latin, &c., several hundred intermediate examples of various degrees of perfection, according to the circumstances in which the different tribes of mankind have been placed, it may be very fairly asked, where does the impossibility of invention commence? In Africa there are more than a hundred different languages without any analogy, though there are two or three which are more extensively diffused. In fact, such is the facility of inventing new sounds significant of idea, that language, if not checked by writing, would go on perpetually changing. In Africa, where there have been no revered and illustrious authors to leave the stamp of their genius on the language, and to give it a fixed standard, we find it changing from generation to generation. We could scarcely understand the language spoken in the time of Chaucer, but an African would be often unintelligible to his grandchild. In fact, the formation of languages is constantly going on, in obedience to a natural instinct, and it is from the impulse of this instinct, that almost every man has a tendency to coin words. Written authority now struggles against the changes which are taking place, and the efforts of the learned are directed to retain cultivated languages in their present state, and hence it is that new words invented to express common ideas seldom outlive their authors.* When languages have arrived at a certain degree of perfection, it is wisdom to retain them in that state, and to resist the progress of useless innovations. The propensity to invent words has been in some instances rather a bane than an advantage to science, as we see exemplified in the confusion and obscurity, consequent on numerous and often useless changes in scientific terminology.

As some languages are extended by conquest, intercourse, and commerce over several nations of the same continent, so at different times do we find that certain languages have tinctured others, even in distant parts of the earth. This circumstance has been attributed, but, in my opinion, too hastily, and without sufficient grounds, to their having had a common origin.† I do not give much credit to the re-

* D'Israeli has made some curious and pertinent remarks on this subject.

† I may allude to an able article which appeared in the number of the *Foreign Quarterly Review*, published in December, 1834. I can scarcely express the gratification I experienced at finding a coincidence, not merely of opinion, *but almost of words*, between myself and the author of the able article on "The Countries, Nations, and Languages of the Oceanic

searches of those modern writers, who have expended so much labour in tracing the affinity of tongues, and I think they have committed a great physiological error in looking for a common origin of languages, whether in the east or elsewhere. I must refer to the *Foreign Quarterly Review,* for an able exposition of the principle, that many languages may have borrowed a considerable number of words from the language of some country dominant, on account of conquest or commerce, without, however, the languages of any of these countries being therefore derived from it. That several European languages have words evidently of a Sanscrit origin, no more proves these languages themselves to be of a Sanscrit stock, than the fact of the number of Latin and Greek terms each now possesses, ought to prove to an observer (ignorant of the precise period when such words were introduced), that these languages are of a Latin or Greek stock.

The strongest proof that we are not to look for a common origin of languages, may be derived from the fact mentioned by Mr. Lawrence in his Lectures on Physiology, *that a number of perfectly distinct languages have been, and are still, spoken by tribes of the same race, within a comparatively small space of country.* Thus, in the kingdom of Mexico, Mr. Jefferson states that more than twenty tongues are spoken, most of which are at least as different as the Greek and the German, the French and the Polish. On the continent of America alone, where there has been so little diversity of race, more than four hundred languages existed. "In Hindostan there are probably not less that forty distinct languages, yet the great mass of the people use but eight, the remaining inhabitants (a mere fraction, and consisting of the rudest of the whole) having more than thirty languages among them."

Mr. Marsden gives a list of eighty-four different lan-

Region." I need hardly add, that I have taken some additional facts in support of my views from this source.—See *London Medical and Surgical Journal,* January, 1835.

guages spoken in the Oceanic region, a list, certainly, by no means complete, for the *Review* to which I have referred says: "We have in our possession several tolerably complete vocabularies not even named by Mr. Marsden, besides notices of no less than forty-six languages spoken by as many distinct nations or tribes, to be found in one corner of the island of Borneo alone, that comprising its northern boundary. A few of these tribes are partially converted to the Mohammedan religion, and have made some progress in the arts, but the greater number are in a very savage state. Every village and every district is a distinct nation, having a separate language not understood by its neighbours."*

The structure of the languages spoken over the immense countries of Thibet, Ava, Pegu, Siam, and China, where the natives are of the Mongolian variety, exhibits to us the very infancy of languages. We have here an opportunity of studying these languages in their commencement, for all are monosyllabic, and consisting of the most simple elements. "As the earliest efforts of the infant are merely sounds of one syllable, so the first adult children of nature stammered out their meaning in the same way. The people of these countries go on speaking without any separation of ideas into certain classes, such as produce the distinction of the parts of speech, as in the more perfectly formed languages. One and the same sound signifies joyful, joy, and to rejoice, and that through all persons, numbers, and tenses."

"The more radical ideas are set down together, and the hearer is left to guess at the connecting link. As there are no inflexions, the cases and numbers are either not noted, or they are marked under urgent circumstances by circumlocution. They form plurals as children do, either by a repetition of the word, as tree tree, or by adding the words much or other, as tree much, tree other, I much, I other, which means We. 'Be heaven I other Father who,' is their mode of expressing 'Our Father which art in heaven.'

"That languages of such poverty, which merely place

* Vide *Foreign Quarterly Review.*

together the most essential ideas without connecting them, must open a wide field for ambiguity and obscurity in civil life, and be totally inapplicable to the purposes of science, is sufficiently obvious. Hence the people who speak them must ever remain children in science. However the Chinese may exert themselves, so long as they are impeded by this imperfect language, they must be unable to appropriate to themselves the sciences and arts of Europe."

"It is a curious fact that the Mongols, the Calmucs, and the Burats, although they have at all times occupied the regions close to Thibet, and have obviously derived their language from the same quarter, are no longer confined to such an imperfect instrument of thought and communication as a monosyllabic language affords. They have (and here we observe language advancing a very considerable step) derivations and inflexions both for nouns, and for expressing moods and tenses. The Japanese, too, another numerous people of Mongolian formation, have a well-formed polysyllabic language, without any resemblance to the Chinese."*

Here we find perfectly different types of languages, monosyllabic without inflexions, and polysyllabic with them, prevailing among nations evidently derived from a common stock. Now it is plain that the languages of the Calmucs and Mongols, &c., must have been formed at a date subsequent to their branching off from the parent stock, and if this be the case (which I think cannot be fairly denied) it furnishes a strong proof of the facility with which nations invent languages, and of the difficulty with which a radical fault committed by the first inventors is surmounted by their descendants.

That there exists in mankind an innate tendency to adopt the same expedients, in overcoming the same difficulties connected with language, is obvious from the fact that almost all nations have fallen on the same natural method of counting and of naming numbers. "There can be no doubt that the decimal notation, which has been in use in almost every age

* Adelung's *Mithridates,* as quoted by Mr. Lawrence.

and country, has arisen from the facility which the ten fingers afford of making calculations. The names of numbers have been universally formed distinct as far as ten, after which compound names have been employed. The exceptions to this rule are only additional proofs of the universality of the principle, they being generally deduced from five, the number of the fingers, and from twenty, the number of the fingers and toes together. We call the simple symbols of a number, digits, or fingers. The Caribbees called the number ten by a phrase which meant all the fingers of the hand, and, in many languages, the words for five, ten, or twenty, are connected either by direct derivation, or by common etymology, with those for the hand or fingers. In France, the scale from 60 to 100 is vicenary—by twenties, and, in the Indian Archipelago, the ancient scales are vicenary."*

Mr. Peacock, from whose work the above extract is taken, seems to have successfully established two propositions:—1st, That the natural scale of notation, alone has met with adoption, meaning by natural scales those which are derived from the hands, or hands and feet together; 2ndly, That amongst all nations practical methods of numeration have preceded the formation of numerical language. But this does not imply that every nation has gone high in the scale of numbers. There are tribes which have never risen to making up large numbers even by the repetition of fives. Aristotle mentions a tribe of Thracians, who never counted higher than four, and the Yancos, living on the banks of the river Amazon, have been stopped by the complexity of their language from even ascending so high. They count no higher than three, the name for which in their language, according to La Condamine, is poettarrarorincoarroac, which consists of twenty-two letters.

I regret that my space will not allow me to quote some other very interesting and curious remarks of Mr. Peacock on this subject. There can be no doubt that the simple and

* Article "Arithmetic," in the *Encyclopædia Metropolitana.*

natural scale of enumeration by decimals, has been derived from the habit of reckoning by the fingers. This, combined with the Arabic notation (one of the most important of human inventions), has materially assisted the advancement of discoveries in various departments of science, by affording a simple and efficient mode of calculation.

I have thus endeavoured to prove that Man is by instinct and physical conformation an inventor of articulate sounds, to serve for the expression of his ideas, and that he is fully capable of inventing languages; in fact, that his tendency to form new words is so great, that, where it is not counteracted by a written standard, languages have completely changed in the course of a few generations.

When a language has become consecrated by being used for the purpose of disseminating the knowledge of a certain religious code, as is the case with the Hebrew and Arabic, the reverence attached, by those who consider that code as sacred, to the laws themselves, is extended to the language used; and thus a powerful check on the natural tendency of languages to change, is at once brought into operation. Again, when a wise system of laws has been gradually disseminated, or when the works of favourite poets and historians have obtained a well deserved celebrity in any nation, then the tendency to change receives a check, as was the case with the Greeks and Romans. A convincing proof that the invention of languages can be achieved at the expense of no great intellectual effort, may be derived from the fact that, "languages are many, when people are savage and rude, or semi-barbarous. In proportion as men become civilised, and communities more extensive, they become few in number, the smaller and ruder dialects being gradually absorbed, or violently exterminated by the prevalence of the more polite, improved, and consequently the most useful forms. We are unaware of the existence in ancient or modern times of any one language, widely disseminated and extensively spoken by many rude tribes, disconnected by locality, and without the knowledge of letters. The Celtic language is indeed said to have been spoken universally in Spain, Gaul, and the British Islands, and the German language equally so from the Rhine to the Baltic; but of this there is no proof, and we are disposed to dispute a fact which is contrary to all authentic analogy in other parts of the world. In China, as Du Halde observes, every province, every great city, nay, every town, has its peculiar dialect, which is the reigning language, for everybody speaks it, the learned, as well as the common people and the women; but then the women and common people can talk no other." . . . . . .

"In Europe we see the most civilised and numerous communities speaking one language, as the German, the Italian, the French, the Spanish, &c., while many tongues occur when we enter the barbarous parts of it, Russia and Turkey. In France and in the British Isles, the rude Celtic, to the great benefit of society, is in progress of extinction, and even the Anglo-Saxon dialect of the Scotch is rapidly giving way to the more polished and useful English. In America, before the Spanish Conquest, there existed but two or three tolerably polished lauguages, each of them spoken by a pretty numerous population. In that continent, although several have disappeared, it is known that there are still spoken upwards of four hundred distinct languages, with no less than two thousand dialects, by the indigenous population, who at the utmost are not reckoned above ten millions in number, whilst the Anglo-Americans, who speak but one language, are themselves alone more numerous."*

The facts brought forward afford a most convincing proof that man possesses an innate tendency to use, and a physiological aptitude to invent, languages, and that under every variety and circumstance of race, climate, and civilisation, he invents them with facility and in endless numbers; for since the first syllable issued from the mouth of the first man who spoke, how many thousands of dialects, of languages, have been invented and lost! This great physiological principle being established upon a sure and firm basis, it

* *Foreign Quarterly Review*, No. 28, p. 388.

must exert a beneficial influence in directing and limiting the researches of the philologist, for it will teach him how far he may expect to elucidate history, by inquiries into the affinity and origin of languages, and it will prevent him from wasting his time and labour, in the vain endeavour to trace the different tongues used by mankind, to one common source.

To conclude, it may be observed that a multitude of languages is a serious evil, and is calculated powerfully to counteract the diffusion of knowledge; it is an evil, however, which will diminish with each succeeding century, for, luckily for mankind, the discovery of the New World and of Australia has secured a vast extent of territory, into which a few of the polished languages of Europe have been transplanted, and where they flourish without a rival. If the time ever arrives, which there seems no reason to doubt, when the continent of North America, and the great island of New Holland shall be as thickly inhabited as Europe, then what advantages to commerce, to science, and to the arts, will arise from one, and only one language, being spoken by the inhabitants of those mighty and distant countries!

These advantages we are scarcely able to appreciate even in the Old World. It will be reserved for the New, to witness, in after ages, this great and interesting spectacle.

FACULTIES AND INSTINCTS OF MAN.

I HAVE now briefly sketched the physiological history of Man, as connected with the peculiarities of his form and structure, and have shown that a comparison of his skeleton with those of all other animals, proves that he alone is by nature a biped, and destined to walk erect. I have spoken also of the comparatively great development of the cerebrum, the seat of the intellectual powers, which pre-eminently distinguishes him, and directed attention to those faculties which mark the first dawn of mind, and which, for a wise purpose, predominate during the periods of infancy, childhood, and youth, conferring on the young a stock of fresh and vivid ideas, and enriching the stores of growing knowledge. I remarked that it was reason alone that gave Man his lofty and commanding position among his fellow-animals, and enlarged on the fact of his being pre-eminently a speaking animal, destined to invent and cultivate language, and prompted by natural instinct, as well as by physical conformation, to form articulate sounds. I concluded by expressing my belief that languages are not entirely traditional, that they are constantly changing, and preserve a permanent character only when a fixed written standard exists; and that if all languages were suddenly lost, we should, in the course of time, have their places supplied by others, some of which would exhibit a considerable degree of cultivation. With respect to grammar, it always accompanies each form of invented speech as a necessary result, being, if I may so express myself, the skeleton of language. And here some important views occur to the physiologist concerning the human mind, and the nature of language, as connected with the subject of education. I have already endeavoured to trace the relative progress and development of the mental faculties from infancy to puberty, and to show that in the earlier periods of life, the faculties chiefly connected with perception, as attention, curiosity, and a memory for names and things, were predominant. Now according to the old mode of education, the order of nature was almost completely reversed; qualities were supposed to exist which were, as yet, quite undeveloped, and those actually existing, and even in a state of considerable perfection, were not cultivated. It is, nevertheless, sufficiently obvious that in endeavouring to educate youth, we are not pursuing a physiological plan, when we make the attempt without having accurately ascertained by observation and study, the faculties which distinguish the different periods of childhood and youth, and their peculiar adaptation to the various branches of science and literature. In youth, when the perception is quick, the curiosity ardent, and the memory good, the mind should be directed to the study of the physical qualities of things, and the accumulation of names; and hence natural history, biography, history, languages, and geography, should be the employment of youth. Every species of knowledge which requires for its attainment, perception, imitation, attention, curiosity, and memory (faculties which are all enjoyed by the child in a very remarkable degree), may be now communicated with facility. Youth, too, is above all others, the period for cultivating the discipline and education of those mysterious and powerful springs of human action, the passions and affections. Languages, however, are not to be taught by commencing with the philosophical part, which is grammar.

'hey should be taught in the way by which a child acquires a nowledge of its own language; a stock of words and phrases hould be learned, and fixed in the memory by repetition, eserving the study of grammar and syntax for a more adanced period. The practical precepts of grammar may be ufficiently enforced by judicious and well selected examples, ut we should never attempt to involve a child in the useless nd perplexing task of studying the ultimate analysis of lanuage. This is the natural and the most successful mode of eaching languages, and yet how generally do we find an pposite plan pursued. The moment a child begins to learn language, a grammar is put into his hands, he is dragged hrough a maze of abstract terms and unintelligible definiions, and is required to understand and explain the complex nd subtile nature of verbs, pronouns, prepositions, and conunctions. He next proceeds to the study of syntax; he s now required to explain all the difficulties connected with he concord, government, and mutual relations of words. He s expected to be able to understand all the intricacies of grammatical abstractions, an expectation supposed to be fulfilled, when the suffering scholar has learned a certain number of rules by rote, which he can mechanically apply for the explanation of grammatical construction. This is termed *parsing*, which a boy may learn to perform, much to the credit of his master and the edification of an audience, while all the while he understands as little about the matter as one of Babbage's machines, which, however, performs calculations much more difficult.

The consequence of this unphilosophical mode of proceeding is, that young minds are frequently disgusted at the very threshold of knowledge, and take a dislike to learning, which it often requires years to remove, and many have given up in despair every notion of acquiring the ordinary scholastic attainments, and have become permanent and incurable dunces. It is for this reason that I think our whole present system of education should undergo a revision. Something, however, has been done, and I may observe here that the mode of teaching languages introduced by Mr. Hamilton is a great improvement. But it appears that not only the present mode of teaching languages, but also the whole system of educating boys, until they arrive at that period when they are destined to commence the active business of life, requires to be changed. In fact, too much of the traditional and monastic system still prevails in our grammar schools and colleges, and too many of our modes of communicating and acquiring knowledge have been derived from the darker ages. The province of the physiologist, however, is limited to pointing out the successive steps which mark the progress of the human intellect; it is for others to adapt and regulate that intellect, in the acquisition of the various branches of knowledge and science.

A change in education such as is here referred to, has been of late almost universally adopted by the utilitarian and wise nation of North America. With them a knowledge of words is considered useful, only so far as it contributes to enlarge our knowledge of things. Languages are, as it were, keys to be employed in opening certain chests containing treasure, but they do not constitute the treasure itself. Yet how many school and college men walk about, vainly displaying the variety and number of the keys they have by great labour acquired, and how many are, consequently, looked up to as learned, who have spent their whole lives in getting means of access to knowedge, which they never even attempt to profit by. Such persons are too often ignorant of nature and nature's works, and consequently, are but narrow-minded pedants, who excuse ignorance of facts much more readily than a fault committed against the rules of grammar and prosody. The mispronunciation of a Latin word in a classical quotation, has at once closed the ears of the British senators against the voice of a man speaking sensibly on a subject of national importance! And yet were our best reputed Oxford Latinist, to read aloud, on trial, a passage of Tully's *Offices* before a suddenly resuscitated jury of Romans, the verdict would be certainly, "TOTALLY UNINTELLIGIBLE," although Cicero himself were the foreman.

Having spoken of the intellectual faculties of Man, including his distinguishing attribute, reason, we next come to compare them with those possessed by other animals. "The intellectual faculties possessed in a certain degree by the higher orders of animals are, perception, memory, the association of ideas, imagination, volition, and reasoning. Cuvier also enumerates the power of abstraction; one privileged being, Man, has the power of associating general ideas with particular images more or less arbitrary, which are easily fixed in the memory, and which serve him to recall the general ideas that they represent; these associated images are what are called signs; collectively they form a language." Speaking, writing, and printing, raise Man far above all other animals. They are the chief engines employed in promoting the spread of knowledge, and rendering it fixed and certain, as has been already explained when speaking of the disadvantages attendant on the deprivation of hearing and sight.

"Though the most perfect animals are infinitely below man in the excellence of their intellectual faculties, it is nevertheless certain that their understanding leads them to perform actions of the same kind. They move in consequence of the sensations they receive; they are susceptible of durable affections; they acquire a certain knowledge of things by experience, according to which they conduct themselves (any one who has observed the training of the dog and other animals will easily fill up this illustration), independently of actual pain or pleasure, by the sole foresight of consequences. In a domestic state they feel their subordination, and know that the being who punishes them is free to do so or not. They assume a supplicatory air when they feel themselves culpable, or know that their master is angry; they improve or deteriorate in the society of man; they are susceptible of emulation and jealousy; they have among themselves a natural language, which is indeed only the expression of their present sensations; but the man teaches them a much more complicated language, by which he makes them know his will and execute it."

A remarkable instance of the effect of habitual obedience to certain words of command, was exhibited by Mr. Cross's elephant, at Exeter Change, when the animal was in a state of frenzy, and the object of attack with fire-arms. "It is singular that, though in this deranged state, he sometimes recognised Cartmill's usual cry of 'Chunee! Chunee!' by sounds with which he was accustomed to answer the call; and that more than once, when Cartmill called out 'Bite, Chunee! bite!' which was his ordinary command to the elephant to kneel, he actually knelt, and in this position received the balls in the part particularly desired to be aimed at. Cartmill, though one of his assailants, kept himself, therefore, as much as possible out of view, in order that his voice might retain its wonted ascendancy. When this same elephant was previously unwell he exhibited the following example of reasoning powers. He had taken medicine disguised in various articles of food, and had become very suspicious of every thing offered to him. On Monday some warm ale was presented to him in a bucket, for the purpose of assisting the operation of the calomel, but he would not touch it until his keeper drank a portion of the liquor, when he readily took it."

I may cite this elephant as having exhibited a remarkable proof of the truth of what I have already asserted, concerning the luminous appearance of the eyes of animals;—"In his fury, Mr. Cross says that his eyes glared like lenses of glass with a red and burning light." Surely in so dark a place this light could not have been the result of mere reflection.

"We perceive, indeed," continues Cuvier, "in the superior animals a certain degree of reasoning, with all its effects, good or bad, which *seems* to be nearly the same as that of infants before they have learned to speak. In proportion as we descend to animals removed from man, the intellectual faculties become weaker, and in the last classes they finish, by being reduced to signs of sensibility, which are sometimes equivocal, that is, to certain feeble motions to escape pain; the degrees between the two extremes are infinite."

Here we perceive, that just as the body of Man, during its growth and development, rises as it were through steps analogous to those which are observed in the ascending scale of animal existence, so the mental faculties rise from the time of infantile life gradually but rapidly, and that at the earliest period, before the child has learned to speak, the mental faculties developed, do not appear to be much superior to those possessed by animals which we look upon as sagacious.

"But there exists in a great number of animals a faculty different from intelligence, and which we call *instinct*. This makes them perform certain actions necessary to the preservation of the species, but often altogether foreign to the apparent wants of the individual, and often also extremely complicated. We cannot attribute these actions to intelligence, without supposing a degree of foresight and understanding infinitely superior to what we can admit in the species that perform them. The actions performed by instinct are not the effects of imitation, for the individuals that execute them have, in many instances, never seen them done by others; they bear no proportion to the common intelligence of the species, but become more singular, more skilful, more disinterested, in proportion as the animals belong to the less elevated classes, and are, in other respects, more stupid. They are so much the property of the species, that all the individuals perform them in the same manner without any improvement."

"Thus, working bees have, since the beginning of the world, constructed the most ingenious edifices, agreeable to principles of the highest geometry, and destined to lodge and nourish a posterity which is not even their own. Solitary bees and wasps also form very complicated nests for their eggs. From the egg there springs a worm, which has never seen its mother, which does not know the structure of the prison in which it is enclosed; but when once it is changed into a wasp or bee it constructs a similar nest, equally perfect, for its own egg."

"We cannot," says Cuvier, "form a clear idea of instinct, but by admitting that the animals endowed with it have, in the sensorium, continued *innate* sensations and images, which determine them to act like sensations received through the organs of sense. Instinct is a kind of dream or vision, that perpetually haunts them, and prompts them to action; and in everything that respects their instinctive motions, we may regard animals *as a kind of somnambulists.* Instinct has been granted to animals as a supplement to intelligence, to concur, together with their strength and fecundity, in the preservation of each species in their due proportions. There are no visible marks of instinct in the animal conformation; but intelligence, as far as we can observe, is in constant proportion to the relative size of the brain, and particularly to that of its two hemispheres."*

In the concluding observations of Cuvier, we are furnished with a striking mark of difference between instinct and intellect. There are no visible or appreciable marks of instinct in the structure of animals, but we find intelligence bearing a constant proportion to the relative size of the brain, and particularly to that of the hemispheres of the cerebrum. Anatomists who have studied the subject with great attention, have never been able to point out any part of the nervous system in animals, as indicative of a higher or lower degree of instinct. Whereas anatomy has succeeded in establishing, in the most satisfactory manner, that there is always a constant and intimate connection between the size of the cerebrum, and the development of the intellectual faculties.

With respect to instinct, it is important to observe, that animals not unfrequently make very curious mistakes. For

* The reader is referred to Griffiths' "Animal Kingdom," (translated from M. Cuvier's work,) vol. iii. p. 360, et seq., for an excellent dissertation on the mental powers and instincts of animals.

instance, flies have the instinct of depositing their ova in places where they shall have plenty of food when they arrive at the maggot state, and hence they generally deposit them on flesh, particularly if it happens to be somewhat tainted. Now there are certain species of flowers (as, for example, the Rafflesia Arnoldi, which is a native of Sumatra, and grows to an enormous size) which have a smell of carrion; on these the flies, deceived by their instinct, deposit their eggs, which, when they become maggots, perish from want of food. The same thing occurs in the case of the Musca vomitoria, with respect to various species of Phalli and Agaraci, which possess much of the odour of dead flesh, leading to similar mistakes. We also observe that two instincts, having different objects, sometimes become opposed to each other, and under these circumstances the stronger always prevails. This is not uncommon among swallows, which have been frequently observed to build their nests at a late period of the season, and near the time when they make their usual migrations from this country. Here the young ones are hatched too late, and the instinct to migrate being stronger than that which prompts them to cherish their young, the latter are forsaken, and perish for want of food.

I have dwelt on the peculiarities of instinct, and the difference between it and reason or intelligence, because the subject is closely connected with Man, who, as we are all aware, exhibits in his actions both instinct and reason. As our bodies embrace in their constitution, tissues analogous to those which enter into the structure of the different classes of inferior animals, so the mind of Man comprises not only the intellect and reason peculiar to himself, but also possesses instincts similar in nature but differing in quality, from those enjoyed by other animals. Locke was the first who pointed out in a clear and forcible manner, how much Man is the creature of external impressions, and how deeply he is indebted to the senses, for the knowledge he possesses. He has compared the mind of Man at its dawning, to a sheet of white paper, prepared to receive any impressions, but containing none. This is no doubt, to a certain extent, a correct view of the case, but I think, in making this assertion, he has gone a little too far; for although no instinctive feelings or emotions could display themselves until impressions had been received from without, still these impressions are not related merely to operations guided by reason. For they also become the subject matter of another very important class of operations, viz. those depending on the agency of innate feelings, and instinctive propensities. The latter are in some instances but little connected with mind, although they require the exercise of volition, and consequently they may be termed organic or bodily instincts, *e.g.*, those which preside over the acts of sucking, swallowing, &c.

Instinct then, comprising innate propensities and passions, makes up a great portion of Man's nature, and is one of the most powerful springs of human action; hence an intimate acquaintance with this agent, under its different phases and modifications, is essentially necessary to the teachers of youth as well as to the rulers of nations. Thus Man is by instinct a *hunting animal.* This affords an explanation of the pleasure he feels in indulging in the sports of the field. It is not merely because he delights in fresh air and enlivening exercise, that he fishes or shoots, or joins in the more active labour of the chase, but because the pursuit of prey is one of his earliest and strongest instincts. Man is and has been a hunting animal in all ages, from Nimrod down to Osbaldistone. He breaks from his slumbers before dawn, he watches through the long and cheerless night, he encounters the most extraordinary fatigue, he disregards the calls of hunger, and risks comfort, health, and frequently life itself, in the pursuit of this favourite amusement. Hunting was one of the modes of providing food given him by nature, before reason and accident taught him the other and preferable mode of cultivating the earth; but although the plenty which agriculture sheds around him, renders him independent of the chase for his supply of food, still Man remains a hunting animal, and no change of circumstances has been able to damage or wear out this, the strongest and earliest instinct of his nature. This is exemplified by the difficulty, almost amounting to an impossibility, which persons many years engaged in American hunting have experienced, in endeavouring again to conform to the usages and habits of a civilised and agricultural society. How often has the dictation of a natural instinct, long gratified, forced them again to the back woods and wild savannahs; how often has it impelled such persons to break the strongest social bonds.

Man is by instinct a *fighting animal.* The child scratches in the nursery, the boy boxes at school, and grown up gentlemen settle their differences with the pistol. The clan has its foray, the district its feuds, and the nation its battles. This propensity explains the occurrence of wars, and the admiration with which mankind looks upon those heroes, who have distinguished themselves by the destruction of thousands. The Roman circus rang with acclamations when the last life blood welled from the side of the dying gladiator. In this country we do not carry our love of the amusement so far; we content ourselves with shouting at a cock or dog fight, a match of pugilism, or a bull-bait. There are also, besides Man, hundreds of animals in whose nature there exists an instinctive tendency to fight. Certain tribes of ants march very considerable distances to fight on the ground intervening between their hive-hills, and carry on the combat with great valour and pertinacity, until victory declaring for one side, forces the other to quit the well-contested field, encumbered by the bodies of the dead and dying. The same thing may be observed in many other species of animals. This propensity to fight has (in the case of man) hitherto withstood more than any other all the efforts of reason; but the rulers and educators of mankind, at the same time that they are aware that the passion is instinctive, should recollect that it is not beyond the limits of possibility, that reason may hereafter gain a mastery over it, more or less complete. I am not sanguine enough indeed, to indulge in dreams of human perfectibility, or to think it probable that a time will ever arrive when peace shall permanently prevail among the nations of the earth. Constituted as human nature is by a wise and beneficent Providence, we cannot bring ourselves to believe that this warring tendency of Man has been given to him without a specific object. Indeed it may be doubted whether danger from without is not essentially necessary to the formation of the social fabric; it may be doubted whether obedience and subordination to the laws and constituted authorities, so essential to the welfare of civilised Man, could ever have been attained, had they not been rendered necessary, in the first instance, by the fear of foreign enemies.

Man possesses not only the instincts of hunting and fighting, but also many others equally remarkable, and some of them of perhaps equal importance. Thus, for instance, he is a *king-making animal*. In this he is not singular, for many tribes of animals adopt a form of government, sometimes despotic, sometimes mixed, sometimes democratic. Man has a strong tendency to look up to some superior power, and a natural propensity, unless guided and directed by reason and experience, to delegate to some other being of his kind, a control over him more or less despotic. Here again education should interfere, and point out how far this tendency ought to be checked or encouraged: suppressed or extinguished it never can be, so deeply and inseparably is it blended with our nature. This instinct in Man will ever render a purely republican form of government, if not absolutely unattainable, at least very precarious as to existence; as society becomes more generally educated, reason is strengthened, and many of our instincts can more readily be suppressed, or modified, and we may look forward to the period when constitutional governments will be more generally acceptable, than they are at the present moment. Still, however open admission to the deliberative assembly may be, a fixed and unchangeable head of the executive will always be required, be he called King or only President. The United States of America enjoy a wisely constituted government, but they do not form a republic.

Again, Man is an animal possessed of a powerful instinct to ornament himself, and to attract the attention of his fellows by various external decorations. This is a passion strong in every one of us; whether in the savage, who prides himself on his tattooing; or the New Zealand chief, who disfigures his face with linear incisions; or the Red Indian, who considers the ring in his nose as the symbol of nobility; or the military man, arrayed in all the glories of feathers and gold lace; or the fine lady, in the fantastic creations of Parisian millinery. It is the love of admiration that gives the common impulse to all; this is the reason why the savage barters his gold for beads and ostrich feathers, and why the soldier sheds his blood like water for an iron cross, or a silver medal. It is this which makes the courtier sigh for a ribbon, or a star, or a garter; and the citizen gaze with admiration and awe at the cocked hat of the sheriff, and the gilded coach of the lord mayor. All these are instincts implanted in our nature for a good purpose, but requiring the guidance of reason to render them available. Shallow philosophers, and well-meaning, but injudicious moralists, have descanted most copiously upon these weaknesses, these faults, these blemishes of human nature. It is, indeed, the duty of reason, of religion, and of philosophy, to control them by means of example, of government, and of education; but were we to succeed in banishing from the human breast all these faults, could we at once extirpate all these weaknesses,—vice might indeed be exterminated, but what would become of virtue? It is the same with the moral as with the physical configuration of man; it is the same with his mind, as with the general constitution of nature's works upon the earth. What spot upon the surface of this globe, enjoys an immunity from the occasional effects of elemental strife? What animal is there that is not subject to various diseases, numerous and often fatal casualties, and lastly to death? And yet who arraigns Providence, who dares assert that the constitution of the earth is imperfect? Who will contend that animals could have been created in such a manner, as to unite with the happiness they now enjoy, a lesser degree of suffering? So it is with the moral disposition of man, so it is with his mind, so it is with his body. Were his moral defects erased, their opposing virtues would receive no strength from exercise, no confirmation from an approving conscience, no reverence from contemporaries or posterity. How could benevolence find occupation, were all alike good and prosperous? Where could charity satisfy her longings, were all free from mental or bodily suffering, were all equally independent of consolation? But I must not, allow myself to be carried away by a subject which, however attractive, can scarcely be accounted one which it is my province to discuss.

There are many, very many, instincts, natural feelings, tendencies, or innate passions, which exercise a most important influence on the well-being of Man, and distinguish him from all other animals. Among these that tendency existing in the human breast to revere a Superior Being, and which exerts such powerful effects upon society, requires a passing notice. This tendency occurs in people the most uncivilised and barbarous, and gives rise to various forms of worship, some, indeed, so concealed, so vague, or slight, that travellers have been frequently deceived, and have been led to propagate the ill-founded opinion, that a society of men can exist totally destitute of any shadow of religion, of all the feelings planted by Divine Providence in the human heart. This tendency exerts an influence on the species, at once the most necessary and the most beneficial. As time will not permit me to enlarge on the nature or effects of the other instincts with which man is endowed, I shall conclude by speaking of one of paramount importance, viz., that tendency which renders masses of mankind liable to be suddenly affected by the same passion, and which may be termed the *instinct of sympathy or of imitation.* The author of the article "Britain," in the *Encyclopædia Britannica*, has spoken so pertinently on this subject, in describing the effects of one variety of this passion, that I shall take the liberty of quoting the passage.

"There is a passion of the human mind, *to which philosophers have not yet given a name*, which at times remains dormant for ages, but which, when kindled into action, seldom fails to alter the whole face of society. This is the passion, or rage, for reforming the world, or for propagating that which, under the influence of this sentiment, appears good for the human race, or just or right with regard to society at large. In the regions of Asia, under the Arabian prophet, it assumed the form of a zeal for religious truth, or a passion to destroy every form of idolatry, and to bring mankind to the worship of one God. Supported by the energy which this passion inspired, and the *contagious* frenzy which it communicated, the Mahometan faith was conveyed from the Arabic Gulf to the banks of the Ganges, the deserts of Tartary and of Africa.

"*The same passion* has in Europe, at different times assumed the form of a zeal for freedom and of religious enthusiasm. At the time of the Reformation it chiefly appeared under the aspect of a desire to accomplish religious reform. In those countries which, like England, were vigorously governed, and where the prince and the people concurred in the same object, the zeal of the multitude was restrained, and the Reformation was not carried to extremes; but where the populace led the way, as in Scotland, Geneva, and other places, the Reformation was destructive to all ancient religious institutions. When the passion for Reform, after two centuries of internal tranquillity, was communicated to the French nation it assumed the shape of a zeal for freedom, and religion was treated with contempt. The passion, however, was the same that had formerly induced the European States to engage in sanguinary wars for the support or overthrow of their religious establishments; in both cases the followers of the new sect were filled with enthusiastic notions of their own power and their own worth, with visionary schemes of impracticable improvements, and with complete impatience of opposition, accompanied with an eager zeal for making proselytes. *Like other social passions, its contagion rapidly flew from city to city*, and, in a lesser or greater degree, it extended to the utmost limits of Europe. * * * * As it is the nature of the human mind, when its attention is exclusively occupied on any subject, to proceed to extremes, new notions were daily broached in England, or imported from the volcanic region of France; one notion in particular was extremely prevalent, that of the boundless perfectibility of the human mind, which is so true in theory, but so false in fact; which, in the hands of Providence seems to be gradually but surely going forward, but which has never failed to cover with confusion all those who have hitherto attempted to act upon it as a present and existing reality. At this period, however, this notion gained singular favour; all imagined that the period was arrived when mankind, become rational and just, were no longer to engage in sanguinary wars of ambition, when good sense alone was to rule the world, and when the public business of society, reduced to the narrow limits of administering justice and of constructing roads and harbours, might be conducted with little trouble, and without the establishment of king and nobles, and of different ranks and orders of men, or the display of military force for the maintenance of tranquillity. As these notions appeared extremely favourable to the common people, they entered into them with much eagerness, and thus contributed to give them a greater appearance of practicability; a sort of general delirium upon political subjects prevailed, and mankind were led to believe that the greatest changes in the order of society might be accomplished with facility and safety."

A most remarkable and instructive instance of the effects produced by the instinct of imitation, is recorded by an able writer on New England, who says, that "in 1692, there lived in a town of New England, called Salem, two young women who were subject to convulsions, accompanied with extraordinary symptoms. Their father, minister of the church, thought that they were bewitched, and having in consequence cast his suspicions on an Indian girl, who lived in his house, he compelled her by hard treatment to confess that she was a witch. Other women upon hearing this immediately believed that the convulsions which proceeded only from the nature of their sex were owing to the same cause. Three citizens, casually named, were immediately thrown into prison, accused of witchcraft, hanged, and their bodies left exposed to wild beasts and birds of prey. A few days after, sixteen other persons, together with a counsellor, who, because he refused to plead against them, was supposed to share in their guilt, suffered in the same way. From this instant the imagination of the multitude was inflamed with these horrid and gloomy scenes. Children of ten years of age were put to death, young girls were stripped naked, and the marks of witchcraft searched for upon their bodies with most indecent curiosity; and those spots of the scurvy which age impresses on the bodies of old men were taken for evident signs of the infernal power. In default of these, torments were employed to extort confessions dictated by the executioners themselves. If the magistrates, tired out with executions, refused to punish, they were themselves accused of the crime they tolerated, and the very ministers of religion raised witnesses against them, who made them forfeit their lives for their humanity. Dreams, apparitions, terror, and consternation of every kind increased these prodigies of consternation and horror; the prisons were filled, the gibbets left standing, and all the citizens involved in gloomy apprehensions. The most prudent quitted a country stained with the blood of its inhabitants, and nothing less than the total and immediate subversion of the colony was expected, when, as on a sudden, all eyes were opened at once, and the excess of the evil awakened the mind which at first it had stupefied. Bitter and painful remorse was the immediate consequence; the mercy of God was implored by a general fast, and public prayers were offered up to ask forgiveness. Posterity will probably never know the cause or remedy of this dreadful disorder. It had, perhaps, its origin in the melancholy which those persecuted enthusiasts had brought with them from their own country, and which had gained fresh strength from the fatigues of the voyage and the hardships inseparable from a change of climate and manners of living. *The contagion however ceased, like all other epidemical disorders, exhausted by its very communication.* A perfect calm succeeded this agitation, and the Puritans of New England have never since been seized with so gloomy a fit of enthusiasm."

Here, we have a remarkable instance of a community being seized with madness upon one subject. Examples of *national monomania,* arising from the overwhelming interest attached to a particular subject, through the intervention of an enthusiasm generated in some individual, or small part of the community, whether by design or accident, and rapidly diffused by means of the instinct of imitation; examples, I say, of such national monomania are of frequent occurrence in history. Were not the facts connected with the celebrated *South Sea Scheme,* in 1721, well attested by indubitable evidence, posterity would be slow to believe that a people, habitually so cautious in pecuniary concerns as the English, could have been swindled with such facility. An imaginary stock was created, and a certain value attached to the shares by the authors of the scheme. The whole nation, infected by the spirit of avaricious enterprise, crowded to purchase, and, in a short time the price of shares had increased ten-fold. At length, the strength of the monomaniacal excitement beginning to diminish, the light of cool reason again appeared, and a nation, which hailed with enthusiastic joy, the near approach of imaginary wealth, was at once filled with the ravings of disappointment, and the madness of despair.

Did time permit, we might with advantage study the workings of the instinct of imitation, as displayed in producing the monomania which affected the whole of the Christian world at the period of the crusades, a monomania whose force changed the fashion and architecture of the social edifice, and wrought effects which permanently altered the condition of European nations. It would appear, indeed, that, under the influence of the imitative instinct, we become capable of achievements otherwise far above our strength, and, consequently, that Providence has ordained this means as suitable to effect great ends, by stimulating mankind to acts of which they would be otherwise incapable. It is true that the moral storm thus excited, often seems to do nothing but destroy; the land is everywhere covered with ruins, and the succeeding generation is reared amidst the wreck, astonished at the madness of their fathers. A more careful observation of the scenes of desolation will, however, detect the sources of future good; prejudices and institutions which stood in the way of improvement have fallen before the shock, while the temporary enthusiasm that caused so many evils has often served, when properly directed, to enlarge in an unhoped for manner, the bounds of human knowledge.

At the commencement of the Christian era, a monomania of migration appears to have seized the nomade tribes residing in the north-eastern parts of Europe and the west of Asia, and to have given rise to those successive inundations of warlike hordes, which, for the time, nearly extinguished civilisation in the countries they invaded, but proved finally the means of giving birth to those principles of civil and religious freedom, that now prevail in European society. No people has suffered more from the working of this passion than the Jews, whose history in Germany, France, Spain, and England exhibits so many intervals of repose, interrupted by violent persecutions carried on by the frantic populace, with all the symptoms of temporary insanity. When accident, or the wickedness of some malicious person, had succeeded in producing a persecution of the Jews in any one city, the effect of this example was often sufficient to arouse the dormant passions of the rest of Christendom, and the persecution speedily became general. Shortly after the successful voyages of Columbus in search of the New World, all the maritime nations of

Europe were seized with a mania of discovery, and the dreams of society were everywhere gilded with the wealth of unknown regions—with the treasures of Eldorado. This passion ruined thousands, it is true, but the enthusiasm it generated enabled man to overcome difficulties to all appearance insurmountable, and, in a comparatively short space of time, he was rewarded with a knowledge of geography, the enlightened parent of commerce. I need not allude to those periods of history when the votaries of astrology and alchemy successively forged chains, in which society was led away captive, neither is it necessary to advert to the lasting effect produced by the passing mania of knight-errantry; all these subjects have been treated of fully by authors of ability.

As communication improves by means of steam-vessels, railroads, and other contrivances, the brilliant results of the mechanical genius of the age, society will be placed in a situation still more liable to the influence of this instinct, a circumstance imperatively demanding the consideration of those, whose duty it is to frame laws for the government of mankind. Formerly the inhabitants of any particular shire or district were almost insulated, and held little intercourse with the rest of their countrymen, and consequently very different feelings, customs, and opinions prevailed in the various parts of the same nation, and served together, with difference of dialect and accent, to prevent the origin of a common sympathy. Trifling as the circumstance may appear, there can be little doubt that the difference of costume which was then observable in each county, served to render the line of demarcation still stronger. Society, thus subdivided into a great number of distinct parts, was not, except on extraordinary occasions, liable to be affected by one common impulse. This state of things no longer exists; the tendency of modern improvement has been to remove the impediments which separated one part of the population from another, its effects are fusing all into one common mass; nations are now more closely connected, and maintain a more frequent, rapid, and perfect intercourse with each other, than formerly existed between different subdivisions of the same kingdom. In consequence of this change, as yet by no means fully accomplished, Man is fast approaching to a state, in which the heaving of the public mind, no longer restrained by the limits of a district, or the boundaries of a nation, will spread with rapidity from people to people, acquiring in its course force, magnitude, and buoyancy, and rolling onward an ocean wave from hemisphere to hemisphere. Raised by the storm of social agitation in the New World, already has it traversed the deep, and precipitated itself on France—has prostrated the most venerable institutions, the most stable monuments of the old; already, reflected back across the Atlantic, has it broken on the shores of South America, shaking, as it fell, the very foundations of that mighty Continent.

The workings of the instinct of imitation are extremely varied, and comprise all those different impressions which suddenly, and unaided by the exercise of the judgment, infect any numerous body of individuals. The panics that have so often arisen in the best disciplined armies must be thus accounted for. The well known "*sauve qui peut*," which hastened the final catastrophe of the hard-fought field at Waterloo, is not without a parallel in the annals of the British army. Napier, in his admirable history of the *War in the Peninsula*,* records a remarkable instance of the panic in that division of our army which, above all others, was distinguished for valour and discipline :—

"On the 22nd September, 1810, General Pack destroyed the bridges over the Criz, and fell back upon the light division; but on the 23rd the enemy re-established the communication, passed the river, and obliged the British horse to quit the plain and take to the hills behind Mortagao. Three squadrons of light and one regiment of heavy cavalry were retained there by Lord Wellington, but the rest he sent over the Sierra de Busaco to the low country about Milheada, whence he recalled Spencer, and at the same time, caused the

* Vol. III. c. vii. p. 325.

third and fourth divisions to take their ground on the position; the former at St. Antonio de Cantara, the latter at the convent. But the light division, falling back only a league, encamped in a pine wood, where happened one of those extraordinary panics that, in ancient times, were attributed to the influence of a hostile god. No enemy was near, no alarm was given, yet suddenly the troops, as if seized with a frenzy, started from sleep, and dispersed in every direction; nor was there any possibility of allaying this strange terror, until some persons called out that the enemy's cavalry were amongst them, when the soldiers mechanically ran together in masses, and the illusion was instantly dissipated."

The following incident, related by Southey in his *Peninsular War*,* strikingly illustrates the effects produced on animals by an union of acquired discipline and the instinct of imitation. It occurred at the embarkation of the Spaniards under the Marquis de la Romana:—

"Two of the regiments were cavalry, mounted on fine, black, long-tailed Andalusian horses; these, about 1,100 in number, it was impracticable to bring off, and Romana was not a man who could order them to be destroyed lest they should fall into the hands of the French. He was fond of horses himself, and knew that every man was attached to the beast which had carried him so far and so faithfully. Their bridles, therefore, were taken off, and they were turned loose upon the beach. As they moved off they passed some of the country horses and mares, which were feeding at a little distance. A scene ensued such as probably was never before witnessed. The Spanish horses are not mutilated, and they were sensible that they were no longer under any restraint of human power; a general conflict ensued, in which, retaining the discipline they had learnt, they charged each other in squadrons of ten or twenty together; then closely engaged, striking with their fore feet, and biting and tearing each other with the most ferocious rage, and trampling

* Vol. II. p. 345.

over those which were beaten down, the shore, in the course of a quarter of an hour, was strewn with the dead and disabled. Part of them had been set free on a rising ground at some distance, but they no sooner heard the roar of battle, than they came thundering down over the intermediate hedges, and catching the contagious madness, plunged into the fight with equal fury. Sublime as the scene was, it was too horrible to be long contemplated, and Romana, in mercy, gave orders for destroying them."

VARIETIES OF THE HUMAN RACE.

In the human species we observe very remarkable varieties as to conformation of body, peculiarities of size and form, and particularly with respect to the colour of the hair, eyes and skin. There is a vast difference in point of colour and appearance between the negro tribes and the inhabitants of England, Germany, and Denmark. You will find that most authors have agreed in dividing the human species into certain races, according to some shades of colour which preponderate. Thus we have the fair, comprising the European and Circassian variety; the black, which includes all the negro and negrite tribes; and the copper colour, which prevails in North and South America, a part of Africa, and a portion of China; and, lastly, we have the olive tribes of Asia, including China and the northern parts of Hindostan.

I shall not enter into any detailed description of these tribes; but I take leave to refer to the works of Lawrence and Prichard, where these matters have been fully and learnedly discussed. I shall merely mention one fact, also dwelt upon by Dr. Prichard, namely, that none of these tribes constitute a distinct species: it is much better to call them varieties. We find that all have been for a very great length of time distinct from each other; thus black and red skins have existed from the earliest historical eras. This is proved by the paintings which exist on the walls of the Egyptian temples, in which we observe these two colours carefully distinguished. If we can place credit in the Chinese records, the olive race must also be of great antiquity; and the same must be allowed of the Jews, Greeks, and Persians of the white race.

Some physiologists have contended that where we find any particular race flourishing, it is quite in vain to endeavour to plant another very different in character from that of the natives of the country. Thus, if a country be filled with black aborigines, it is quite useless to attempt to colonise it with whites, and they point to Sierra Leone as an example corroborating their views. They assert that if we take a country inhabited by any intermediate race between the white and black, as, for instance, the red or the olive, we may, with some hope of success, plant either of the extremes in that country, and they refer to the facility with which both whites and blacks become naturalised to the climate of America. This conclusion has a great appearance of plausibility, but it is not borne out by fact. At very remote historical eras, various red and black tribes existed in Africa, and they still subsist there, while an addition has been made since the Hegira, by the introduction of the white Arabian race. Thus at present we have races of three distinct shades of colour coexisting in Africa. Two of them have been living together from the most remote antiquity, and the white has been settled among them for the last 1100 years.

It is not merely by colour that the different varieties of mankind are distinguished from each other. It is well known that the negro differs from the European not only in the colour of his hair and skin, but also in his skeleton—in the form of his skull, his spine, his ribs, and his superior and inferior extremities. There can be no doubt that the European has a more highly developed organisation, so far as the skull is concerned, and that in this respect he possesses great advantages over the negro. This distinction is quite obvious on a slight inspection of the skulls of each, and we can tell at a glance, by the low and retreating forehead, which of them belonged to the negro.

Inasmuch, therefore, as the cranial organs of the white or European race, are found to be more fully developed than those of other nations, many authors have been led to the opinion, that Europeans possess an intellectual superiority over the rest of their species, and that the history of mankind furnishes ample proof of this view. We have already seen what imperfect instruments many of the languages spoken by the black, red, and olive races are, and how little they are calculated to promote the spread of knowledge. I think it may be fairly questioned, whether this and other accidents of a similar tendency, have not contributed to retard the intellectual progress of the nations, whose deficiencies we are wont to attribute, not partly to co-operating causes, but entirely to a supposed want of development in the cerebral mass. History informs us that science first dawned upon Egypt, that it was there the first seeds of civilisation were planted, and that it was from Egypt that the science, literature, and arts of antiquity were transplanted into Western Asia and Europe. And, what is still more remarkable, there are strong and almost certain proofs that the Egyptians received their learning and their civilisation from the black or Ethiopian race; indeed, Mr. Prichard seems to have established this beyond contradiction. Here then is a fact opposed to the general opinion, that the European variety has always surpassed the other races in the career of literature and science. The cradle of European literature lay in Greece, which, it has been fully proved, derived the greater part of its learning from Egypt, and this in its turn from the black tribes inhabiting Ethiopia. It should also be remembered, that literature and science in China, were for many centuries in a far more advanced state, than they were at the same periods among the European nations.

I may observe, that with respect to the black and white varieties of mankind, the habits which distinguish them are, like their colour, hereditary. Thus it might be supposed that the children of European parents, born in a warm climate, from being habituated to it from the moment of birth, would be far better able to bear it than their parents. Such, however, is not the fact. The children of English, French, and Irish parents bear a warm climate very badly; they languish during infancy, and frequently die before they attain the age of puberty, so that, in order to secure a certain degree of power in the constitution, it is frequently necessary to send them back to Europe. On the other hand, children born in India, and of a stock intermediate between the Hindoo and the European, participate in the qualities of both, being in body as active and healthy as the Hindoo, and in intellect as distinguished as the European. There is no instance in which the crossing of breeds has been so successful in producing a vigorous and intellectual race, as that between the European and the East Indian.

It appears that many habits, physical as well as moral, are to a remarkable extent hereditary; of this I could adduce numerous instances. The hereditary tendency to certain moral or immoral habits in particular persons has been long known; and it has been frequently remarked, that the offspring of such individuals share in the same tendencies, and are exposed to the same dangers in passing through life. The same hereditary resemblance exists also with respect to certain habits of body. Thus, if the parents are accustomed to the use of a certain species of aliment, the same will be found to agree with their offspring. Our infants would soon sicken and die, if obliged to take the food on which the infants of the Greenlander and Esquimaux subsist and thrive. I was intimate with the late Sir Charles Gieseckè, Professor of Mineralogy to the Dublin Society, who had spent some time in Greenland, and he told me that he had often seen sucking infants, five or six months old, lying at the bottom of a boat, while the parents were engaged in fishing, seize on a piece of blubber or stinking fish, and suck and swallow it with avidity, nor had he ever known any bad consequences to ensue from the use of such apparently improper aliment. I need not say that a very small portion of such substances would act as a poison on one of our Irish children, whose parents feed on milk and potatoes. This is an interesting subject for consideration, and is worthy of being borne in mind by the practical physician.

The form of the head differs very considerably among the various races of mankind, but in none is it so remarkable for its peculiarities, as among the Carribbean tribes who inhabit the West Indian Archipelago and a portion of the Continent of America. Here, however, the very striking difference of shape is owing, not to any peculiar natural conformation, but to the operation of artificial means, sedulously employed from the earliest periods of infantile life. We know that compression, if applied constantly during the period of growth, will prevent any part of the body from becoming fully developed. Hence the Chinese, who confine the feet of their female children in iron boots during the period of growth, succeed in producing those wonderfully small and distorted feet on which their fine ladies hobble. A somewhat similar mode, and for the same fashionable purposes, has been adopted with respect to the head by the Caribs. If compression was carefully and constantly applied to the head on all sides, the growth of the cranium and brain would be obstructed, and the individuals experimented on might have amazingly small heads, as the Chinese have small feet; but even if it were possible for such persons to arrive at full growth and maturity, the necessary consequence of such compression would be to make them idiots. However, it is possible to modify the shape of the head very considerably without inflicting any great or abiding injury on the mental faculties, by applying compression in a particular way, so as to make the skull assume a different shape from the natural one, without lessening its volume, or the mass of its contents. Some of the Indian tribes called *Flatheads,* compress the skull laterally, and by this means the head is made to assume a flattened and elongated shape, so that a line passing from beneath the chin to the vertex, instead of measuring seven or eight inches, is nearly twice that length. I need scarcely add, that the origin of this disfigurement is to be traced to that all-prevailing principle—vanity, a flat and elongated head being looked upon by the Indians as an unequivocal mark of nobility and beauty. Other tribes compress the head backwards and downwards, so as to make it project posteriorly in a very curious manner. Which of these modes is the most physiological I cannot venture to pronounce, but they certainly succeed in altering the shape of the skull and brain to a very considerable extent, and, what is equally curious, this unnatural treatment does not appear to interfere much with the development of their intellectual faculties. It would appear that, though the natural shape of the brain is greatly changed, still this organ retains its usual size and weight. I mention these facts, because, at a late meeting of the British Association at Edinburgh, there was a debate as to whether some skulls dug up in Mexico, did or did not belong to an extinct race, inasmuch as they happened to be shaped in a curious manner, similar to that now spoken of.

I have already alluded to the fact, that the different races of mankind are adapted to different countries and climates, and that each lives longest in the country where it is either aboriginal, or settled for a long course of generations. This law, however, does not seem to affect races intermediate between the natives of two very different climates, as we see exemplified in the vigorous and long-lived breed which results from a cross between whites and negroes. It is a common saying, and an article of popular belief, that we in the north of Europe are healthier, stronger, and live to a more advanced age than the dusky inhabitants of the tropics. I do not think that either of these assertions is borne out by the truth. I believe that men are to be met with among the black tribes of Africa, as robust and as powerful as any Swede, German, or Englishman. The descriptions given by Clapperton and Denham, of the blacks inhabiting the interior of Africa, are quite sufficient to prove that they are possessed of great bodily strength and uncommon vigour of constitution. Major Denham mentions that on one occasion, having to cross over a slippery and dangerous chasm, he was under the necessity of having himself carried by one of the natives; and he says that, while mounted on the brawny shoulders of this gigantic negro, he could not help feeling his own weakness, as compared with the strength of his guide, who carried him with as much apparent ease as a woman carries an infant. With respect to longevity, we do not find that in this respect either, do the whites possess any advantages over their dusky fellow-men. We know that in North America the two races have subsisted together for a considerable length of time, and that, although some late acts of the government have removed many of the disabilities under which portions of the black population laboured, still their intermixture with the whites is by no means extensive. However, this sometimes occurs, and the children of such unions are much in the habit of intermarrying. Now it is a curious fact that this mixed breed, forming the different varieties of mulattoes, are not only an intellectual race, but they are also remarkable for their bodily vigour, and, in particular, for their superior longevity. According to a late census of the population of the United States, it appears that of 20,000 whites, only one arrives at the age of 100, of the blacks only one out of 1,400; while among the mulattoes, one out of every 500 attains the age of a hundred. This seems very strange, particularly to those who believe that no constitution can equal that of the European or white man in vigour and durability; however, there can be no mistake in the matter, for the facts I have mentioned, are taken from an official census. Here, then, we have evidence sufficient to overturn the erroneous notions which prevailed with respect to the comparative longevity of the black and white races; for we find that in America, where the climates, at certain seasons, appear equally suited to each, the black is longer lived than the white, and the mulatto than either. One would be led to imagine that the mixture of black and white would give rise to a mongrel breed, possessing neither durability nor strength of constitution: but this is not the case, for we find that forty times as many mulattoes become centenarians, as we can meet with in the same number of whites.

LAWS OF PERIODICITY.

There can be no doubt that certain periodic quantities of time hold a very intimate connexion with the conditions of the human system, both in health and disease. Many diseases, particularly those of a febrile character, have been long remarked for the tendency they manifest to terminate by what is called a crisis on certain days, and many of the healthy functions of the system exhibit a more or less periodicity, of which the uterine action is perhaps one of the most remarkable instances. Accurate observation has established that none of the functions of the body is performed in a perfectly steady or equable manner. They are subject even to a diurnal periodicity; thus the pulse, and the consumption of oxygen by respiration, exhibit slight but notable variations, which have periods of twelve hours, and it is highly probable that the same law holds with regard to animal heat. The consumption of oxygen, the development of animal heat, and the digestive activity are all greater in winter and spring than in summer and autumn. Of all the periodic numbers, which have been noted by the professors of medicine in ancient and modern times, the number seven in point of days or years, seems to be most intimately connected with the revolutions of the human system. At seven years the milk teeth are shed, and a new and permanent set make their appearance; at fourteen those important changes in the physical and moral character, which constitute puberty, begin to manifest themselves; and at twenty-one the individual is supposed to have arrived at the years of discretion, or, in the common phrase, is said to be of age. From this, up to the ninth septennial period, the connexion of the number seven with the changes in our systems becomes less apparent, but I have no doubt that a more accurate observation will show that influential modifications of the system, whether physical or moral, may be observed at each septennial period during this interval. Thus at eight-and-twenty a man is supposed to arrive at the full perfection of intellectual and bodily powers; at five-and-thirty the characters of manhood, mature, reflective, and provident of the future, become distinctly marked; and although, during the succeeding periods, the physical and moral revolutions are faintly shadowed out, and life appears like a stream, to the eye of a remote spectator, descending in a noiseless and unchecquered current, still a closer inspection will show that its course is modified by certain appreciable changes, and that these changes are connected with climacteric periodicity. In this country females generally begin to menstruate at fourteen, and at the sixth or seventh septennial period the function is either interrupted or ends, and they cease to bear children. Among males, sixty-three has been long noticed as a period at which the constitution is very apt to break down, and hence it has been termed the grand climacteric. If we cast our eyes round the circle of our friends and acquaintances, we will find many persons, who have arrived at this age, beginning to manifest indications of declining health—losing flesh, and becoming weak, nervous, and dyspeptic without any obvious cause. This constitutional struggle goes on for months, the individual loses his strength and spirits, he becomes pale, emaciated, and valetudinary, and his friends remark that he is breaking up very fast. After a certain length of time matters come to a crisis, the constitutional debility and uneasy feelings culminate in some distinct and decided form of disease, or an unexpected and unaccountable change for the better occurs; the patient begins to recover his appetite and strength, good digestion, sound sleep, and a flow of spirits gradually return, and he is congratulated by his acquaintances as one who has dipped in the fabled fountains of youth, and got a new lease of existence. He now goes on favourably until he arrives at that period, which is considered to be the average duration of long lived persons—three score years and ten.

Such are the changes which occur at the various septennial periods of life. They are more prominent at the commencement and termination than during the middle, but if we were in possession of more accurate knowledge on this subject, it is very probable that we should find that none of these periods pass without some form of constitutional disturbance. In youth the processes, which mark the progress of moral and physical development, give to these changes a more palpable character, and in old age, when the powers of the constitution are weakened, periodicity also exhibits itself in a more determinate way. Sir Henry Halford has written a very interesting memoir on this subject, and certainly his observations appear to be borne out by facts. We frequently have occasion to notice the breaking up of the system, which occurs about the grand climacteric, and to see some persons, after wrestling with it for a considerable time, sink under a well marked disease, while others will rally, regain their wonted vigour, and go about for years in the full enjoyment of health. I may mention, in addition to what I have said respecting the number seven, that it seems to hold a very extensive relation to the critical termination of fevers. We have, as almost every one knows, seven, fourteen, and twenty-one day fevers; and it has been long remarked, that critical terminations are very commonly observed to occur on the seventh day, or on some day the number of which is formed by one of the multiples of seven.

The decline of life is accompanied not only by a failing of the physical energies, but also by a decay of the intellectual powers; the brain shrinks, and its specific gravity becomes greater than in an adult of similar stature; its functions are now carried on with diminished intensity, and the intellectual lights become proportionately dimmed; memory fails, imagination is no longer vivid and excursive, the pleasures of sense lose their attraction, and the objects of human pursuit appear hollow and unsubstantial. Amidst this wreck of intellect, feeling, and health, the old man would be in a truly melancholy and cheerless state, had not nature provided against his total desolation, in the survival of some important affections, the tendency of which is to reconcile him to himself and his species. One of these is the love of life, a selfish principle no doubt, but given to man for the wise purpose of counteracting that propensity to self-destruction, which irksomeness of life is apt to generate; the other is the love of offspring, which prevents the unnatural transfer of property, and connects the old with the young generation. The wisdom of making the affections of the aged take new root in their grand-children is sufficiently obvious; by this provision the extremes of life are brought into contact, and the leaf, though sear and withering, covers and protects for a time the bud yet too tender to bear exposure.

Many interesting considerations present themselves connected with the duration of human life. Three score years and ten has been long reputed a ripe old age, being, as an old author remarks, a good medium, by which the world is neither overstocked nor kept too thin. It is not merely a selfish motive which makes us pursue these enquiries, for we may be assured that as we succeed in improving the rules of life, and as a knowledge of those agents, which tend to lengthen or shorten its duration, becomes more generally diffused, mankind will profit by the investigation, and the average duration of human existence will be extended. Much benefit has been already derived from such enquiries in all civilised countries. I do not fear contradiction when I assert, that the prolongation of human life is a decided advantage, because, in proportion as the judgment of the old is brought to act on the passions of the young, will the wisdom of nations accumulate, and the solidity of individual character be increased. In making an estimate of the physical qualities of the human race, longevity should form one of the ingredients, and it is a subject which deserves the notice of the politician and the moralist as well as of the physiological enquirer. That nation, in which life endures longest, will, *ceteris paribus*, exhibit the greatest solidity of intellect. Where the duration of life is short, there is more or less probability that the decisions of the state will be acted on by the passions and impulses of the young. There is a great difference between the average duration of human life in England, and in Italy, and the south of Europe, and this, as long as it remains so remarkable, will tend to make the English a wiser and more solid people, and must render their laws and institutions more secure than if generation were to succeed generation with great rapidity.

With respect to the greatest duration of human life in later times, I believe the best authenticated instance on record is that of Thomas Parr, who attained the extraordinary age of 152. It is said that "Old Jenkins" lived to the age of 169, but this has not been sufficiently ascertained. The celebrated Drakenberg of Norway, who died at the age of 147, remained a bachelor until his 111th year, when he came to the resolution of taking a wife, and was married with great pomp, his nuptials being attended by the whole Danish Court. He continued to enjoy the blessings of the matrimonial state for several years, and what is rather uncommon, survived his wife. If we turn to the article "Longevity," in any of the Cyclopædias, we find an account of the most remarkable instances of longlived persons, it is therefore unnecessary for me to accumulate examples. During the course of my practice, or in the circle of my acquaintance, I do not remember to have seen in this country any person above 105 or 106, but I have recently conversed with a very intelligent lady of about that age. During the past week, as stated in the newspapers, a person has died at the age of 114, and in different parts of Ireland individuals have been known to reach the age of 120.

In illustration of this, I may mention a curious instance which occurred in my own family. The Rev. Dr. Graves, of Templemore, died the year before the last, at the age of 84. During the year 1758 and 1759 he lived in the house of his great grandmother's brother, John Newell, who was high sheriff of the county of Limerick in 1712. Mr. Newell lived at Anglesborough, on part of Lord Kingston's estate, in the county of Limerick. He was nearly 50 years old at the Battle of the Boyne, where he served in King William's army. He died about the year 1760, aged 127. In this instance I had an opportunity of witnessing how far back a few links in the chain of traditional testimony may occasionally carry us, as I have heard at my own table anecdotes of the Battle of the Boyne, related by the Rev. Dr. Graves, who had heard them from one actually present at that battle.

It is not only at present a common opinion, but was so some thousand years ago, that the human race is in a state of degeneration, that man from being a giant has dwindled into a dwarf, and that his bodily vigour has sustained a proportionate diminution. We find this opinion frequently expressed in the writings of Homer, in which Nestor so often deplores that the colossal stature and enormous strength of the heroes he had known in youthful days were no longer to be found. The same opinion was maintained during the historical era, and still exists to a very great extent. We hear men constantly complaining not only of the moral, but also of the physical degeneracy of mankind; and the present race are said to be but pigmy representatives of their tall and athletic ancestors. I believe most of these assertions to have but little foundation in truth, and that in point of strength and stature, mankind has not diminished so much as the admirers of antiquity suppose, while

In the matter of longevity the present races have considerably surpassed their predecessors. From historical records, and from an examination of the lists published by the Roman censors, in which the number of the citizens, male and female, with their respective ages, was given, it appears that the average duration of life among the Romans, when compared with the English of the present day, was as thirty to forty-five. Thus out of thirty Romans, as many would die in a given period as out of forty-five Englishmen. This is a great difference in mortality, and here, at least, we have proof that men were not so longlived eighteen hundred years ago as they are at present. Moreover, it has been established that the term of human life has not only increased since the time of the Romans, but that it has received a considerable addition even within the last hundred years. So great has been the increase in the mean duration of life, that in the tables which were made sixty or seventy years ago, and which served as the basis of calculations for insurance companies, the duration of life has been found very considerably underrated. The consequence of this error, however, has turned out very favourably to the companies, for as the rates of insurance were calculated and charged according to their limited estimate of the duration of life, their profits during the last fifty years have been enormous, owing to this cause, that out of a given number of persons taken seventy years ago, the average number of deaths would considerably exceed what it would be at present. We have, therefore, full and satisfactory proofs that life has increased in a very remarkable manner throughout Great Britain within the last century, not only in the rural population, but also among the inhabitants of towns and villages. In London, the duration of life is nearly 25 per cent. greater than it was in 1734. Now to what are we to attribute (and this is a most important question) this remarkable and satisfactory increase in the duration of human life? Partly (and I mention it with feelings of pleasure and pride) to the various important and valuable improvements in medicine and surgery. Many diseases at present treated with success, were at that period either managed on false and empirical principles, or they were looked upon as incurable and fatal. I need not allude to the time when many surgical diseases were deemed incurable, that are now successfully treated, or refer to the long list of fatal complaints among lying-in women and infants; to the state of our science with respect to pulmonary and cardiac diseases, or point to the improved treatment of fevers and constitutional affections, and to the blessings of vaccination. The progress of medicine, based on sounder and better principles, has been intimately connected with the diminution of mortality in modern times. Any one of these improvements in practical medicine, would be sufficient to produce a result such as would be sensibly felt in the lists of mortality.

It would appear almost incredible what vast numbers of children were formerly lost, particularly in the ill-conducted institutions of past years. Among these, the Dublin Foundling Hospital is worthy of a special notice, as showing the horrible consequences which result from gross mismanagement. I have read with feelings of sorrow and disgust, the minutes published by a Parliamentary Committee on the state of this institution. It appears that during the space of twenty-one years ending in 1796, ten thousand two hundred and seventy-two sick children were sent to the infirmary; out of these forty-five recovered! Dr. Bisset Hawkins, who makes this statement, does not mention the cause of this frightful mortality, which earned for the physician the sobriquet of Herod the Great. The true reason of the mortality was, that to save trouble and expense, these unfortunate infants were not provided with nurses, and that almost all of them were crowded into foul wards, where, by being spoon-fed, they took infection from each other. There was no nurse to give them the breast, and when they cried and became troublesome, they were dosed with laudanum to keep them still. And the laudanum did succeed in keeping them still, for many of them never awoke.

I would not cite this foul blot on medical practice, had it ot been unparalleled in the history of the healing art; and id it not furnish a striking lesson to the managers of public istitutions, showing to what an appalling extent abuses may xist in such establishments. Indeed I will venture to ssert, that the institution of foundling hospitals has been n the whole productive of more harm than good. I pass ver the circumstance that the child is deprived of the dvantages of being suckled and attended by a mother, or by a urse interested in its welfare, and shall only observe, that ı every institution of the kind, where helpless infants are ongregated in great numbers, the greatest attention and are cannot prevent a mortality far beyond the usual average nder different circumstances, and hence it is that foundling ospitals are now almost entirely given up, not from any motive f paltry economy, but from the necessary tendency they ave to occasion a vast destruction of human life.

In England the rate of annual mortality has considerbly diminished within the last seventy or eighty years. In 780 it was calculated that one person out of forty died in he year; in 1790, only one in forty-five died; and, in 1821, he mortality became so low as one in fifty-eight. Here e have a cause capable of producing an amazing difference n the state of the population. With respect to the rest of he European states, the following is a comparative estimate f the rate of mortality :—one in twenty-eight in the Roman nd Venetian states; one in thirty in Italy in general; one n thirty in Greece and Turkey; one in thirty-nine in the Netherlands, France, and Prussia; one in forty in Switzerand, Austria, Spain, and Portugal; one in forty-four in European Russia, and Poland; one in forty-five in Germany, Denmark, and Sweden; one in forty-eight in Norway; one n fifty-three in Ireland; one in fifty-eight in England; one in fifty-nine in Scotland and Iceland; so that we perceive that the duration of life in this country is very great when compared with others, and that whatever foreigners may say about its dull and foggy climate, it is a fact that its inhabitants live much longer than those of the sunny climes of southern Europe. The boasted climate of Italy, with its soft vernal breezes and cloudless skies, gives a mortality of one in thirty, whereas among our Irish bogs it is only one in fifty-three; while in the Roman and Venetian states, more than twice as many out of a given number die, as among the bleak districts of the Scotch Highlands. It is, then, perfectly well ascertained that in England, Ireland, and Scotland, the mortality is much lower than in the poetic "lands of the sun," Italy and Greece. But we are not to attribute the superiority of any country in this respect, either to its soil or climate, for there is no doubt that if civilisation, the blessings of a free government, and the enjoyment of the comforts of life were as extensively diffused among the Greeks and Italians, as they are among the inhabitants of the British Islands, the rate of longevity in these countries would be remarkably increased.

I have already alluded to the beneficial influence on human life, which has resulted from the numerous and important discoveries in medical science. The improved treatment of a vast number of complaints, of fevers, pulmonary affections, and of surgical diseases too numerous to mention, has tended materially to prolong the duration of human life, but none can be put in competition with the truly great and invaluable discovery of Jenner. In order to convey some idea of the vast quantity of human lives saved by the introduction of vaccination, I shall direct attention to a brief statement of some facts bearing on this interesting question. In 1790, one out of every eight children born, died of the small-pox; in 1820, only one out of 2,066; that is, out of this number there are now saved about two hundred and fifty, who forty years ago would have died of small-pox. In 1779, the small-pox destroyed in Sweden 15,000 persons; in 1784, 12,000; in 1800, 13,000; in 1822, 11.

It is an interesting but melancholy task to turn back for a moment to the history of former ages, and to pass in review the different causes whose fearful operation has at various times made whole countries desolate, and swept almost entire generations from the surface of the earth. As time will not permit me to enter upon the details connected with this subject, I must refer to those historians who describe the state of England, for two centuries after the departure of the Romans, as well as to the accounts given by contemporary authors of the depopulation by the sword, plague, and hunger, which threatened to exterminate whole nations, during the dark ages following the fall of the Roman Cæsars.

We have seen that the average duration of human life has proceeded, *pari passu,* with civilisation and an improved state of living, and that men are generally much longer lived at present, than they were during the middle ages. Yet some persons, more poetical than discriminating, believe that poverty and barbarism are the promoters of health, and that longevity is to be found only in the hut of the savage. The savage tribes, it is true, display great vigour and activity of body, and an astonishing endurance of hunger, fatigue, and pain; but it has been fully established, that the mean duration of life among them is far below that of civilised man; whole tribes of them are frequently swept off by epidemics, and the mortality among the children is enormous. Poets have taken a particular pleasure in singing the praises of him who derives food, clothing, and health, from the chase, who quenches his thirst in the cool spring, and makes his bed beneath the canopy of heaven, and they have given to poverty the reward of health, peace, and longevity; but unfortunately statistical inquiries have, by the dull reality of facts, destroyed all these beautiful illusions, and have stripped poverty of its charms, by proving that the liability to disease is increased, and the duration of life diminished, in proportion to the privations man is doomed to undergo. If we take thirty or forty persons in the middle class of life, and compare them with similar numbers of the poor in the Liberties in Dublin, or St. Giles's

K

in London, we shall find that the annual mortality among the latter is much greater, and that the term of life diminishes in proportion to the extent of their poverty.

It appears from a very interesting essay by M. Villermé, on the comparative mortality among the indigent and those in easy circumstances, both in the capital and in the departments of France, that there is a striking and remarkable difference. Throughout the departments, the mortality is one in fifty among those who are in good circumstances, while among the poor it is one in twenty-four.

A similar difference, he states, exists between the mortality of the poorer and of the more opulent parishes of Paris. The density of the population, the narrowness of the streets, and other local circumstances, generally supposed to be very influential on the public health, were proved to be unimportant when compared with the single element, the general state of the people as to the possession or the want of the comforts of life.

On an examination and classification of the deaths which take place annually in the Paris hospitals, it appeared, likewise, that the mortality is much less considerable among the tradesmen and artisans who generally earn a tolerable competence, than among those of the lower order who have no certain and constant means of support, and who are frequently exposed to a degree of penury, which, while it tends, by weakening, to render the body more susceptible of disease, and less capable of resisting its attacks, serves likewise to undermine the moral energies, and to give rise to mental sufferings which still further shake and debilitate the constitution. This latter fact proves that the resources of medicine are comparatively inefficacious when employed to cure disease complicated with the effects of previous poverty; and, on the whole, the evidence before us is strongly in favour of the conclusion, that the general diminution of mortality in France and England, is owing chiefly to the ameliorated condition of the great mass of the people, and to a more general diffusion of ease and comfort. Would that the same renarks were applicable to the country or to the city we nhabit!

Statistical documents are wanting to enable us to compare he mortality of Ireland or of Dublin, with that of England r of London,* but I have no doubt the difference must be triking. I draw this conclusion from personal observation, nd from a comparison between the modern medical annals f the two countries. Whoever has witnessed the number f those applicants who crowd the doors of our medical intitutions, or has seen how inadequate the Dublin hospitals re for the accommodation of the sick poor,—whoever has ollowed the progress of those epidemics which almost annually levastate this city,—must acknowledge the extraordinary prevalence of disease in our metropolis. Need I adduce proofs of the squalid poverty and wretchedness of its victims? Shall I draw a sketch of what we every day see? The colours usually employed to depict human misery are too weak and eeble for the task; nor will the legislative or statistical inquirer, who endeavours to discover the true causes of all this wretchedness, derive consolation from the too-convincing proofs which everywhere abound—that ignorance, intemperance, and vice with all its varied features of deformity, nave powerfully aided in producing this excess of human misery and degradation.

The frequent epidemic fevers which spread their ravages throughout the provinces of Ireland, prove that its peasantry enjoy scarcely any more immunity from disease than the poorer inhabitants of the towns. One fact is well worthy of notice;—these epidemics are usually preceded and accompanied by circumstances tending to aggravate the usual state of misery and want. Thus, when fever devastated a large portion of Ireland in 1822, I had an opportunity of proving that the distressed invariably became also the diseased dis-

* I have, however, given one in fifty-three as the annual mortality of Ireland, on the authority of Hawkins. How data were obtained to make this calculation is more than I can guess.

tricts—the invasion of typhus was always preceded by the march of dearth—the steps of pestilence but deepened the foot-marks of famine!

To explain the origin of that poverty which excites the sympathy even of strangers,—to account for a scarcity of provisions in a country whose ports are crowded with shipping employed in carrying away corn and cattle,—to investigate the sources of that pollution which has demoralised a people naturally open, frank, and generous, and has rendered intemperance and improvidence the most venial parts of the national character,—belongs not to statistical medicine; the duty of the physician extends not to these subjects; his employment is to alleviate the effects, without discussing the causes of misery and vice; but he owes it to society—he owes it to his country—to proclaim aloud the existence of the evil.

CHANCES OF LIFE.

With respect to the chances of life, a few words will be sufficient. It may be worth while retaining in memory as a general fact connected with this matter, that of a given number of children born in this country, one-third die before the completion of the first year, one-half before the eighth year, two-thirds before the thirty-eighth, and three-fourths before the fiftieth year. It is, of course, to be understood that this calculation applies only to large numbers, for when the numbers are small, the results may be very different. Thus, on St. Patrick's Day, in the year 1782, nine students walked from Trinity College Dublin, to Bullock, where they dined. In 1833 eight of them were still alive, and I have not heard of the death of any of them up to the present period (1835). I mentioned this fact the other day to a very fine old gentleman, aged seventy-six, and he observed that he could communicate another of an opposite description. He said that he had served in the Irish volunteers in 1782, and that of his entire Grenadier company, consisting of fifty men, there was only one now living. What a different fate overhung these two groups of persons. It is remarkable how long a certain set of men holding the same office in succession, have sometimes happened to live. There can be little doubt that the steady policy of the Imperial court of Vienna has been partly at least, owing to the extraordinary length of time the modern prime ministers of Austria, including Metternich, have lived. A similar successive longevity on the part of the rulers of

Prussia, has aided other circumstances in aggrandising their territories, as has been well remarked by a late writer in the *Edinburgh Review*.

So much having been said respecting the chances of life, some persons might be anxious to have a short method of making an approximate calculation as to its probable duration. The simple rule is, that the chances are equal that every healthy adult will live half the difference between his own life and eighty-one. This, which is the mode of computation generally employed, is very near the truth. Thus, if a man be forty years of age, the chances are equal that he will live half the difference between it and eighty-one years, viz., twenty years and a half, and, therefore, that the duration of his whole life will be about sixty years.

Having said so much respecting longevity, there are a few other points which remain to be noticed, as being connected with the general physiology of man. It is a remarkable fact, that although there is no uniform proportion between the number of males and females produced by the same parent, yet that the total number of each sex brought into the world, taking the average of any large community, is nearly the same; yet, to speak more exactly, we have in all cases a small excess of males. The data that we possess, however, while they prove that this excess exists in all countries, seems to show that the amount differs in different places. Any person who takes the trouble of putting down the number of children in each family of his acquaintance, would find that in some there is a preponderance of males, in others of females, but when he comes to arrange the whole under their respective sexes, he will be surprised to find their numbers so nearly equal.*

From a very extensive examination it appears that in Germany and England the proportion of males to females is as twenty-one to twenty, while in Ireland it is generally as twenty-one to nineteen. Thus it appears that we have an

* Born within the city of London and the bills of mortality, from Dec. 10, 1833, to Dec. 10, 1834:—Males, 13,601; females, 13,615.

additional Irishman out of every twenty-one, born to have his head broken, at least, if the hypothesis be correct, which accounts for this greater proportion of males by supposing that Nature provided for their being destroyed in single combat or in war!

The necessity for this excess of males has been differently accounted for; but it would appear to be best explained by supposing it to be ordained for the purpose of providing for the greater mortality of the male children. There is something in their constitutions which renders them more liable to fall victims to the diseases of infancy and childhood than those of the opposite sex; so that, after the period of puberty, the females slightly exceed the males in point of number. Thus, although the proportion of boys born is greater than that of girls, the larger mortality among the former during childhood not only restores the balance, but even causes a slight preponderance in the numbers of the latter, and this fact has been verified by making a comparative estimate of the adults of both sexes.

Some curious considerations claim our notice as connected with the proportion of males and females born, where the relative ages of the parents differ. An elderly man married to a young woman has generally the majority of his children boys, and *vice versâ*. "This," says Mr. Sadler, "compensates in some degree, for the late marriage of the male, as otherwise such late marriages would consign a certain portion of the female sex to a necessary celibacy." Mr. Sadler also maintains that early marriages are not more productive than late ones; that in the former case the mortality of the children is greater than in the latter, and therefore that they do not augment the population as much as they are generally believed to do. He has also endeavoured to show that the marriages of the rich are not more productive than those of the poor, and that the increase of population is checked rather than otherwise by its density and degree of comfort. Certain it is, however, that many more women are barren among the rich than among the poor. Hence, it may be inferred (and although the discussion of this question is not within the province of the physiologist, I may advert to it), that population will not be found to keep pace with the increasing wealth and comfort of the community. The richer people are, the fewer, it would appear, are their children; and, consequently, the elevation of the inhabitants of any country to a condition of increased comfort and independence, is not accompanied by a necessary tendency to an increased and superabundant population; and it is a fact, that population increases most slowly in those countries where the great bulk of the people are comfortable. I might instance that part of France, where the population does not double itself in the same time that it quadruples in Ireland—Normandy, a province in which the peasantry are all small proprietors, and live in a state of comparative comfort.

With respect to the relation which the offspring bears to each parent, I shall beg leave to quote for you the following remarks, chiefly derived from Mr. Prichard's work:—Peculiarities in the progeny, or hereditary conformation, as it is termed, are generally supposed, and apparently with some ground, to be determined chiefly by the father; that is, the offspring follows principally the male parent, though it is liable to partake of the peculiarities of the mother. Children resemble in feature and constitution both parents, but I think more generally the father. In the breeding of horses, oxen, and swine, great attention is paid by experienced breeders to the males. In sheep, it has been commonly observed, that the colour of the lamb corresponds to that of its sire. 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 a white mother is much darker than the progeny of a white father and a black mother. In the West Indies, the mixed offspring is descended from white men and black women. In England, it often happens that black men who are brought from the West Indies as servants marry white women, while it is uncommon for black women to get husbands in England.

The English mulattoes are consequently blacker than those born in the West Indies, whose mothers are generally of the negro race. It seems indeed that, in some instances in animals, the union of sexes of different varieties has had a further influence on the offspring of the female than could have been expected; it has even influenced the character of several successive births. Thus in the well known case of the quagga and mare, the hybrid strongly resembled its sire the quagga. It was not until the birth of the fifth foal, which this mare afterwards produced to various sires, that the last of the quagga marks disappeared! This fact concerning the quagga is very curious, and affords a faint analogy to what has been observed in certain genera of insects.

As far as the size or stature of the offspring is concerned, it seems to be pretty well ascertained by facts known to the breeders of cattle and horses, that this depends in a great measure on the mother. Perhaps the sex of the offspring also is determined chiefly by circumstances connected with the mother. Some women seem to be prone to produce a great proportion of male, others of female children; and I think these peculiarities are common among the females of particular families.

With regard to the relative number of males and females born from a given number of marriages in different ranks of life, it has been found that, though the aggregate number of each sex is nearly equal when we take the whole community, yet there is a difference in their relative numbers among the different classes into which that community is divided. Some interesting observations on this point have been made by M. Giron. He divides individuals into different classes; the first is composed of persons whose employments tend to develop their bodily powers; the second, of those whose business tends to enervate; the third, of those whose employments are of a mixed description. He found that, in the first class, the number of male births exceeded the average proportion of male to female births throughout France; that, in the second class, the number of female births exceeded the average proportion of female to male births; and that, in the third class, the proportion of male and female births was nearly the same as the average proportion throughout France. Hence he arrives at the conclusion, that the pursuits of agriculture tend to the increase of the male population, and that the habits of commerce and manufactures favour an augmentation of the female portion of the community.

In addition to what has been already said, let me make a few cursory observations on the variety in the proportion of births to a marriage. It has been supposed that the fecundity of marriages is in proportion to the comfort and independence of the community, and that fewer children are born from a given number of marriages in countries which are deficient in agriculture, industry, and the blessings of civil liberty. This, however, is not the fact. In England the proportion of births to marriages from 1800 to 1810, was as 4 to 1, and from 1810 to 1821, as 4·22 to 1. In Scotland and Holland it is as 4·2 and 5·2, while in Russia and several of the Italian states it is as 5·25 and 5·45, to 1. I shall not take up time with these statistical details any further than to observe, that in the degree in which a nation advances in prosperity and civilisation, premature and imprudent marriages will become less frequent, and the number of births will be proportionally diminished. The lateness of marriages may be generally taken as a good test of an improved state of society, and as exhibiting that power of moral restraint over the passions which should characterise civilised and intelligent man.

I had almost forgotten to mention the remarkable fact, that the cultivation of science and literature appears to be favourable to longevity, contrary to the opinion generally entertained on this point; indeed it seems that the man who is engaged chiefly in mental labour has a fairer prospect of length of years than he whose occupations imply an exclusive bodily toil. Franchini has enumerated one hundred and four Italian mathematicians of different epochs; he has ascertained the ages at which seventy of these died, and among them we find eighteen who had attained the age of eighty, and two of ninety, and this in a climate which is not generally considered to be favourable to longevity. In France, one hundred and fifty-two men of science and letters have been taken at random; half the number appear to have cultivated science, and about half to have devoted themselves to general literature; on adding together the age at which each of them had died, it was found that the average result would be above sixty-nine years, for each individual.*

I will here quote from the *Quarterly Review*, No. 99, the following Table of the Comparative Longevity of Female Authors of the last Century:—†

	Age.		Age.
Mrs. Delany	93	Lady Hervey	70
Mrs. H. More	89	Mrs. Trimmer	69
Lady Russell	87	Mrs. Inchbald	68
Mrs. Lennox	84	Mrs. Cowley	66
Mrs. Barbauld	83	Mrs. Hamilton	65
Mrs. Montagu	81	Mrs. Rowe	63
Mrs. Piozzi	80	Mrs. Radcliffe	60
Lady Suffolk	79	Mrs. Macaulay	53
Mrs. Chapone	75	Mrs. Sheridan	47
Lady M. W. Montague	73	Mrs. Centlivre	44

I may repeat here what I have already mentioned, that in England there is a remarkable difference between the mean duration of life in the agricultural and manufacturing districts, a fact which goes to prove that the mode of life, and the various physical circumstances connected with the different pursuits and occupations of men, have more influence than the mere effects of climate. Indeed it is one

* This average duration of the lives of literary men which is given by Hawkins, is evidently greater than can be allowed, neither are Madden's tables of the mean duration of the lives of *literati* free from the same error, as is well shown in the *Quarterly Review*.

† *Madden's Infirmities of Genius.*—These ages are given by the Reviewer.

of the evils of civilisation that it forces a nation to earn wealth by the too often debilitating employments of manufacturing industry. However great and powerful in a commercial or political point of view manufactures may render a nation, it is established beyond all doubt, that the combining of people into large masses, which the perfection of manufacturing arrangements requires, has a strong tendency to spoil the race. Let us go into Manchester, or any of the large manufacturing towns, where men, women, and delicate children, are confined for ten, twelve, and fourteen hours to the heated and unwholesome air of a factory, and consider for a moment what the result of such a mode of life must naturally be, and what effects it must produce on the physical qualities of the race. Can we expect that a mode of life such as this, continued for several generations, should have any other effect than that of giving rise to a race of men characterised by degenerated stature, impaired energies, and premature decrepitude? Formerly few large cities were able to maintain their own population; the number of deaths exceeded the births, and they would have dwindled away, in point of inhabitants, had they not received from time to time a fresh supply from the country. This, however, is not the case at present. The numerous and important improvements in ventilation, watering, and other matters of police, as well as the more general diffusion of the comforts of life, and the more successful treatment of disease, enable our large cities to maintain their own population and even to increase it.

Some cities, however, seem, from the operation of unfavourable causes, incapable of supporting their own population; they are, however, very few in number, and it is probable that as the arts of life and the blessings of civilisation become more diffused, their number will be still further diminished. The principal, and I believe the only cities of this description at present, are Rome, Petersburg, and Stockholm; in these the number of deaths exceeds that of births. What the cause of the preponderance of deaths over births in Rome may be I have not been able to ascertain exactly; there is, however, a remarkable difference, the births being one in thirty, the deaths one in twenty-four. At Petersburg, in the year 1833, the births were 9,311, the deaths, 17,085. It is to be observed, that at Petersburg the males exceed the females by nearly 100,000, owing to the great influx of servants and persons depending on the court. Modern improvements tend to remedy this loss in some degree; still it appears from the investigation of Mr. Roberton, that the greater mortality of children as well as of adults in all large towns opposes a very material obstacle to the increase of their population, particularly when combined with other causes unfavourable to reproduction and longevity.

A very curious subject for investigation has been lately brought forward in France and this country, namely, the supposed influence of season and atmosphere on the commission of crimes. The inferences which have been made with respect to this singular question are by no means established, but I mention the circumstance in order that it may be better investigated when opportunity offers. It has been stated that man is so much under the influence of physical causes, that the quantity of crime committed in any great mass of society varies with the seasons; that each season brings back a recurrence of the same crimes even as to details, and almost exactly in the same proportions. This fact seems to be explicable by the varying wants, varying opportunities, and perhaps (but I much doubt this) by the physical influence of the seasons on theconstitutions of criminals. It has been however stated, that the temperature of the air, the quantity of moisture or drought, and the various electrical conditions of the atmosphere, influence our bodies, and through them re-act on our minds, and that these, concurring with immoral influences, render us less capable of resisting the tendency to commit crimes of a particular description. It has been also asserted that these crimes vary with the season of the year, the offences against property being most common in winter and spring, those against life in summer and autumn. It is quite plain that this may be considered in various points of view. Thus we can easily conceive that the long winter nights will give a facility to the operations of the thief and the robber, which they do not meet with in summer, and therefore it is natural to expect that offences against property will be more numerous in the winter season.

While on this subject I may observe, that there are a number of curious facts with regard to one of the greatest of crimes, suicide. If we look here for the influence of season, it would appear that the greater number of suicides occur in summer. Thus, in that part of London, called the city of Westminster, the average for many years shows that the number of suicides in November is one-third less than in June. In France, also, November, December, January, and February fall greatly below the other months of the year as to the proportion of suicides. With regard to this crime it is strange, but nevertheless true, that where moral and religious education is neglected, the number of persons who kill themselves is increased in proportion to the extent of civilisation.

Among the capital cities in Europe, Dublin and Naples are those in which the fewest suicides occur; on the other hand, Paris and Berlin are remarkable for the number of persons who destroy themselves. In Spain the proportion is very small, and the same thing may be said of many other nations both in the Old and New World. From the habit our English neighbours have of publishing every occurrence in the newspapers, they have earned for themselves the reputation of being the most suicidal people in Europe. English spleen and English suicides are a common topic of conversation on the Continent, and it is believed that the combined effects of fog, spleen, and a melancholic temperament, prove so irksome to John Bull, that he makes away with himself in despair. This, however is a false supposition. Later and more accurate returns have proved, that the English are not half so prone to self-destruction as their more mercurial French neighbours, and it is probable that there are five times as many suicides annually, in Paris as there are in London. In Paris they wisely conceal these things from the public; in London they publish everything. Murders, suicides, and other revolting crimes are detailed in the newspapers, with an elaborate and disgusting minuteness, and pictures of human guilt in all the glaring deformity of circumstantial detail and heightened colouring, are exhibited day after day, to gratify the morbid taste of a prurient and culpable curiosity. It need hardly be said, that this is unwise, unphilosophical, and pernicious in its effects. There is a principle of imitation in the human breast, deeply blended with our nature, and given for a good purpose, though it is but too often perverted. It prompts us to imitate what is great, noble, and useful, but sometimes it inclines us to copy what is bad, and there can be no doubt that murders and suicides have been committed in consequence of reading recitals of them in the public prints. It is not that the mind of the reader is captivated by the account of a murder or of a suicide. But men of weak minds will sometimes, on reading a vivid description of self-destruction, get a fixed idea into their heads, this idea becomes daily more and more impressed on the mind, so that they can think of nothing else; and when we add to this fixedness of idea, the ordinary tendency of thought, which is to impel to action, we arrive at an explanation of the fact, that the propensity to commit suicide may and does sometimes originate in imitation. Thus, after the death of the late Lord Castlereagh, it was remarked that several persons destroyed themselves in the same way. For a like reason it appears injudicious to give too particular and circumstantial details, concerning the last illness and death of persons who have been objects of great public interest. The impression thus made on the minds of individuals, who either are, or believe themselves to be, similarly affected, often leads to the worst results, as was exemplified by the great mortality among lying-in women which was observed after the death of the Princess Charlotte. To return to suicide, a remarkable case occurred while I was at Hamburg. My friend, Dr. Oppenheim, was called to visit a man who had cut his throat. The carotids escaped, but the injury inflicted was so great that the patient died after protracted sufferings. His body was given to Dr. Oppenheim for dissection. The man who took care of the anatomical school, happened to be in the room at the time, and Dr. Oppenheim said to him in a joking way, "John, have you any fancy to cut your throat? If you have, don't do it in such a bungling way as this man did; a little more to the left here, and you will cut the carotid artery." The individual, to whom this observation was made, was a very sober, steady, person, with a family and a comfortable subsistence, he never had manifested the slightest tendency to suicide, and had no motive to commit it. Yet, strange to say, the sight of the corpse of a suicide, and an observation uttered in jest, made a powerful impression on him; the idea of self-destruction seized upon his mind, and about an hour after Dr. Oppenheim left the dissecting-room, he was horrified at hearing that John had cut his throat. Fortunately he had not profited by the anatomical instructions given to him, he did not cut the carotid, and consequently recovered!

Many of my readers, no doubt, will remember the extraordinary history of suicides at the Hôtel des Invalides at Paris. In this institution there was a long dark corridor, with a projecting beam, or post, at the darker end of it. It was a place well adapted for the purposes of suicide, and accordingly one of the pensioners came there one day and hanged himself. In the course of a few days six or seven others did the same. This caused an extraordinary sensation; the like had never been heard of before; the inmates were comfortable and happy, and the crime of self-destruction was almost unknown among them. The post was removed, and a window was broken open at the end of the corridor, the peculiar associations of the place were thus dissipated, and there were no more suicides.

I could bring forward many other facts to show that the propensity to commit suicide is encouraged, not only by imitation but also by other causes. It would appear, that industrious and prudent people, who have a regard for their families and are anxious to provide for them, very seldom commit suicide. Accordingly we find that, out of 120,000 persons, who insured their lives in the Equitable Insurance Office, the number of suicides in twenty years was only fifteen.

The causes of suicide are frequently difficult of explanation. It has been attributed to climate, temperament, education, political and private condition, and many other circumstances. It is a curious fact, that the Irish are the least suicidal nation in Europe. The two cities, in which the fewest suicides occur, are Dublin and Naples. And it is remarkable, that in both these cities the populations resemble each other very closely. Between our poor citizens and the Neapolitan Lazzaroni there are many points of resemblance; the same bodily vigour, the same patient endurance of hardship, the same buoyancy of spirits and quaint humour, the same carelessness of the future, and I am sorry to add, the same poverty, are remarkable in both. Still they never dream of self-destruction. An Irishman has sometimes very little compunction in knocking his neighbour on the head, but he seldom thinks of killing himself. We have forty murders for one committed in Prussia, and in that country there are forty suicides for one committed in Ireland. This calculation I made about ten years ago, and it was the result of much investigation. Both nations have since materially changed. Fewer Prussians, in proportion, are now killed by themselves, and many more Irishmen are now killed by one another.* This is a curious subject and well worthy of the attention of the philosopher and legislator.

With regard to the connection between education and

* If official statements are to be relied on, the increase of murders in Ireland has been progressive since the *penultimate* rebellion.

L

crime I shall be necessarily brief, as I am anxious to proceed to the subject of temperaments. In France, it appeared before the Court of Assize, in the year 1832, that of the accused, 4,540 could neither read nor write, 2,192 could do so imperfectly, 682 could read and write well, and 151 were educated in a superior manner.

TEMPERAMENT AND APPETITE.

The ancients directed a considerable share of attention to this subject, and attributed great importance to a due knowledge of the different temperaments. They believed that the regulation of the economy in health, as well as the prognosis and treatment of disease, depended on an accurate acquaintance with their various modifications, and insisted strongly on the necessity of their study for the successful practice of the healing art. It may be proper to explain (though I do not deal much in definitions) that by temperaments we mean certain appearances of body, supposed to be connected with a peculiar state of health, digestion, temper, and conduct of the system when attacked by disease. We find in Dr. Bostock's *Physiology*, that the ancients divided temperaments into four kinds, corresponding to the four qualities of Hippocrates, hot, cold, moist, and dry. These were supposed to give their specific characters to the four ingredients of which the blood was composed, namely, the red part, the phlegm, the yellow, and the black bile; and hence were derived the names of the sanguine, the phlegmatic, the choleric, and the melancholic temperaments, as indicating an excess of each of these substances. Dr. Bostock has endeavoured to reduce these to a better and more intelligible arrangement. He considers that the division of the ancients has some real foundation in nature, although on this, as on other occasions, false theory has been blended with correct observation. To the four temperaments of Hippocrates he adds a fifth, and, giving new appellations to the former, he ranges the leading varieties of the human constitution under five denominations, viz., the sanguine, the tonic, the relaxed, the muscular, and the nervous temperaments. He then goes on to describe each of these temperaments respectively, and concludes by observing that although very few individuals possess any of these characteristics in an extreme degree, and though they may be considerably modified by circumstances and confounded by intermixture, still we are warranted in believing that different temperaments actually exist, and that they influence the corporeal and mental functions of our frame.

According to all the definitions of temperaments, and among the rest those of Dr. Bostock, we find that it is not always from external appearances of the body, which a stranger could at once recognise, that a knowledge of any individual's temperament is to be obtained. In truth it does not appear to me to be possible from any external appearance of the body, to distinguish accurately either the ordinary state of health, or the probable issue of disease. We are taught to believe that those who are spare and dark complexioned, are most subject to bilious and abdominal complaints, and that persons of full habit and sanguineous temperament are liable to hæmorrhage, apoplexy, and other analogous morbid actions; while those who are of fair complexion, high colour, light hair, and blue eyes, are supposed to have a tendency to consumption. I do not believe that these observations are founded in fact. With respect to consumption, it is true that we meet with a great number of phthisical patients with fair complexions, red lips, and grey or blue eyes, but then we are to recollect that the majority of the inhabitants of this country possess these characteristics. If we go into France or Italy we find consumption not less prevalent among the dark-complexioned, fact easily accounted for by recollecting that in those countries the bulk of the population is dark and swarthy. Again, as to the opinion that persons of dark complexion are more subject to abdominal diseases, I must observe that this does not correspond with my experience. While on the continent, where I received a considerable portion of my medical education, I was drilled into a thorough knowledge of temperaments, but I have never derived any particular advantage from this study, in the prognosis or management of disease.

Phrenologists have been at some pains in arranging temperaments, and have studied the subject for the purpose of enabling them to judge, how far temperament may influence or modify the functions of the brain, and how far the quality as well as the quantity of brain is to be taken into account in the formation of individual character. I do not feel bound to enter upon any discussion connected with this subject, or to bring forward arguments against phrenology at the present day, when it is acknowledged by all scientific men, that it is only a species of ingenious empiricism, founded on mere hypothetic induction. The admission that temperament should enter as a necessary ingredient into such speculations, is fatal to the system, for it implies the existence of a principle of which it can form no estimate. It matters not that one man's brain be of equal size and dimensions with that of another, if it be admitted that temperament exerts an influence on the nervous system of one person, which renders his brain far more energetic in the performance of its functions than that of another. Such an admission as this is quite sufficient to derange all these calculations. For my own part, I feel perfectly convinced that the quality of brain should be an essential element in our reasonings, were we able to form an estimate of the mental powers from an examination of the cerebral mass.

Some of the appetites to which man is liable, and which are destined partly for the support of the individual, and partly for the propagation of the species, demand a brief notice. First, with reference to the appetite for food. I do not intend to enter into any general considerations relative to the phenomena and theory of the process of digestion, my purpose, at present, is merely to state a few facts concerning the appetite for food. This instinctive desire, though manifested at the very earliest period of extra-uterine life, does not appear to exist in the fœtus during the whole time of its sojourn in the uterus, yet, during the last two months of utero-gestation, the stomach is so prepared, that, if expulsion should occur, the fœtus is capable of commencing the process of digestion.

At this period, the food by which the young of most of the higher classes of animals is nourished, consists of a bland emulsion prepared by the hand of nature, and composed of oily, saccharine, caseous, and albuminous ingredients, blended with inimitable art, so as to form a highly nutritious and digestible aliment, not requiring the aid of teeth for mastication, or of saliva for deglutition. From the facility with which it is digested, and the large quantity of nutriment which it contains, assimilation goes on with great rapidity, and thus a sufficient quantity of materials is furnished to supply the wants of the growing body. Were we discussing the subject of animal chemistry, we should examine the composition of milk in detail, for the present I shall only remark (and the fact is of great importance in many points of view) that the aliment destined for the nutrition of all the higher animals during the tenderest and most delicate stage of post-fœtal life, is not a simple but a compound substance. In birds, the food of the young is the same as that of the parent, but it is generally prepared by some previous act on the part of the parent, who either breaks it up, so as to render it more easily swallowed, or by taking it into the crop, reduces it to a pulpy state, in which it is returned for the support of the young bird.

Prompted by instinct, the infant immediately after birth seeks the food best suited to its wants, and, when placed near the breast, proceeds at once to gratify this earliest of propensities. There is nothing more curious or interesting in the history and phenomena of animal life, than the remarkable discrimination, and almost unerring tact, manifested by animals in the selection of food. I have already alluded to this subject, and mentioned that animals almost invariably choose the food which is proper for them, nevertheless, they sometimes commit mistakes, particularly when impelled by strong instinctive impulses. Thus cows and horses, after long confinement in stables, and the use of dry feeding, are apt, when first turned out into green pastures, to devour the fresh herbage so greedily, that they frequently swallow plants which they would have rejected at another time, and in this way are sometimes poisoned. Linnæus pointed out this circumstance long ago, and remarked that, at Tornea, cows, on being allowed to go into fresh pastures at the beginning of spring, appeared to have lost the instinct which, under ordinary circumstances, prevents them from eating the water hemlock, and other poisonous plants. Dr. Fleming mentions that, in the Orkneys, goslings, when first turned out in spring, frequently die from eating the leaves of the fox-glove.

In man, the instinct which leads to the selection of appropriate food, is by no means so accurate as in animals; in the earlier periods of life the selection of food depends upon the parent, after this it is regulated, not by instinct, but by reason and experience. With respect to the peculiar sensation termed hunger, it is not necessary that I should enter into any detailed investigation of its cause, particularly as our knowledge on this point is both scanty and imperfect. By some it is attributed to the friction of the coats of the stomach on each other in the empty state of that organ; others look upon it as a consequence of the irritation produced by the accumulation of the gastric juice in contact with, and acting on, its coats. Various other explanations of this phenomenon have been given, some of which are trifling, and all unsatisfactory. It would appear to arise from the sympathy which the stomach has with the whole system, as seems proved by the fact that in cases of disease of the pylorus, where assimilation does not take place to any extent, the patient may feel very hungry with a full stomach.

Where a supply of proper food cannot be obtained, various modes have been resorted to for relieving the sensation of hunger. Some persons allay the cravings of appetite by chewing tobacco and swallowing part of the saliva, others by smoking, and it is a fact well known to most nations, particularly the Irish, that the want of a breakfast may be rendered less sensible by the use of the pipe. Soldiers on long marches have been frequently known to seek for an alleviation of hunger by holding pebbles in their mouths, and in many parts of the East the same thing is more completely accomplished by eating opium. Some of the native tribes in South America, whose supply of food is scanty and precarious, prepare a kind of aluminous clay, which they make up into balls, and swallow when pressed by famine. Many of the Hottentot tribes, and several individuals of other countries, who travel through the inland parts of Africa for the purposes of commerce or scientific investigation, carry with them what are termed famine girdles, these are worn over the loins and abdomen, and are tightened accordingly as their supply of food fails, experience having taught them that compression of the abdominal viscera, is one of the most effectual modes of relieving the sensations of hunger.

With regard to the quantity of food which an individual is capable of consuming at a meal, this is chiefly regulated by habit. Europeans and most civilised nations who are accustomed to live regularly, eat at certain times, and take a certain proportion of food, and if they should chance to exceed this, they experience a sense of oppression about the stomach, and feel heavy and incapable of exertion. Among savage tribes, however, where agriculture and commerce are either totally neglected or but very imperfectly pursued, (the supply of food depending on the uncertain labours of the chase, and the prey being frequently killed at a distance from home,) the habit of devouring immense quantities of food is generated, and the savage, doubtful of the prospect for the next few days, concludes that the best and simplest plan he can pursue, is to eat as much at once as will probably suffice until another chance of supplying his wants may occur. Thus it is related by a missionary in his travels through Southern Africa, that on one occasion his party had been forced to tighten their famine girdles to the utmost, having been for several days without any kind of solid food, when fortunately a zebra was shot. The carcase was immediately roasted, and, after he had eaten two or three pounds, he felt an inclination to sleep, and lay down at a distance from the party. During the course of the night he awoke, and found that the negroes were still engaged in stuffing themselves with unabated eagerness. He again went asleep and again awoke, and continued in this way, alternately dosing and waking, during the night, but remarked, with no small degree of astonishment, that every time he awoke the Africans were still eating away as if they had only just commenced. They had heaped fresh fuel on the fire, and taken off their famine girdles in the beginning of the night, and they lay stretched on the grass, gorging themselves until their bellies, which had been quite lank and concave, became strikingly protuberant and convex.

Captain Cochrane, in his Journey through Russia and Siberia, relates the following facts, strongly illustrative of the influence which habit, climate, and hereditary disposition, exercise upon the human appetite and digestive powers:—"At Tabalak I had a pretty good specimen of the appetite of a child, whose age did not exceed five years. I had observed the child crawling on the floor, and scraping up with its thumb the tallow-grease which fell from a lighted candle, and I enquired in surprise whether it proceeded from hunger or from liking of the fat. I was told from neither, but simply from the habit, in both Yakuti and Tongousi, of eating whenever there is food, and never permitting anything that can be eaten to be lost. I gave the child a candle, made of the most impure tallow, a second, and a third, and all were devoured with avidity. The steersman then gave him several pounds of sour frozen butter; this he also immediately consumed; lastly, also a large piece of yellow soap; all went the same road, but as I was convinced that the child would contiuue to gorge as long as it could receive anything, I begged my companion to desist as I had done.

"As to the statement of what a man can or will eat, either as to quality or quantity, I am afraid it would be quite incredible; in fact, there is nothing in the way of fish or meat, from whatever animal, however putrid or unwholesome, but they will devour with impunity, and the quantity only varies with what they can get. I have repeatedly seen a Yakuti or a Tongousi devour forty pounds of meat in a day; the effect is very observable upon them, for from thin and meagre looking men they will become perfectly pot-bellied. Their stomachs must be differently formed from ours, or it would be impossible for them to drink off at a draught their tea and soup scalding hot without the least inconvenience. I have seen three of these gluttons consume a reindeer at one meal; nor are they nice as to the choice of parts, nothing being lost, not even the contents of the bowels, which, with the aid of fat and blood, are converted into black puddings."

Some, perhaps, might be inclined to look upon this statement as grossly exaggerated; I do not believe it to be so, for it is fully corroborated in the following extract from the narrative of the voyage made by the Russian Admiral Saritcheff:—

"No sooner," says the Admiral, "had they stopped to rest and spend the night, than they had their kettle on the fire, which they never left until they pursued their journey, spending the intervals for rest in eating, and, in consequence of not sleeping, they were drowsy all the next day. Such an extraordinary voracity was never attended with any ill effects, although they made a practice of devouring at one meal what would have killed any other person. The labourers had an allowance of four poods (one hundred and forty-four pounds English) of fat, and seventy-two pounds of rye flour, yet in a fortnight they complained of having nothing to eat. Not crediting the fact, the Yakuti said that one of them was accustomed to consume at home, in the space of twenty-four hours, the hind quarter of a large ox, twenty pounds of fat, and a proportionate quantity of melted butter for his drink." The appearance of the man not justifying his assertion, the admiral had a mind to try his gormandising powers, and for that purpose he had a thick porridge of rice boiled down with three pounds of butter, weighing together twenty-eight pounds, and although the glutton had already breakfasted, yet did he sit down to it with the greatest eagerness, and consumed the whole without stirring from the spot; and except that his stomach betrayed more than ordinary fulness, he showed no sign of inconvenience or injury, and would have been ready to renew his gluttony on the following day.

An instance of extraordinary appetite has been lately communicated to me by Mr. Mulock. A gentleman affected with psoas abscess, which opened in the usual manner, was greatly emaciated in consequence of the excessive discharge of purulent matter. He had all the symptoms of violent hectic, and was sinking rapidly, when, being given over by the late Mr. Hewson, he determined to gratify his desire for food, which had shortly before become inordinate. He accordingly took six meals in the day, consisting of beefsteaks, mutton, fowl, and, in short, of food the most nutritious, washed down with plentiful potations of wine and the strongest porter. Mr. Mulock, who watched the case very carefully, found that he consumed on an average sixteen pounds of solid food daily. The effects of this diet on his constitutional symptoms were very remarkable. His pulse became gradually slower and fuller, his strength increased, the colliquative sweats diminished, and he finally recovered perfectly. This and similar instances are full of instruction, and prove that fever may be a consequence of debility. The effects of a properly adjusted diet in diminishing disease of this nature, I every day witness in the fever at present epidemic, *in the more advanced stages of which, raving, very quick pulse, want of sleep, and a host of bad symptoms, often yield to wine and proper nourishment.*

Mr. Derwent Conway, in his "Personal Narrative of a Journey through Norway," makes the following remarks, well worthy of the attention both of the physiologist and the practical physician :—

"In looking at the Norwegian peasantry, one is struck with their sturdy forms and healthy faces ; notwithstanding the great appetites and daintiness of the Norwegians, and the artificial style of cookery practised among them, indigestion, with its train of evils, is unknown among them. I leave it to the physiologist to determine whether this be owing to acquired habit, or to constant exercise, or to peculiarities of climate; it is certain, however, that the traveller will in vain search the interior of Norway for a dyspeptic, and yet I am well convinced that the diet of a hearty Norwegian would create such an attack of indigestion in any inhabitant of my own country, as would put him on a regimen of water-gruel for a month. In looking at a healthy population such as Norway, where diet is not more simple than it is in England, and excess in eating and drinking is far more general, we are led to conclude *that works on diet and regimen are less useful than they pretend to be,* and that we must look for the differences in health rather to certain refinements, luxurious indulgences, incident to a highly civilised state of society, than to the errors of diet. This may at least apply to the upper ranks. I am certain that one may see a greater number of *malades* in the city of Bath in one day than could be collected from every part of Norway. But if we were to transport a hundred of the inhabitants of Asterdalm to the gaieties of a London winter, with its refinements and artificial habits, though to quite as simple a diet, the change would soon make itself apparent in the enervated frame and languid faces of the Asterdalms. The converse of this I know to be true. I am well acquainted with a person, who in this island was a martyr to indigestion; nothing but the simplest kind of food could be eaten by her for years, and during all that time not one particle of butter had been tasted. But not many months after a removal to Norway, there was not a trace of dyspepsy left; she eat the same diet, and almost as much, as those among whom she had come, but along with this was coupled Norwegian habits, early rising, early hours, daily and nearly constant exercise in the open air."

Indeed, I have long been of opinion with Mr. Conway, that works upon diet are less useful than they pretend to be. I am in the habit of considering the stomach rather as a joint sufferer with the rest of the system, than as the cause of the disease itself. Physicians in general are too much inclined to look upon those cases in which digestion is badly performed, as examples of mere disease on the part of the stomach; whereas, in the majority of instances, the stomach only participates in the effects produced by some cause which has debilitated the system in general, and consequently has weakened the powers of the stomach as well as those of the other organs. Loss of blood, mental anxiety, constant confinement and want of exercise, over-exertion of mind, late hours, excesses in sensual enjoyments; these, and a thousand other causes, give rise to general debility, to an enervated state of the whole frame, including all the organs, the stomach among the rest. When such a result has been produced, how mistaken and narrow are the views of those who only look to the state of the digestive organs, and who attribute to their derangement the origin of all the evils that afflict the patient! How unsuccessful must be their practice, who in such cases confine their attention to accurate rules of diet, and to medicines calculated merely to act upon the stomach and liver; how frequently, overlooking the true sources of the malady, do they aggravate the patient's suffering by the blue pill and purgative system! A man may have a stomach weakened in consequence of his suffering from periostitis, which prevents sleep; powers of digestion may be impaired in consequence of the re-action produced on the constitution by certain local diseases, such as piles, cancer, ulcers, or by various general affections, as gout, syphilis, or scurvy. It is obvious that in all such cases the indications for cure must be very different, and must extend beyond the mere rules of diet, or the selection of aperient and stomachic remedies.

I may remark, that, in some persons, there exists a ravenous and insatiable craving for food, constituting the disease termed bulimia. Something of this nature occurs in patients labouring under diabetes, they eat and drink both night and day, and hence they are by far the most expensive inmates of an hospital. In Dr. Thomas's Practice of Physic we find some curious cases of bulimia detailed; among which is one of a person, named Tararre, who had recourse to the vilest filth to satisfy the cravings of an insatiable appetite, and who, among other things, was strongly suspected of having eaten a child. It may be observed here, that in such cases the functions are never natural. The discharges from the bowels and bladder are inordinate in quantity, and remarkable for their unnatural character, and there is an enormous evaporation of fluid from the skin, generally of a highly offensive odour. A singular species of bulimia exists among the West Indian blacks, and has been very well described in the *Edinburgh Medical and Surgical Journal.* Persons labouring under this affection have a desire to eat lime, ashes, earth, and other disgusting substances; the disease is generally accompanied by a hard and tumefied state of the abdomen, and in some instances appears to be of an epidemic character. In chlorotic and hysteric women something analogous to this is frequently observed, the appetite for food becomes diseased, and they devour various indigestible and improper substances. I have this day visited a young lady, who has manifested a strong desire for eating clay.

In some cases, on the contrary, the appetite for food becomes preternaturally diminished, and it is astonishing to observe the small quantity of aliment on which some individuals have existed for a great length of time. Instances are brought forward as wonders, of persons, particularly females, who had subsisted for a considerable period with-without any food at all. We sometimes hear of young ladies having lived for months on such meagre aliment as lemon-juice. Thus Johanna Naunton is *said* to have lived on lemon-juice alone for seventy-eight days.*

I may, however, observe, that most cases of this description occur in the persons of hysterical females; and it is a curious fact, that many of these individuals have an extraordinary tendency to deceive their friends and medical attendants. Weak-minded persons of an hysterical habit led away by an inordinate desire to cause pity and wonder, seek to become the subjects of some surprising story or miracle; and it is astonishing to see what inconveniences they will undergo, in order to excite this temporary interest. Among the various modes adopted for accomplishing this object, fasting is one of those most generally employed; and hence we frequently hear of females who have lived for months without taking any food. Cases of this description, and other instances of an analogous nature, are interesting as connected with the strong tendency which exists in mankind to deceive and be deceived. A case is recorded by Dr. Otto of Copenhagen, in which it is stated, that needles to the amount of four or five hundred were extracted at various times from the arms and body of a female. This case was published in all the Medical Journals of Europe, and excited a great deal of attention, and certainly it must be acknowledged that this female succeeded completely in her purpose, for it appeared on accurate investigation, that she thrust the needles into various parts of her own body, for the purpose of exciting wonder and having herself talked of. I recollect a case somewhat like this, which occurred in the Female Orphan House in this city.

* In Caillet's Account of a Residence among some African Tribes, the natives are represented as subsisting *almost altogether upon milk.*

One of the girls was attacked with inflammation of the fore-arm, and the symptoms were so violent that all treatment proved unavailing. Deep-seated inflammation of an intense character attacked the sheaths of the muscles and the tendinous expansions, and sloughing went on to such an extent, that the surgeon who attended the Institution, finding the best-directed efforts of treatment unavailing, came to the resolution of amputating the arm. The operation was performed, and, on examining the limb, a vast quantity of needles were found in various parts, thrust deeply into the muscular mass which forms the bulk of the fore-arm. A case, still more extraordinary, is related in the Transactions of the Association of the King and Queen's College of Physicians in Ireland: it was that of a young woman who was said to have vomited up the larvæ of several insects; indeed, it was stated by some physicians in Cork, on whom she had imposed, that she had discharged a winged insect, which, if it did not fly out of her mouth, was at least perfect in all its parts when ejected from her stomach! This extraordinary narrative, now ascertained to have been the result of gross but well-managed deception, has been frequently quoted by Continental writers, and has been suffered, uncontradicted, to disgrace the excellent work in which it was originally published !*

It is astonishing what pleasure persons of this description find in deceiving their friends, and what ingenuity they practise to support the deception. It is necessary for every practitioner to bear this in mind, for few can have an idea of the frequency with which these attempts to impose, in a minor degree, occur among private families, and how often the friends of hysterical and hypochondriacal individuals are thrown into a state of alarm by such practices. Again; such impositions frequently deceive the medical practitioner; and when detected, as they generally are, by accident or by the keener penetration of non-professional persons, they

* Since the above was written, the true history of this case has been given by Dr. Pickells in the work alluded to.—Ed.

have a tendency to throw ridicule on the profession. I remember being brought, some time ago, by a medical friend, to see a woman, living at one of the gate-houses in the Phœnix Park, who was said to have passed the most extraordinary substances from the bowels. I procured some of the alvine discharge, and had the curiosity to go through the task of lixiviating it, and insulating from the mass the foreign substances blended with it. I found these to consist entirely of a quantity of gravel, which the impostor had picked up in one of the walks and secretly mixed with the discharges. Some of the larger quartz pebbles had been selected by the physician in attendance, who had them washed and preserved as specimens of gall-stones!

But to return; without adducing examples of hysteria in females, it may be stated that the greatest length of time which persons in ordinary health can live without taking any food, appears from the most authentic accounts, to be about seven or eight days. Thus we find, in Franklin's account of his Journey, that Mr. Drummond lived for seven days without food, and this is generally the utmost time that total abstinence can be borne without producing fatal consequences. There is, however, one case on record of a person who survived until the eighteenth day. Such cases must be exceedingly rare, for in the normal condition of the system no human being can live without food longer than from seven to nine or ten days. Many of the inferior animals, as toads, serpents, tortoises, and insects during the chrysalid state, subsist for a considerable length of time without taking any kind of aliment, and the same thing may be observed in hybernating animals. In the latter, the suppressed state of the vital energy during the dormant period, and the very imperfect discharge of all the functions, seem to be the chief reason why their prolonged abstinence is borne with such remarkable impunity.

Long fasting, besides its immediate effects in reducing the bodily powers to a state of great debility, has a strong tendency to bring on a peculiar state of the system, in which the stimulus of food is apt to produce fatal effects by lighting up rapid and violent inflammation. Persons who, after a long deprivation of food, have taken a hearty meal, very seldom recover from its effects. The same result is to be observed from drinking a large quantity of fluid after long continued thirst. Thus Columbus states that several Indians who had been confined in his vessel and deprived of drink for many days, died almost immediately after swallowing copious draughts of water.

It is highly instructive to the practical physician as well as to the enquiring physiologist, to consider what is the nature of those symptoms which arise from want of food, when continued beyond a certain period. I need not describe the sensation of distress and sinking, the total prostration of bodily power, the burning thirst, the strange type of fever, and the maniacal excitement produced by deprivation of food. We may find the effects of starvation depicted in all their appalling reality in the accounts given by many authors.

A few of the facts connected with the history of starvation, however, are in one point of view highly interesting, and demand a more particular notice. In the first place, continued deprivation of food produces (and this is a very singular effect) irritation of the stomach. After some time this is followed by fever, and then by furious delirium. Of these three important facts the latter is the most curious. In cases of starvation one of the most remarkable consequences has been *the occurrence of high maniacal excitement.* It is necessary to bear this in mind, because a knowledge of the fact enables us to look with a different eye, on the apparently savage and demoniac acts of those poor wretches, who have been exposed to the horrors of starvation. In reading the sickening details of the wreck of the Medusa, it is some consolation to reflect that the murders and atrocities, committed by the crew, were probably not the acts of accountable beings, but the ordinary results of maniacal excitement.

The following particulars, taken from a narrative of the sufferings of those who embarked on the raft, constructed to save the crew of the French frigate the Medusa, present strong proofs of the excitement in the delirium caused by starvation:—

"The second night was still more dreadful, and many were washed off into the sea, although the crew had so crowded together, that some were smothered by the mere pressure. To soothe their last moments the soldiers drank immoderately, and in their fury attempted to cut the cables which held together the spars and beams of the raft; a general conflict ensued between those who attacked and those who defended it. Many of the former were killed, and one, who affected to rest himself upon the side, but who in fact was treacherously cutting the ropes, was thrown into the sea. Another, whom M. Correard had snatched from the waves, turned traitor a second time, he, too, was killed. At length the revolters, who were chiefly soldiers, being repulsed, threw themselves on their knees, and with the utmost abjectness implored mercy; at midnight, however, they rebelled again. Those who had no arms fought with their teeth, and thus it was that many severe wounds were inflicted; one man in particular was most wantonly and dreadfully bitten above the heel, while his companions were beating him on the head with their carabines, previously to their throwing him into the sea. The raft was strewed with dead bodies, after innumerable instances of treachery and cruelty, and from sixty to sixty-five perished that night. The force and courage of the strongest began to yield to their misfortunes, *and even the most resolute laboured under mental derangement.* In the conflict the revolted had thrown two casks of wine into the sea, together with all the remaining water. A day of comparative tranquillity now succeeded. The survivors erected their mast again, which had been wantonly cut down in the battle of the night, and endeavoured to catch some fish, but in vain; then it was that they were reduced to the last resource, the most repugnant to human nature, and the bodies of their dead companions became their sustenance. A third night followed, which was only interrupted by the plaintive cries of wretches, exposed to every kind of suffering, ten or twelve of whom died of want. Some flying fish were caught, which, mixed up with human flesh, afforded one scanty meal. A new insurrection, *still for the insane purpose of destroying the raft,* broke out on the fourth night, and this too was marked by perfidy, and terminated in blood; most of the rebels were thrown into the sea. The fifth morning mustered but thirty men alive, and these in the most wretched state, sick and wounded, and the skin of the lower extremities corroded by salt water. * * * * There now remained but twenty-seven; of these but fifteen appeared capable of out-living their present fatigue. A council of war was held, and it was resolved that, as the weak consumed a part of the common store without hope of surviving, they should be thrown into the sea. * * * * In such a situation, distress and misery increased with a very accelerated ratio; and even after the desperate measure of destroying their companions and eating the most nauseous aliments, the surviving fifteen could not hope for more than a few days' existence. A butterfly lighted on their sail the ninth day, and though it was held to be the harbinger of good, many a greedy eye was cast upon it. The misery of the survivors increased, and they even stole from each other little goblets of urine, which had been set to cool in the sea-water, and which was now considered a luxury." M. Savary made some observations on this subject which are not devoid of interest, particularly when we combine them with the diuretic qualities lately ascribed to urea. He says that the urine of some was much more agreeable than that of others, and in all cases this beverage proved an instantaneous and powerful diuretic.

A curious fact connected with this subject is mentioned by Captain Cochrane, who says, "that nothing is so acceptable to reindeer as human urine, and I have even seen them run to get it as occasion offered."*

* Journey through Russia and Siberian Tartary.

In modern times, national famines are of much less frequent occurrence than during the middle ages, when commerce was restricted and agricultural pursuits insecure. The greatest famine ever experienced in England was in the reign of Edward II., in 1513, but even its horrors and devastations were exceeded by those which marked the occurrence of similar misfortunes in France, where, in 1031, under King Robert, human flesh was sold in the butchers' shops.

GENERAL PRINCIPLES OF DIETETICS.

At the conclusion of my observations on the appetite for food, I spoke of the various modes adopted by mankind to allay the sensation of hunger, and of the extraordinary effects produced on the system by long deprivation of food and drink. In considering the length of time man may subsist without taking any solid aliment, it is remarkable that persons labouring under various forms of disease, bear the want of food much longer than those in the full enjoyment of health. Thus we see every day instances of persons in fever taking no nourishment for weeks except a little whey or barley-water. The same thing is observed in certain forms of gastric disease, the patient goes on sometimes for months harassed by continued vomiting, and rejecting his food almost immediately after it has been swallowed, yet it is very rare to find such a person dying of starvation.

A knowledge of the symptoms which arise from want of food is of great importance in the treatment of fever and other affections, in which the patient remains for a considerable time without taking any kind of nutritious aliment. There is a certain advanced stage of fever, when a degree of delirium is present, when the patient's pulse is quick, his eye suffused, his tongue dry, his sensibility to external objects either impaired or deranged, his watchfulness persistent, or only interrupted by an imperfect slumbering with half-closed eye-lids, when every organ is in a morbid condition, and every function vitiated. At this period of an almost mortal struggle with disease, the dry tongue, the blood-shot eye, and the cerebral excitement, are apt to betray the practitioner into the error of supposing that the existence of inflammation in the brain or stomach is the only thing capable of accounting for the alarming train of phenomena present, and with this impression he has recourse to leeching, blistering, and other modes of depletion. But the mischief is not to be obviated in this way; the symptoms assume a more intense and threatening character, and the patient sinks. A far more reasonable and more successful practice, is to endeavour to calm the nervous irritation by the employment of opiates, and to sustain the sinking powers of life by the judicious administration of light nutritious food and wine. Often have I under such circumstances seen the tongue become moist and clean, the conjunctivæ grow clear and pale, the delirium subside, and tranquil refreshing sleep return, under the use of wine.

I have mentioned that one of the effects of starvation was irritation of the stomach. In many cases of fever, where gastric or gastro-enteric disease is said to exist, and in numerous instances of dyspepsia supposed to be connected with an inflammatory condition of the mucous membrane of the stomach, the treatment adopted by many practitioners on the continent and by some in this country, is perpetual leeching and a rigorous diet; in fact, besides constant local depletion, a modified system of starvation is enforced. Now the so called gastro-duodenitis of fever is, in a vast number of cases, nothing more than a species of gastric distress, with pain in the stomach and tenderness on pressure, and, often in such cases, have the debilitating effects of constant leeching, combined with the want of food, brought on the very symptoms which they were intended to remedy. In concluding this brief notice of a very important subject, I would beg leave to refer to Piorry's work, in which we find some excellent remarks on the *diète absolue.*

With respect to the nature of their peculiar aliment, animals have been divided into the frugivorous, graminivorous, carnivorous, and omnivorous. Among the latter, man is properly classed. Man and several other animals have been called omnivorous, because vegetable matters, fruits, and flesh are equally suited for their nutrition.

A great deal has been said and written about the diet most suitable for man. Formerly it was the fashion to extol the numerous advantages attendant on a frugal fare; it was asserted that the more simple the diet, the more healthy; that vegetable food was more conducive to longevity than animal, and that repasts consisting only of the fruits of the earth and the water of the spring, were essential to vigour of body, clearness of intellect, and peace of mind. Modern investigations have overturned this beautiful and poetic system of dietetics, by proving that it has no real foundation in nature. In the first place it appears, that when we study the conformation of the human body, and the peculiar structure of the organs employed in the various processes of digestion, we find that man is evidently destined to be an omnivorous animal. If we look to his teeth, we find them to be adapted to the mastication of all sorts of food, whether fruits, vegetables, or flesh. Again, when we examine his stomach and intestines, we find that he has neither the short and simple intestinal tube of the carnivorous, nor the long and complex one of the graminivorous animals; in fact that the stomach and intestines are calculated to derive nutrition from every species of food. In addition to this, man is the only animal that prepares his food, submitting the various articles of diet to processes which at once render them agreeable to the palate and easily digested; in other words, man, prompted by instinct, and assisted by reason, is the only cooking animal, the only one capable of modifying the properties of the various alimentary matters used by different classes of animals, so as to render them suitable to his own nutrition. Hence the various operations of cookery are universally known, and have been practised from the most remote era, and there is no instance of a tribe or nation existing at any period, unacquainted with the modes of preparing food. It is true that until the arrival of Europeans, the inhabitants of New Holland were ignorant of the process of boiling water; but they were perfectly well acquainted with the modes of preparing food by roasting or broiling.

The opinion of poets and philosophers, that a simple vegetable diet is calculated to produce, not only greater clearness of intellect and length of life, but also greater bodily vigour, does not seem to be founded in truth, for it has been established, that persons living on a mixed diet, and using a large proportion of animal food, enjoy an equal, if not superior longevity, and exhibit more intellectual energy and bodily strength than those who live upon vegetables. That persons living on a mixed diet, and using a large proportion of animal food, are stronger than those who subsist chiefly on vegetables, is proved by the experiments made with the dynamometer, by M. Peron. He selected seventeen Frenchmen, fourteen Englishmen, fifty-six men of the island of Timoa, seventeen New Hollanders, and twelve of Van Diemen's Land (all, except the Europeans, living chiefly on vegetables), and, having ascertained their respective strength, he gives the mean results in each case. From the details it appears, that in point of strength the English rank first, next the French, then the inhabitants of Timor, and, lastly, those of New Holland and Van Diemen's Land. In the latter, the greatest strength of the arms was equal to 62 kilogrammes; in the English trials the greatest was 83, and the least 63. In the power of the loins, the maximum among the New Hollanders was equal to 13 myriagrammes, while the lowest of the English was 12·7, and the highest 16·3. Thus we see that the English, who consume a considerable proportion of animal food, are stronger than the French, and the French than oriental nations, who subsist chiefly on rice.

The idea of living on a purely vegetable diet originated in many countries, from a notion that it was wrong and unlawful to deprive animals of life, for the purpose of supplying bodily wants which could be otherwise gratified, and it is the peculiar boast of those who profess this doctrine, that it is in strict accordance with the dictates of a refined and comprehensive humanity. But the discovery of the microscope has unfortunately stripped this doctrine of its most amiable character, by showing that, in chewing his crumb of cheese, the Pythagorean murders thousands of living beings, and in swallowing his cup of water deprives myriads of life.

It may be asked why do I dwell on this subject? Because I am persuaded that many of the opinions held at present with respect to diet, are founded on false theories. I am convinced that simplicity of diet is too much insisted on in the treatment of dyspeptic and other cases. I believe that simplicity in prescription, and simplicity in diet, have been carried too far. It is now well established by theory as well as by experience, that in prescribing, we accomplish our object with more certainty and effect by combining several remedies, than by limiting our practice to the employment of a single therapeutic agent. It is the same thing with respect to diet. I am not an advocate for luxurious living, nor would I recommend that excess of variety which characterises the meals of the gourmand, but I think it is wrong and injudicious to make persons live on a single dish. There is a physical as well as a moral objection to it. The custom of partaking of various kinds of food is not easily overcome, the patient grows tired of his solitary chop or beef-steak, and feels no gratification in eating. Now, *ceteris paribus*, whatever is eaten with a relish is more easily digested than that which is swallowed with indifference or dislike. Many persons assert that a meagre and scanty diet, in quantity much smaller than the appetite demands, and consisting merely of a little bread and gruel, is calculated to promote longevity, and maintain intellectual as well as bodily vigour. I do not believe this. I have no intention of encouraging gastronomic ingenuity, but I must confess I look on such simplicity in diet as an error against nature. It is an error against that principle which has made man press into his service so many individuals of the animal kingdom, and convert so many vegetable substances to the purposes of his own nutrition.

Let us consider for a moment those articles which are prepared by the hand of nature for the food of man and other animals. Let us look to that substance which forms the only nutriment of the young of all the mammalia, milk. Is milk a simple substance? No; it is a compound of saccharine, caseous, oily, and albuminous principles; a substance which the simplifiers of diet would say was too complex to be presented to the stomach, and yet it is that which nature has destined for the only support of a vast number of animals, at the most tender period of existence. Again, let us look to the food prepared for graminivorous animals, and we shall find that nature has been here equally varied and bountiful in her productions. It would be impossible to get a pasture in which the grass is restricted to a single species; in most pastures there are from fifteen to twenty different kinds, differing in the nature and combination of their vegetable principles, and having separate effects on the economy. Had nature limited the horse or the ox to a single species of grass, this profusion would not have existed; but it was never intended that man and his fellow-animals should adhere to a strict simplicity of diet. On the contrary, I feel fully convinced that a certain variety in food is highly essential to the restoration or maintenance of health. This opinion may appear strange, but I can aver from experience, that the physician who treats the valetudinary and dyspeptic on these principles, will be much more successful than he who restricts his patient to a single dish.

The researches of experimental physiology have elicited a number of important facts bearing on the question of simplicity in diet. Magendie, as we all know, has shown that dogs fed on sugar alone, become after a certain time weak and emaciated, lose their sight from ulceration of the cornea, and eventually die. Again, M. Raspail, in his late work, *Nouveau Système de Chimie Organique*, has shown that gluten, the nutritive principle in plants, will not sustain animal life. Neither sugar nor gluten alone is capable of supporting life, but, if we combine them, they afford a wholesome and nutritious aliment. The human body is not simple; it consists of a great number of fluids and solids, which differ essentially in their nature and chemical composition. Into this composition many elementary principles enter, and is it not, then, reasonable to suppose that a variety of materials will be required? If we were to reduce diet to such a state of simplicity as to diminish the number of the elementary principles which enter into the composition of the solids, I do not think the nutrition of the body could go on. It is true, that nature is able to manufacture a great many different elements from very few materials, but a certain number of principles must exist to enable her to prepare the compound, which she employs for supplying the various wants of the system.*

"In France, most substances are exposed, through the medium of oil and butter, to a temperature of at least 600° Fah., by the operation of frying or some analogous process. They are then introduced into a macerating vessel with a little water, and kept for several hours at a temperature far below the boiling point (212°), not perhaps higher than 180°; and by these united processes, properly conducted, the most refractory articles, whether of animal or vegetable origin, are reduced, more or less, to the state of pulp, and admirably adapted for the further action of the stomach. In the common cookery of this country, on the contrary, articles are usually put at once into a large quantity of water, and submitted, without care or attention, to the boiling temperature. The consequence is, that most animal substances, when taken out, are harder and more indigestible than in the natural state, for it is well known that albuminous substances, as, for example, white of egg, become the harder the longer they are boiled."

* The preceding observations on diet were given in a lecture delivered last November. Those which follow are taken from the 104th No. of the *Quarterly Review*, which I did not see until long after; they remarkably corroborate my views.

An excellent illustration of the principle laid down by the Reviewer is afforded by the liver and the kidneys, each of which becomes *remarkably harder* in consequence of the common methods of cooking. There can be little doubt that the livers destined for the food of dogs are rendered much less palatable and digestible by the pains the unwilling cook is forced to bestow on them.

"These observations are often of the utmost importance in a medical point of view. When the powers of the stomach are weak, a hard and crude English diet (such, for example, as half raw beef-steaks so frequently recommended) is sure to promote much discomfort by promoting acidity, while the very same articles, well cooked upon French principles, or rather the principles of common sense, can be taken with impunity, and easily assimilated.

"It has been remarked, on the authority of one of our ablest physicians, that our principal alimentary matters may be reduced to three classes, of which sugar, butter, and the white of egg, are the representatives. *Now, it is a curious circumstance, that milk, the only article absolutely prepared and intended by nature as an aliment, is a compound of all the three classes; and almost all the graminaceous and herbaceous matters employed as food by the lower animals, contain at least two, if not all the three.* The same is true of animal aliments, which consist at least of albumen and oil. In short, it is almost impossible to name a substance, employed by the higher animals as food, that does not essentially constitute a natural compound of at least two, if not all three, of these great principles of alimentary matter." * *

"It would seem that various food is the most wholesome for man; that he thrives best upon a proper admixture of vegetable and animal diet. The Brahmins, who feed solely upon rice, are not long-lived, and are endowed with feeble constitutions; on the other hand, the Esquimaux are obliged to mix saw-dust with their train-oil." * * *

"But it is in the *artificial* food of man that we see *this great principle of mixture* most strongly exemplified. Dissatisfied with the productions spontaneously furnished by nature, he culls from every source, and forms in every possible manner, and under every disguise, the same great alimentary compound. This, after all his baking, roasting, and stewing, &c., how much soever he may be disinclined to believe it, is the sole end and object of his exertions. Even in the utmost refinement of his luxury, the same great principle is attended to; and his sugar and flour, his eggs and butter, in all their various forms and combinations, are nothing more or less than disguised imitations of the simple elementary prototype—milk."*

To conclude this part of our subject, I may observe that even water, as nature offers it for our use, is by no means unadulterated and free from what the ignorant would call *impurities*; as whether we draw it from the spring or the river, it contains a great variety of salts, gases, and organic matters. When purified by distillation, it becomes at once unpalatable and indigestible!

So far as to the general principles of diet. A few facts may be here mentioned with respect to some particular articles of food. It is curious that occasionally certain principles become developed in chocolate and cocoa when long kept, which render them injurious to the sight. Persons who have used these substances (but particularly cocoa) for a long time, are apt, under such circumstances, to get weak sight and amaurosis. Chicory also brings on amaurosis, and this substance is not unfrequently used to adulterate coffee. Rice again appears to be bad for the sight, particularly when used in a damaged state; and it has frequently been remarked, that the number of blind persons in the East is very great. Dr. Tytler has gone so far as to assert that the Oriental cholera is caused by eating spoiled rice; this, however, is not borne out by facts, for we have had it raging here among a population, the majority of whom never even tasted rice.

Having spoken of simplicity of diet in respect to food,

* *Quarterly Review*, l. c.

I may now say a few words concerning drink. I have already stated that it was my conviction that too much simplicity in the use of solids was bad; the same remark may be made with respect to fluids. I believe that water was never destined to be the exclusive beverage of man. Nature has prepared milk for his use as well as water; and in tropical climates she has furnished various fluids from plants to refresh his strength and cool his burning thirst. We also find reasoning man, in every country of the globe, expressing various juices from plants for the purpose of giving variety and zest to his drink. If we turn to the records of the most remote antiquity, we find that in the earliest periods of society, in the days of primitive innocence and patriarchal simplicity, the art of making fermented liquors was known and practised. The use of wine is of very high antiquity among the eastern nations; and we find the early Egyptians using a fermented liquor from grain, which was termed *barley wine,* and was drunk by the poorer classes. Among the infinite ramifications into which the human family is divided, we do not meet with any tribe so barbarous, or so insulated from commerce with the rest of mankind, as to be unacquainted with some mode of giving variety to their ordinary drink. There can be no doubt that nature never intended water to be the only beverage of civilised man; and I am confident that if the whole British nation drank nothing but water for the next twenty or thirty years, they would not be as fine and as vigorous a people as they are at present. Indeed I have but little doubt that if all mankind were to become water-drinkers, the poetic idea of the degeneracy of the human race would, in the course of a few generations, be realised. Of this, however, there appears to be but little apprehension, for the tendency to mix fermented and other liquors with the ordinary drink is universally diffused through the mass of mankind. Here, however, reason must control the appetite; and though it was intended that man should use fermented liquors as well as cooked victuals, still he must recollect, that, like other boons, these must be enjoyed in moderation, and a wholesome medium observed. The abuse of fermented liquors is attended by a numerous train of evils; and hence our Temperance Societies have a highly laudable object in view in endeavouring to control the appetite for drink; but, in pushing matters too far, they have overshot the mark, and thus the arbitrary nature of their rules has prevented their doctrine from being more generally received and adopted. The total interdiction of spirits in every shape has deterred the lower classes from joining their ranks. It is true, that the abuse of spirits is a mighty evil,—that it is the great and destructive poison which operates in the veins of the nation. This, however, should not totally forbid their proper use, for, in small quantity, they appear well suited to this climate, and they even possess advantages over wine.

The constitution of different individuals differs in nothing more remarkably than in the tolerance of spirituous liquors, some being affected by a very small quantity, while others are able to indulge in immense potations with impunity. I lately attended a very corpulent man, of large stature, who was remarkable as an excellent man of business, and had for many years directed the complicated affairs of a large factory in the neighbourhood of this city. His intellect was always clear, and he was constantly employed in revising the accounts and superintending the expenditure of an establishment in which there were five or six hundred operatives. While thus employed he drank a glass of brandy every three-quarters of an hour, so that his daily allowance varied from eighteen to twenty glasses! This practice he had continued for many years without any apparent injury to his constitution. The break, however, came at last, and he died of dropsy at the age of 35.

Among savage nations the introduction of ardent spirits by Europeans, has been productive of the most disastrous consequences, and it is to be feared that the supply is facilitated in many cases for the very purpose of producing the moral degradation, and national ruin, that have too often followed their introduction. The most remarkable instance of a savage toper on record, is that mentioned by Moore, in the Account of his Travels in Africa. "The King of Barsally, as well as his attendants, are zealous Mahometans, and whenever he was not completely intoxicated, he prayed most fervently. Far from thinking, with others of his persuasion, that it was worse than death to taste brandy, or other strong liquors, he considered it almost a deadly evil to taste anything weaker. His usual course of life was to rise at night and to drink till towards day-light, then eat and go to sleep till near sun-set. At that time he rose, and, having again drunk copiously, went to sleep till midnight. His insatiable thirst for brandy kept both his subjects and neighbours in a state of perpetual terror: when he stood in need of a supply of this indispensable article, he immediately sent to the managers of the company at James's Fort, requesting that they would dispatch a cargo to be exchanged for slaves, a call which these worthy personages always obeyed with the utmost alacrity. Then the king marched suddenly to a neighbouring town, set fire to three parts of it, and stationed his guards at a fourth, who seized the inhabitants as they attempted to escape. If he was not at war with any of his neighbours, he then" (says Moore) "falls upon one of his own towns, and uses them in the very same manner."

Tea and coffee have also their peculiar effects on the system; which, however, vary considerably in different individuals. One person uses large quantities with impunity, while another who takes a moderate share only, leads a wretched life. It is a fact, that many persons, labouring under headache, tremors, bad sleep, and indigestion, may be cured by leaving off tea and coffee, and using instead, table-beer or porter. By substituting these (the latter in the case of English stomachs, the former in that of Irish), and by giving solid and nutritious food, without confining the patient to one dish, many cases of obstinate dyspepsia have been cured.

With respect to the subject of diet, many curious and important facts may be learned from a perusal of one of the most extraordinary books of modern times, the Life of Caspar Hauser. This unfortunate youth, whose birth was a riddle, and his death a mystery, subsisted until he was upwards of sixteen years of age on bread and water. The extraordinary physiological phenomena connected with this young man's intellect, senses, and bodily functions, when exposed to the full influence of physical agents, have been ably and accurately detailed by his biographer, M. Feuerbach. There is one very curious circumstance in his case which deserves notice. He laboured under a constant thirst and drank enormous quantities of water. This habit was not of recent origin, but had existed as long as he could recollect. As soon, however, as he got accustomed to warm drinks, his thirst diminished, and in the course of a few weeks the mere heating of his drinks had enabled him to satisfy thirst with the ordinary quantity.

Among substances used as mere condiments, salt is one of the most general. It would appear that man accustomed himself, at a very remote period, to the use of salt, on account of the necessity of preserving the flesh of animals in warm climates, as well as for the purpose of rendering his food more palatable. Many other animals also exhibit a strong liking for this substance, and seek it with extraordinary avidity. In North America, buffaloes are known to travel great distances in quest of salt, and pigeons fly hundreds of miles to gratify this desire at the salt springs. In Central Africa this propensity leads to annual migrations of animals, which travel in droves for several days, until they arrive at a salt spring, when they commence drinking the water with great eagerness and apparent relish. I cannot explain why these animals seek for salt at certain seasons of the year, but it is reasonable to conclude, that an instinct so strong and so persevering could not have been given in vain.

There are many interesting details connected with the derangement of health resulting from the want of salt, in persons long accustomed to its use; and we have also several curious facts with respect to the effects produced by habitually using salt in large quantities, or rather by the prolonged consumption of salt provisions. In the latter case scurvy is the consequence, in the former a distressing train of nervous and dyspeptic symptoms. In certain parts of Asia and Africa, where no salt can be procured, European travellers have suffered very great distress. With scurvy we are long acquainted; it exists generally among sailors who have subsisted for a length of time on salt provisions, and may frequently be seen among the poorer classes of people from the same cause. It is most generally combined with an enfeebled habit of body, with purpura, and dropsy. Among the artisans and roomkeepers of Dublin, who live chiefly on salt meat and salt fish, we meet with many persons who are feeble, pale, asthmatic, and subject to hemorrhages from the nose, gums, stomach, and bowels, and who have a tendency to anasarca and other dropsical swellings.

With respect to various other condiments, it may be observed, that they have been extensively used for a considerable space of time, and in moderation are productive of good effects. They prevent flatulence and promote digestion, but, as in the case of spirits, when used to excess, they produce irritation of the digestive system. I have lately seen an example of chronic inflammation of the stomach, caused by the too free use of Cayenne pepper. It produced severe bowel complaint, with tormina and bloody stools, followed by dyspepsia, under which the patient has now been labouring for the last seven months.

I need scarcely observe, that food must be varied according to the occupation of the individual. Persons who take violent exercise in the open air require a strong and highly concentrated nutriment. The natives of the Pampas, who are constantly on horseback, and ride enormous distances, fatiguing several horses in a day, are in the habit of using what is called jerked beef, which consists of the muscular portions of the flesh, cut into thin stripes and dried in the sun.

This forms a highly nutritious food, and Captain Head gives an interesting account of the surprising exertions he was able to make while living on dried beef and water alone.

We find, also, that sleep is supplementary to food, and that the more sleep a person takes, the less food he requires. The man who sleeps until nine o'clock in the morning seldom eats so hearty a breakfast as he who rises at five. In the same way soldiers when engaged in night duty, and sailors when they have additional watches in bad weather, require an extra allowance of food and drink. We meet with many interesting facts bearing on this point in Captain Parry's account of his attempt to reach the North Pole, from which it appears that he was obliged to increase the allowance of food during that arduous period of the expedition, when the men had scarcely any sleep for many days in succession.

I shall now proceed to make a few observations on the stature, strength, and swiftness of the human race. In doing so I must necessarily be brief. With respect to stature, it is a curious fact, that from the most remote ages there has existed a singular propensity among mankind, to disparage the size of their contemporaries, and to represent it as diminutive, when compared with that of preceding generations. We find traces of this opinion in the works of various writers from the time of Homer and Hesiod down to the present period; indeed, this is carried so far in the ancient authors, that whenever an old man speaks of the stature and physical powers of men, it is only for the purpose of descanting on the degeneracy of the human race, and of referring, with much complacency, to the feats of superior strength and activity which he witnessed among the tall and athletic companions of his youth. That this opinion is not borne out by facts, is proved by the measurement of human bones found in the most ancient burial places, by considering the stature of the Egyptian mummies, by the examination of ancient armour, and, lastly, by inspection of the buildings designed for the abode and accommodation of mankind in former ages. Additional evidence in this direction is afforded by a reference to the general size and stature of those tribes or nations, who have never assumed the habits of civilized society, and who still live in a condition analogous to that of the earlier races of mankind. Thus, if we examine the native Americans, Africans, and South Sea Islanders, we shall find that they do not exceed us in stature; indeed it has been generally observed that they are inferior in height to Europeans.

The accounts given of persons of gigantic stature who lived in past ages, have been proved by the accurate researches of modern science, to be nothing more than fables founded upon the anatomical error of mistaking the bones of extinct animals for human remains, together with the common propensity to believe and to report the marvellous. All the supposed gigantic remains have turned out to be those of the elephant or some other large animal, and there is no authenticated example on record of a man higher than eight or nine feet. The modern instances of extraordinary height have, with very few exceptions, been observed among the nations of Europe. Thus a Swede, in the King of Prussia's Guards was eight and-a-half feet in height; a German in the service of Duke John Frederick of Brunswick, measured the same; Gilby, a Swede, was eight Swedish feet in height; Reichard, a German, eight feet three inches; and O'Brien, an Irishman, eight feet four inches. Among the ancients, the Germans were remarkable for their great stature. Of the moderns, the inhabitants of Patagonia, who are in general from six to seven feet in height, are especially to be noticed.

With respect to the strength of men, the same opinions have prevailed as with regard to size and stature. It has been asserted, that the men of the present time have degenerated from the vigour of their ancestors; and it is also maintained, that civilised man is inferior in strength to the savage who roams the wilds of Africa or America. Neither of these opinions appears to be well founded; bodily strength is the result of health, exercise, and a proper supply of wholesome food; and hence the well-fed classes of a civilised community, may reasonably be expected to surpass the miserable savage, who frequently labours under want of food and other privations.

With respect to the activity of man, many feats have been recorded, and much has been written, concerning the swiftness and endurance of various individuals. In this respect the negro does not appear inferior to the white man, as we may judge from the observations of modern travellers in Africa. I may refer also to the accounts given by historians of the games held at Lisbon in 1489, in honour of the baptism of the African King Bernay. "The Portuguese monarch celebrated this event by all the exhibitions which were fashionable in that age—bull fights, feats of dogs, and puppet-shows. Bernay took this opportunity of displaying the prowess of some of his own followers. As the principal Portuguese cavaliers were making a display of their horsemanship, he called several negroes, who, on foot, followed and kept pace with the swiftest of their steeds. One of the negroes, having mounted, leaped off his horse while at full gallop, and, following, again mounted with the same facility, as if the animal had been standing perfectly still."*

During Alexander Selkirk's long sojourn on an uninhabited island, he gradually acquired the power of running with such swiftness, as to be able to overtake and catch the wild goats.

With respect to feats of strength in modern times, the most surprising on record are those performed by Thomas Topham, about a century ago, and of whose performance an interesting account is given in Brewster's *Letters on Natural Magic*. This man's strength was prodigious, being equal to 800lbs., which is double that of very strong men. This leads me to speak of gymnastics, as connected with the development of strength; and, without entering into any lengthened discussion of the subject, I may observe, that however desirable such a system may be to those who cannot take proper exercise in any other way, it is, generally speaking, totally unnecessary for the development of the

* Di Barros, vol. iii., p. 7.

body. Natural gymnastics are constantly and extensively practised by every healthy boy and girl, unless prevented by an improper system of education. Among females it too frequently happens that wholesome exercise is neglected; and we find in Dr. Arnott's *Treatise on Physics,* a detail of the various expedients resorted to by those who educate girls, to prevent them from enjoying the free and healthy use of their limbs. Boys, fortunately, are not subjected to the same restraints; and hence, if an anatomist were to visit one of their play-grounds, he could scarcely point out a single muscle which is not repeatedly exercised during the brief space allotted for recreation. Gymnastics certainly encourage the development and increase the power of certain muscles; and those who exercise their muscles in this way will be so far stronger than others. But it does not follow that such persons are healthier than those who take ordinary exercise. It is a remark as old as the time of Hippocrates, that men who practise gymnastics are in a dangerous state of health. They may increase the power of their muscular system, but, if they do so, it is at the expense of the rest of the body; and it was remarked of old, that the athletes and others who practised gymnastic exercises, were subject to violent disorders, and seldom long-lived.

It is difficult to prevent boys from taking too much exercise. During the period of growth great fatigue injures the general health. But even when gymnastic exercises are so managed as to avoid this inconvenience, and when they succeed in imparting to the boy an extraordinary degree of muscular development, I am perfectly convinced that the natural adjustment of the functions is thus prevented; for however well fitted the frame of youth may be for feats of agility, nature has not adapted it for strength, the attainment of which she defers until the period of growth is passed; and consequently her plans are deranged, when muscular strength is artificially and prematurely obtained.

OF THE SENSE OF TOUCH.

WEBER's experiments on the sense of touch, as given in his *Annotationes Anatomicæ et Physiologicæ*, Lipsiæ, 1834, are extremely interesting and original; some of them have been already published in English periodicals, but in so imperfect a manner, as to furnish a very inaccurate and incomplete view of their results.

If we touch the skin with the points of a compass one inch asunder, while the person experimented on shuts his eyes, he at once perceives his skin to be touched in two places. By gradually diminishing the distance between the two points, we finally discover that the person feels his skin to be touched by but one body; he describes this body, however, as being a little longer in one direction than another, and it appears that this longer diameter corresponds with the line of direction between the two points of the compass. When these points are brought still nearer together, this inequality in the diameters is no longer felt, and the person has a defined perception of being touched by but one point. Now Weber has determined, by experiment, that the different portions of the surface of the body vary considerably in accuracy of touch, *as measured by the distance at which the points of the compass can be still distinguished from each other;* for it is evident that parts endowed with great power of touch, will continue to give notice of two points, at a distance from each other, so small, that when applied at the same distance to less sensible portions of the skin, these two points excite but one sensation, and are by the touch erroneously judged to be but one. Thus the tips of the fingers and the point of the tongue were found to possess the most accurate sense of touch, for when the points were distant but half a Parisian line from each other (counting from the inner surface of each point), the feeling of two distinct points existed, and when they were within two-fifths of a line, although the person seemed to feel but one body, he nevertheless felt it to be longer in one direction than in another. The dorsum of the tongue was remarkably less sensible, for if the points, placed in a line parallel to the median, were less than three lines distant from each other, they were not felt to be distinct. *Few persons who have not tried similar experiments, will be prepared to credit the announcement of the great differences which exist between the tactile accuracy of different portions of the skin.* On this subject the observations of Weber are quite novel, and open a new field for inquiry, not only to the physiologist, but to the practical physician and surgeon; for it is obvious that injuries or remedies applied to the skin, must act with very different degrees of energy on parts so widely different in tactile sensibility from each other. I have repeated many of Weber's experiments, and confirmed his results; a little practice is necessary, in order to accustom ourselves to judge of the sensations perceived, as the points of the compass approach each other, and come within the *limits of confusion.* This term I have adopted to express the distance at which they produce the feeling of but one body, longer, however, in one direction than another. The sensation thus imparted is most curious; a few instances will suffice to prove the extent of the scale through which this *limit of confusion* ranges, when the points are placed *on the same horizontal line.*

	Lines.
Tip of the tongue	1
Margin of the tongue, one inch from its tip. .	2

	Lines.
Skin on the zygoma	6
Forehead	6
Hairy scalp	8
Middle of the back	12
Near the upper border of the scapula.. ..	18
——— inferior angle of the scapula ..	24
On the loins	12
Side of the abdomen	12
Anterior surface of the arm	10
Posterior, do.	14
Tips of the fingers	1
—————toes	3

The above results were obtained in examining the surface of the body in various persons. The following table, which Weber has arranged in the ascending scale, as to the measurements of the *limit of confusion,* was made from experiments upon himself. He entitles it "Tabula graduum subtilitatis tactûs in potissimis corporis mei partibus, quos per minimam distantiam crurum circini corpori impositorum, qua perpendicularis et horizontalis crurum situs, et intervallum interpositum sentiri poterat, metitus sum."

The *limit of confusion* in the following table, is therefore the distance at which the points of the compass could not only be perceived to be distinct from each other, but their direction, whether horizontal or perpendicular, could be judged of:—

	Lines.
Tip of the tongue	$\frac{1}{2}$
Inner surface of the finger tips	1
Red part of the lips	2
Inner surface of second phalanx of the fingers	2
Outer surface of the third phalanx	3
Tip of the nose	3
Inner side of the ends of the metacarpal bones	3
Dorsum of the tongue, one inch from its point	4
The portion of the lips which is not red ..	4

	Lines.
Edge of the tongue one inch from its point..	4
Metacarpal bone of the thumb	4
Apex hallicis	5
Skin covering the buccinators	5
Dorsum of the second phalanx of the fingers	5
Palm of the hand	5
Surface of the eyelid..	5
Centre of the hard palate	6
Anterior surface of the zygomatic process ..	7
Dorsum of the first phalanx of the fingers..	7
Outside of the ends of the metacarpal bones	8
Mucous membrane of the lips close to the gum	9
Posterior surface of the zygomatic process..	10
Lower part of the forehead	10
Back part of the heel	10
Occipital skin, lower part	12
Back of the hand	14
Neck, beneath the lower jaw	15
Vertex of the scalp	15
Patella..	16
Skin on the sacrum	18
Acromion	18
Glutæus	18
Superior and posterior surface of the forearm	18
Leg near the knee and near the foot ..	18
Dorsum of the foot near the toes	18
Sternum	20
Dorsal spine over the five superior vertebræ	24
Cervical spine near the occiput	24
Lumbar spine..	24
Centre of the cervical spine	30
Centre of the dorsal spine	30
Middle of the arm where it measures most in circumference	30
Middle of the thigh	30

This enumeration of relative distances, allowance being made for all probable inaccuracies in the experimental estimate of these distances, affords ample matter for reflection, and furnishes abundant proofs, if any were wanting, of the wise adaptation of parts to the functions they are called on to discharge. Here is no unnecessary expenditure of tactile power, but a most rigid economy of the sense of touch, which is nowhere spread over surfaces indiscriminately, and without reference to their other physical qualifications. *This great difference was never before suspected to exist;* it was indeed known that the tops of the fingers, the tip of the tongue, and some other parts, enjoy the sense of touch in a pre-eminent degree, and are capable of judging much more delicately of the objects, than any other portions of the body they are placed in contact with. This was attributed partly to habit, partly to their shape, and many laid great stress on the facility with which these extremely movable parts could be adapted and applied to bodies undergoing examination. Now, for the first time, it has been proved by Weber, that quite independently of all these extraneous circumstances, the skin itself varies in the intensity of its tactile power: and that this arises not from the mere varying thickness of the epidermis, and local delicacy of conformation in the cutaneous tissue, but from an original difference in its organization. All these facts tend strongly to overturn the common hypothesis, that the sense of touch is diffused throughout the whole texture of the skin, and to render it much more probable, that it is performed only by certain organs extremely minute, but differing much in their mode of distribution, being crowded together and numerous in some parts of the skin, while in others they are more sparingly present, and are, as it were, thinly scattered. On this supposition alone can we account for the singular differences in tactile discernment, which the various portions of the skin exhibit. The researches of Breschet, to which the attention of the English public was first drawn, in an able analysis by my friend Dr. Costello, published in the *Dublin Medical Journal* for September, 1835, have rendered it certain, that the sense of touch is performed by a less simple apparatus than was generally imagined. M. Breschet considers that the nerve parts with its neurilemma at the dermis, as the optic nerve does in entering the sclerotic, and that the projecting papillæ take a new envelope from the outer surface of the dermis; that the mere nervous pulp does not, of itself, constitute the organ of touch, but that, as in the sense of hearing or of sight, there is an apparatus, all the parts of which must be in unison to be perfect. If any one of the constituent parts be wanting, touch cannot be exercised, and the dermis, neurilemma, and proper epidermic membrane are to the papillæ what the complicated apparatus of sight and hearing are to the optic and acoustic nerves. The analogy goes farther, for the optic and acoustic nerves, on entering the structures of the eye and ear, undergo the same change as the tactile nerve entering the dermis, with this difference, that the two former remain in their cavities, where light can penetrate to the one, and sound to the other, but the nerve of touch must advance, as it were, to meet impressions.

The following very curious phenomenon is recorded by Weber: "If the points of a compass, distant from each other one or two lines, applied to the cheek, just before the ear, be then moved successively to several parts of the cheek, we shall find, on approaching the angle of the mouth, that the points will appear to recede from each other; this is produced by the great difference of tactile power in these parts. It is a general law, that the more sensitive portions of the skin regard any two points as further asunder from each other, than equi-distant points appear to be to a less sensitive portion. The same experiment may be tried by holding together the extremities of the fore finger and thumb, and then passing the tips of both in a line from the ear to either the upper or the under lip; as they approach the latter, they will feel to the cheek as if they were becoming more and more distant from each other."

Another fact was observed by Weber, "If the legs of the compass be applied to two contiguous surfaces, enjoying the functions of voluntary motion, they will appear to be much more distant from each other, than when they are applied to one of these surfaces separately. Thus, if the points are distant half a line, they are not perceived to be distinct when applied to one lip, but when one point is applied to the under lip, and another to the upper, they are at once felt to be two."

Another very remarkable conclusion announced by Weber deserves consideration: "Apply the legs of a compass to two portions of the skin, differing from each other remarkably, either in structure, in function, or in the use habitually made of them, and the legs will appear to be more clearly and distinctly felt, than when they are applied to one and the same surface, even though it be the more sensitive of the two; thus the legs of the compass when in contact, one with the inner surface, and the other with the red outer surface of the lips, appeared much more distant from each other than where they were in contact with the red surface only, which has much greater tactile powers than the inner surface. The same observation applies equally to other neighbouring surfaces, differing much from each other in tactile power, viz., the margin and the dorsum of the tongue, the volar and the dorsal surfaces of the finger-points, &c."

One result of Weber's experiments, is of great importance in a physiological point of view: "The tactile powers of any part of the skin are not, as is generally imagined, directly proportioned to its sensibility; thus the mammæ are easily tickled, and when irritated, may suffer great pain; in these respects they exceed any portion of the trunk, and yet the skin of or around the nipples is but very indifferently endowed with the faculty of touch, properly so called. Indeed, the same remark applies to the arm pits, the flanks, the soles of the feet &c., and all ticklish parts of the skin in general, as they are possessed of a comparatively slight power of discriminating objects from each other by means of the touch. Who was ever made to laugh by tickling the points of his fingers? and yet they are possessed of a tactile accuracy far exceeding that of any other portion of the skin!"

This is a very curious subject of inquiry, and one not yet fully investigated. The reason of the matter is sufficiently obvious; for parts endowed with the greatest tactile acumen, are necessarily much exposed, being so placed as to be brought with the greatest facility into contact with external bodies; consequently, if so disagreeable a sensation as that arising from tickling were easily induced by this contact, these parts would be almost useless as organs of touch. The experiments of Weber, considered with reference to the researches made by Breschet on the structural anatomy of the skin, render it extremely probable that the sense of touch, properly so called, resides in a peculiarly constructed apparatus, supplied with certain ramifications of the cutaneous nerves; while the function of sensation, comprising the power of perceiving painful or pleasing impressions, is much more generally diffused, and is the result of a much simpler organization. In fact, although the internal, mucous, fibrous, and serous surfaces, and the parenchyma of the different organs, are all capable of becoming acutely painful, particularly when inflamed, yet it is very doubtful whether the sense of touch, properly so called, is ever exercised by those parts. No foreign substance is ever distinctly felt by the touch in the stomach and bowels; a sensation, painful or pleasing, is indeed excited by some matters immediately after they are swallowed, but all consciousness of their presence, by means of the sense of touch, soon ceases, and it cannot be again recalled by the utmost exertion of the will. A foreign substance lodged in the alimentary canal, or in the trachea, may give rise to the greatest possible degree of irritation; but, though it acts upon the nerves of the parts immediately in contact with it, these nerves convey no idea to the sufferer of the shape or size of the body, or of any of its other physical qualities, concerning which we receive information through the medium of the sense of touch.

Weber's observations on the comparative tactile energy of the different portions of the trunk of the body, are extremely curious, and have disclosed a very remarkable difference between the sense of touch in the trunk and in the extremities. In the latter, when the points of the compass are placed across the axis of the limb, (horizontally,) they are much more accurately distinguished than when they are placed in the longitudinal direction, or parallel to the axis of the limb (vertically); in other words, the *limit of confusion* is much sooner attained in the vertical than in the horizontal position of the points. Now in many parts of the trunk, the contrary obtains, and the vertical position gives more accurate results than the horizontal; this singular difference Weber explains by the different manner in which the nerves supplying the extremities and the trunk are distributed. The branches of the former generally run nearly parallel to the axis, while those of the latter pursue in most cases a transverse course; all parts of the trunk do not exhibit this difference. Whether this explanation is or is not to be admitted, the fact is undoubted. Our author next proceeds to show that motion, whether it be of the touching organ, or of the body touched, greatly augments the clearness and accuracy of the perception, a fact too familiar to require any elaborate illustration. As to the *idea of direction,* which we derive from the sensation imparted to the skin by any minute substance, he justly observes, that it is always judged to be perpendicular to the surface of the skin at the point of contact. Of this there can be no doubt, and here we have a very striking analogy between the sense of vision and of touch; for it is a primary law, that rays of light impinging on the retina, always produce a sensation, *i. e.* are seen in a direction perpendicular to that point; it would be well worth while examining, whether the same law of perpendicularity is extended to the ear. In the case of the eye this law is eminently useful, as it enables many rays originally diverging from the same luminous point, all to create a sensation in the same direction, although in converging, they strike the retina from very different directions.

In the eye all these perpendicular lines meet at a common point, thence called the centre of visible direction, and this result, derived from the spherical shape of the retina, is attended with the most important consequences. No one has as yet attempted to investigate the question, whether any similar provision or contrivance exists with regard to the lines of direction, to which each part of the auditory nerve receiving vibrations, refers sound. Any given point of the hearing surface of the acoustic nerve, receives impulses from the vibrations necessary for this sense, conveyed either through the fluid of the vestibule and semicircular canals, or through the solid bone surrounding the cochlea; and the question arises, whether vibrations excited originally by the sounding body, arrive by different routes simultaneously at the same point of the nerve, so as mutually to reinforce and strengthen each other. Is there in this case any provision made to prevent vibrations, which arrive in different directions from interfering with each other, with reference to the sensation they produce? Or are both, as impinging on a common point, referred to one common direction? If this were the case, the analogy between the perceptive properties of the retina and auditory nerve would be perfect, and nothing would remain to the philosophical examiner of the mechanism of the sense of hearing, but to discover what relation these lines of common direction bear to the surface of the auditory nerve, and to each other; are they, as in the case of the retina, perpendicular to the nervous surface, and in what manner are they so arranged, that in consequence of the shape of that surface in the convolutions of the internal ear, each line of direction resulting from the vibrations communicated to any point, may be parallel to the various other lines of direction which result from vibrations, simultaneously communicated to all other points of the nervous surface?

These are extremely difficult questions, but it is by no means improbable that they may hereafter be satisfactorily resolved. But to return to the sense of touch, in some parts of the surface, an exception seems to occur to the general rule of perpendicularity; thus, when a hair of the head is pulled, we can judge perfectly well of the direction in which it is pulled. The most obvious explanation of this fact, which refers the discrimination of the line of traction to the bulb of the hair, Weber proves to be erroneous, and he shows that we judge of the direction in which the hair is pulled by means of the muscles called into exertion to counteract the pull, and keep the head steady during its continuance. If these muscles be not called into play, which is the case when the head is held steadily by the hands of one person, while another, by making firm pressure with the fingers around the point where the hair is pulled, prevents the least motion in the inclosed portion of skin, then no matter in what direction we pull the hair, it cannot be judged of by the person who is the subject of the experiment.

Weber's researches on the faculty the skin possesses of estimating and comparing different pressures made on its surface, ought not to be altogether passed by. One chapter he entitles *"De Subtilitate Tactûs in Cognoscendo Corporum Pondere."* If both the right and the left hand of the same individual are supported on cushions, and that he keeps his eyes shut, while unequal weights are placed one on each hand, he will, if the difference between the weights be considerable, be able to tell on which hand the heavier lies: slight differences of weight cannot be thus estimated, but they at once become perceptible if the hands be raised from the cushions: the muscles that now support the weight give great assistance in estimating its force. Thus we judge of the weight of any heavy body, partly by the pressure it produces against our surface, but chiefly by the quantity of muscular force required in lifting or sustaining it. Weber has ascertained that in most men the left side of the body and the left extremities, enjoy a more accurate perception of weight than the right, so far as weight is estimated by pressure. In eleven out of fourteen persons experimented on, the left side of the body and the left extremities were found to be more sensible of weight, measured by pressure, than the right; in two the contrary was observed, and in one only no difference between the sides could be detected. He offers no satisfactory explanation of this very remarkable and hitherto unobserved phenomenon, which is obviously of some value as marking an original difference between the nervous power of the right extremities and right side of the trunk, as compared with the left; a difference which favours the idea, now indeed generally admitted, that we cannot explain the circumstance of man being right-handed and right-footed, except on the hypothesis of an original difference in the vital powers and development of the right and left halves of the body.

Weber next proceeds to make some observations, *De Subtilitate Tactûs in Sentiendo Calore.*

I long ago maintained the opinion that the perception of heat and cold is not a mere modification of the sense of touch. I am glad to find this view of the subject advocated by so high an authority as Lord Brougham, who, in his *Discourse on Natural Theology*, p. 111, remarks that "there seems as little reason for arranging the sense of heat and cold under touch, as for arranging sight, smell, hearing, and taste under the same head." Experiments made for the purpose of comparing the energy of this sense in different parts of the body, are attended with obvious difficulties: thus if, in two cases, the surface of the substance applied to the body be not exactly of the same extent, the result is not to be relied on, for, *ceteris paribus*, a larger body will give the impression of heat with more intensity than a smaller, and that in a remarkable degree. Thus, let one vessel contain water heated to 98°, and another water at 104°; now if the finger be placed in the latter, and the whole of the other hand be immersed in the former, we shall be led to form a wrong judgment, and will pronounce the water at 98° to be hotter than that at 104°! In some cases the same error was made when the difference of temperature amounted to eight degrees, the hotter being at 106°. If the parts are kept a good while immersed, the person sometimes becomes sensible of his error, and judges rightly.

Weber has discovered the very remarkable fact, that, *in most persons, the left hand is more sensible of heat or cold than the right.* Thus, when the hands of a person lying in bed, and of exactly the same temperature, were plunged each into a separate vessel of hot water, the left hand was believed to be in the hotter medium, even though the water it was in, was really one or two degrees cooler than that in the other. Weber has rendered it highly probable that the greater sensibility which the left hand undoubtedly possesses in perceiving changes of temperature, is owing to the circumstance of its being covered, particularly on its palm, by a thinner epidermis, in consequence of its being less used. Nothing is more striking than the accuracy of the skin in giving notice of changes of temperature; for a difference of one-third of a degree is detected clearly when the hand is immersed repeatedly and successively in two vessels of water, differing only so much in temperature. The skin detects best very minute changes of temperature, when the medium examined does not fall short of, or exceed very considerably, the usual temperature of the body. Water at 98° can be much more certainly distinguished by the hand from water at 100°, than can water at 120° from water at 118°. As the ear perceives best a difference of tone in sounds, neither too high nor too low, or immoderately loud, so the skin judges with most accuracy of medium temperatures, which produce no very violent or painful effect on its nerves. Weber is of opinion that the perception of temperature imparted to each nervous extremity in the skin, goes to unite itself to, and strengthen, simultaneous impressions in the other ramifications of the same nerve, thus producing, by the conflux of a great number of impressions, a much stronger result and effect. This, at least, is certain, that a large surface conveys much stronger impressions than a small one, and estimates changes of temperature with greater delicacy, Thus, if we place the fore-finger of one hand in water at 104°, and plunge the whole of the other hand into water at 102°, the latter will appear to us to be the warmer. If we plunge the finger successively into vessels containing hot water, we are unable to perceive very minute differences of temperature, which at once become perceptible when we use the whole hand. Nay, water, which can easily be borne by a single finger, will appear intolerably scalding to the whole hand! With regard to the power the skin possesses (by means of touch and its modifications) of comparing together two different temperatures or weights, various and multiplied experiments prove, that this power is exercised with the greatest success, when the perceptions compared are not simultaneous but successive. It is the same with the smell, taste, and hearing; apply to the tongue by means of camel's hair pencils, small portions of an acid and of a sweet substance; if the application of both be in quick succession, their taste is accurately distinguished and appreciated; but if they be applied simultaneously, the result is a less vivid perception of either, and a blending as it were together of the acid and the sweet. A similar result is obtained by applying the mouths of phials containing two different but strongly odoriferous substances, to the nostrils; and musicians have long ago remarked, that when we wish to compare together two notes, it is done with much more accuracy by striking them in quick succession, than by striking them simultaneously. Vision appears to present an exception to the law which governs the other senses; for if we want to compare the lengths or the colours of any two lines, we place them close together, and look at them at the same moment. As Weber well remarks, however, the exception is here only apparent; for the truth is, *that we see nothing with perfect accuracy unless its image falls on the retina at the extremity of the optic axis;* consequently, in examining two lines close beside each other, although we think we examine them simultaneously, yet we do not do so; our examination and comparison is made by causing the image of each to occupy the extremity of the optic axis several times in very rapid succession. The change in the position of the eye is here so slight, and is performed with such ease, that we are unconscious of it.

Weber made many experiments on the accuracy of the sense of weight: of course this sense is more developed in some individuals than in others, and is capable of being rendered more exact by practice. Men accustomed to estimate weights by poising them in their hands, will distinguish perfectly between those which differ only by a thirtieth part. In comparing two weights, we poise them in rapid succession *in the same hand*. The intervention of a few seconds between the poising of the first and of the second weight, does not prevent their accurate comparison. The interval may amount to twenty seconds, and yet a just estimate will still be made; but when it amounts to forty, all accuracy is lost. The sight enjoys a still more accurate power of discrimination than the sense of weight, for a well practised eye will distinguish between two lines, one hundred, and one hundred and one *lines* long respectively; in other words, will discover a difference amounting to one-hundreth part of the whole. According to the experiments of Delezennius, quoted by Weber, the sense of hearing is still more accurate, for a well practised musical ear will distinguish between two sounds differing from each other only $\frac{1}{320}$, calculating the number of vibrations the sounding bodies make in a given time.

A line can be perceived to be longer than another, even when an interval of fifty or sixty seconds elapses between the time of looking at each of them in succession, provided that the lines differ $\frac{1}{11}$th in length. If they differ only $\frac{1}{21}$, then an interval of thirty-five seconds may elapse without destroying our judgment, but if the interval be longer, its accuracy becomes injured. When the difference between the lines amounts only to $\frac{1}{50}$, an interval of three seconds between the examination of each, is the longest that can be allowed without interfering with the correctness of the comparison.

Having followed Weber through his valuable Treatise on the Sense of Touch, it may be worth while to dwell on some of his conclusions. We have a well established and definite idea of the distance of some parts of our bodies from others. Thus we feel the distance of the finger points from the wrist, and we remember that distance. It is the same with the arm as far as the elbow, and with the foot. These are all lengths which are firmly imprinted on the mind, and consequently there is a physiological reason for using them, as mankind have always done, as standards of measurement. When any two points on the surface of these parts are touched at the same time, we can with our eyes shut, and by means of the sense of touch alone, estimate with great accuracy the distance the touched points are from each other, provided the points are situated somewhere near the sides or extremities of these parts, as at the tips or on the sides of the fingers. Here two points will be perceived to be distinct at distances much less than half an inch; but if the points be situated elsewhere, as on the back of the hand, then, although they be distant from each other half an inch, they will scarcely be felt as distinct, provided the line joining them is parallel to the long axis of the part: when it is transverse, the perception is much clearer, and continues at much smaller distances.

The discovery, that two equi-distant points of contact on the same surface excite very different ideas of the distance between them, according as the space lies lengthways on, or across the limb, is one of the most striking and important which Weber has made, and can be most readily verified by experiment.

Nor am I aware that modern physiologists have obtained any results more curious than those relating to the different tactile acuteness enjoyed by various parts of the skin; a difference so great, that the points of a compass applied to the tip of the tongue can be felt to be distinct when distant only half a line from each other; whereas, to use Weber's own words, "In medio brachio, in medio femore, in dorso scapulæ, aliisque in locis sensus ille naturâ tam parum acutus est, ut apices circini $1\frac{1}{2}$ pollicibus Paris, a se invicem distantes, unam impressionem proferant, si nimirum ita ad has partes admoventur, ut linea utrumque apicem inter se conjungens, secundum longitudinem brachii vel femoris posita sit."

ON THE USE OF THE COCHLEA IN THE ORGAN OF HEARING.

Weber has discussed this interesting question at some length, and I have thought it useful to give a literal translation of all his remarks, inasmuch as this subject has not been treated in a satisfactory manner by any English author whose works I have read. Dr. Arnott, for instance, makes no attempt at an explanation of the difference between the functions of the semicircular canals, and of the cochlea; his only remark is that "the separate uses of these parts are not yet perfectly known." Professor Quain, in his admirable *Elements of Anatomy*, a work abounding in deep physiological research, does not even allude to any difference of function between the several portions of the labyrinth. Such being the case, Weber's opinion on this important subject will, no doubt, prove most acceptable to English physiologists:—

"And first it is evident that the propagation of sound to the internal ear, takes place not merely through the *meatus auditorius externus*, but also through the *bones of the cranium*; by the former we receive notice of sounds from without, by the latter, we more readily hear our own voice. The vibrations produced by our own voice are indeed also heard by the route of the external ear, but they are conveyed with greater distinctness through the medium of the bones of the skull.

Thus, if you stop both ears firmly with the fingers, so far is your voice from being rendered inaudible, that you hear it more distinctly and louder than before. If now we remove the finger from one ear, immediately we find that the sound of our voice appears stronger in the other. *I shall now endeavour to prove that sounds propagated by and conveyed through the bones of the head, are heard chiefly by means of the cochlea, whereas sounds coming from without, by way of the meatus auditorius externus, are not so readily received by the cochlea, as by the route of the vestibule and the semicircular canals.* In truth it is at once evident, that with respect to sound depending, as it always must, on vibrations communicated to the percipient nerve, it cannot be a matter of indifference in what manner that nerve is arranged for the reception of these vibrations: it cannot be a matter of indifference whether it receives them from a solid or from a fluid. I shall, however, demonstrate, that in almost all animals, these vibrations are communicated to the extremities of the acoustic nerve by the two-fold means of a vibrating solid and a vibrating fluid, *and that in man the cochlea constitutes the part of the organ of hearing which is destined to place the nervous extremities in communication with a vibrating solid, whereas the semicircular canals place them in contact with a vibrating fluid.* The utility of this provision is not perhaps intelligible in the present state of our knowledge, but we have reason to conclude such a provision to be necessary, finding it so generally adopted in so great a number of animals. It is ascertained that sounds propagated through an uniform medium, whether fluid or solid, lose but little of their force, whereas they lose much in passing from a solid to a fluid, or *vice versâ*. Experience shows that in the shafts of mines, the stroke of a hammer in a neighbouring shaft is very audible when that stroke is made on the solid rock, and it is still more distinctly heard when the ear is placed in contact with the rock, whereas the voices of the miners in that neighbouring shaft are never heard. Sounds, too, are transmitted through water with the greatest celerity and distinctness, and may be heard at great distances when the head is under water, but they become inaudible the moment the head emerges above its surface. What an obstacle to the propagation of sound even a thin stratum of a different medium presents, is rendered evident by the diminished loudness of the noises in the street, when by drawing up the window we intersect the path of the aerial propagation of sound by means of thin panes of glass."

"Experience, too, proves that solid bodies communicate their vibrations to fluids, with a facility proportioned to their extent of surface, and that solids receive vibrations from aeriform media more easily when the solid is shaped in the form of a membrane. A tense cord does not easily communicate its vibrations to the air unless it be fixed to some flat body, which being of a like nature solid, receives the vibrations of the string without difficulty or loss, and propagates them to the air through the medium of its own extensive surface. It is an observation of these phenomena which has led to the adoption of sounding boards in those musical instruments, in which the vibrations causing sound proceed from strings, as in the case of the violin, the piano, and the harp, whereas sounding boards are not required in the various kinds of wind instruments. The reason of this difference is sufficiently obvious, in the one case a solid with an extensive surface must be brought into connection with the vibrating string, in order to diffuse its vibrations more energetically through the air, whereas in wind instruments, the vibrations being derived from the air itself, no such provision is necessary."

These laws by which sound proceeds with such facility through the same medium, and is weakened by passing into a different one, and the laws which regulate its transmission through air, solids, and fluids, all tend to confirm the conclusion, that the vibrations conveyed through the bones of the head, are heard chiefly by means of the cochlea. For if the sonorous vibrations pass, as we have proved they do, from the air in the mouth to the internal ear, through the medium of the bones of the cranium, they will act no doubt on that portion of the internal organ of hearing which is nearest, and which possesses such an arrangement of the extremities of the auditory nerve as places them in contact with the bone, itself a portion of the osseous communication between the mouth and the internal ear. That portion is the cochlea, for the cochlea and the nervous expansion which adheres to its walls are intimately connected by means of its osseous parietes with the other bones of the cranium. These vibrations proceeding from the air within the mouth, cannot be transmitted with similar ease to the auditory nerve where it is distributed throughout the vestibule and the semi-circular canals, for here nature has separated designedly the nervous expansion from the bony parietes.

Weber is very strong and distinct on this important anatomical distinction between the relation that the nervous expansion of the auditory nerve bears to the bone in the cochlea, as compared with that which obtains in the semi-circular canals. The cochlea exhibits its bony parietes and septa in a state of intimate adhesion with the auditory nerve, whereas in the semi-circular canals nature has studiously separated the bony parietes from the contained tubular and sacculated expansion of the auditory nerve, either by means of a liquid secretion, or of a loose cellular membrane.

This manifest anatomical difference is well described by Scarpa, and is tersely but clearly given by Quain, who, speaking of the cochlea says, "that the nerve proceeds by many minute pores to the scalæ, upon the entire surface of which it forms a delicate expansion, *supported by the osseous and the membraneous part of the septum.*"

All concur in stating that nothing like this direct contact and intimate adhesion between the osseous parietes and the enveloped nervous expansion, exists in the vestibule and the semi-circular canals.

"The preceding observations," concludes Weber, "render it sufficiently apparent, that the membranaceous vestibule and membranaceous semi-circular canals, differ in structure from the osseous vestibule and the osseous semi-circular canals, in such a manner, that vibrations travel through the bones of the cranium with more facility to the cochlea and round sac, than they do to the membranaceous portions of the internal ear.

"The next question is, whether the sonorous vibrations that are derived from the external air, and proceed through the meatus externus to the ear, are propagated with greater facility and strength to the nerve of the vestibule than to the nerve of the cochlea. In the first place, it is evident that the vestibule and the semi-circular canals directly connected with it, must receive a stronger impulse from the aerial vibrations than the cochlea, for the former have a solid communication by means of the chain of ossicula with the membrana tympani, whose vibrations are consequently imparted at once to the membrane of the fenestra ovalis, whereas no such direct communication exists between the membrana tympani and the fenestra rotunda. The membranes of the semi-circular canals and the vestibule too, seem to be more easily set in motion by the fluid which invests and surrounds them, than is the case with the lamina spiralis of the cochlea. The latter is, nevertheless, furnished with provisions calculated to enable it to receive impulses from the external air also; for the fenestra rotunda, being closed by a membrane, must impart the vibrations that occur in the cavity of the tympanum, while another opening, by forming a communication with the vestibule itself, must place the cochlea in connexion with the latter, in such a manner that the vibrations which the chain of ossicula have imparted to the fluid of the vestibule, must through that fluid be at once propagated to the cochlea.

"I have next to prove the assertion which I made at the commencement, viz., that nature has so constructed the ear in man, and various other animals, as to make a provision for the reception of the sonorous vibrations in a two-fold manner, by means of the acoustic nerve, which is so disposed in the internal ear as to present, for receiving these vibrations, a double surface of contact; the one consisting of a soft, pultaceous, nervous expansion, surrounded by a fluid, the other formed of a reticulated net-work of extremely minute, but firm, nervous ramifications. The former receive the sonorous vibrations through the medium of a fluid, the latter of a solid. In man the cochlea is the portion of the organ where the firmer extremities of the acoustic nerve are disposed for this purpose. Fishes and amphibious animals have no cochlea, but they have an arrangement which answers the same purpose; for in osseous fishes, we find that the membranaceous labyrinth contains three white little stony bodies, of great specific gravity, very hard, and much resembling vitrified argillaceous clay; two of these are enclosed within a sac full of fluid, adjoining the vestibule, and lodged in the basilar portion of the occipital bone. These lapilli are furnished with fine nervous filaments, fastened to rough depressions and elevations on their surface; thus vibrations are imparted from the lapilli to the acoustic nerves; the third lapillus is situated in the anterior portion of the membranaceous vestibule, and receives no nervous filaments. It has, however, another mode of communicating with the acoustic nerve, for it lies against a very large branch of that nerve, where it expands on the membrane of the vestibule, and thus compresses this nerve between itself and the cranium. In cartilaginous fishes and in amphibious animals, in the place of these lapilli, we find certain little bodies consisting either of concrete gelatine or of a chalky pultaceous matter, and to which both Scarpa and myself have traced ramifications of the acoustic nerve. Neither is the *lamina spiralis* of the cochlea in man formed, without reason, of two structures, an osseous, and a cartilagino-coriaceous tissue; for as the same nervous branches pass from the osseous to the cartilaginous portion of the *lamina spiralis*, it is natural to conclude that, receiving sonorous impulses from both, these impulses are communicated by means of a different mechanism in the two cases. This idea is confirmed by an examination of the calcareous fragments found in the labyrinth of Rays, composed of two portions; one pellucid, and resembling a tremulous jelly, the other white and chalky, and which seem to discharge the same function in these animals, that the cochlea does in man. These fragments are so divided, that their gelatinous and chalky portions lie in contact by means of extensive smooth surfaces. Nature has so disposed the extremities of the auditory nerves in the semi-circular canals of all animals, that these extremities receive the sonorous impulses directly from a fluid. This is very plain, even in man, in whom the dilatations termed ampullæ, and which correspond with a similar enlargement of the nerve, are both filled with and surrounded by a fluid. In fishes it is still more evident, for in Rays a nervous filament can be traced to each ampulla, which it enters and within which it forms a crescent-like septum.

"Scarpa was the first to discover the remarkable difference in consistence and texture which exists between that portion of the auditory nerve which supplies the cochlea, and that which is distributed to the vestibule and semi-circular canals. The latter surrounded on all sides by a fluid, are soft and pulpy, evidently fitted to receive impulses from a fluid; the former, on the contrary, firm and ramified, are adapted to the reception of vibrations from a solid."

Weber next proceeds to detail the circumstances connected with the proper discharge of the function of hearing, and which render this double provision necessary. On this subject I shall not copy his observations, for if the fact of this double provision be conceded, its utility can be inferred *à priori*, and proved by experiments. The following experiment, related by Weber, is striking. If we take a musical sounding fork while vibrating, and place the handle between the teeth, keeping the lips closed on it, while both ears are stopped with the fingers; we hear its tones more loudly even than when the ears were open: if we open now one ear, immediately the sound heard by that ear appears to be diminished. The same thing happens when the instrument is applied to the left temple, the right ear being closed with the finger; we now hear the tones more distinctly with the right ear than with the left, although the former is at so much greater a distance from the instrument; now, here, the sonorous vibrations must be propagated through the bones of the head.

Weber is at a loss how to explain the remarkable fact that closing the ear makes the sound received from a vibrating body, through the bones of the cranium, appear louder than before. This fact, he observes, appears paradoxical, for we cannot understand why one source of sound should seem to produce a greater effect, the moment another co-operating source of sound which arrives by the route of the *meatus externus*, is cut off by thus stopping that opening with the finger. There is in truth a great difficulty here; various explanations suggest themselves: the apparent increase of loudness in the sound heard through the bones of the head, may arise from the cessation of all other sounds that usually arrive by the *meatus externus*, and which in the natural state of the organ serve to dilute and drown the sounds derived through the other channel, in the same way that light admitted into a room from several different windows seems to diminish the intensity of that which enters from any one window. This appears to me a more tenable explanation than either of those suggested by Weber, who thinks that the closure of the ear may act mechanically on the internal organ, so as to dispose it to propagate sounds through the bones with more readiness. How this could be effected I cannot even guess, nor do I place much reliance on his hypothesis, that the sound coming through the external meatus produces vibrations in the internal ear, which to a certain extent obliterate those that arrive through the bones.

Weber mentions a curious fact with regard to sounds. Shut one ear, and then whistle the note *d* marked with four lines $\overline{\overline{\overline{\overline{d}}}}$, or any still lower note, and you will hear it more distinctly with the closed than with the open ear; whereas if the note be higher, we hear it more distinctly with the open ear!

Many facts prove the facility with which sounds are conveyed through the solid textures of the body to the internal ear. It is by this channel that we hear the slightest touch applied to the hair, the slightest scratching of any portion of the integuments of the head, or face. Close the lips and bring the teeth into contact ever so gently, and it is scarcely possible to avoid producing a sound which is heard distinctly. This experiment is still more striking when the external ears are closed. Experiments and observations are still wanting, to ascertain how far the same channel may not be the means of conveying vibrations imparted to even distant portions of the skeleton; from some experiments I have made, it seems extremely probable, that when we stand erect upon, or place a hand on a solid, its vibrations may be conveyed in each case to the internal ear. The different joints which intervene do not present any interruption of the continuous solidity necessary for this conveyance, inasmuch as the articulating surfaces are always in close contact. Our solids, therefore, may be regarded as so many natural stethoscopes interposed between the cochlea, and the media in contact with all parts of our bodies. It may be well to bring this subject to a close by giving Weber's concluding sentence:—

"Si igitur ex his, quae nunc diductius exposita sunt, verisimile est, vocem propriam hominis et mammalium ab ossibus cranii excipi, ad cochleam potissimum propagari, et hac de causâ facilius ab aliis sonis extra corpus excitatis et ad meatum auditorium propagatis discerni; utilitas, ex hac auris fabrica ad nos, maxime vero ad infantes et bestias redundans, non parvi aestimanda est. Multum enim haud dubie hac re proficimus, quod jam in primâ infantiâ diverso modo id, quod a nobis efficitur, ab effectibus causarum extra nos positarum, discernere discimus."

ON LATENT LIFE, AND ON VITAL CRYSTALLISATION.

CONSIDERATIONS SUGGESTED BY SOME PASSAGES IN THE WRITINGS OF CARUS AND OF TREVIRANUS.

Carus, so well known by his works on anatomy and physiology, has made some observations on latent life,* that appear deserving of attention, and have suggested to me the following reflections.

An accurate observation of physical phenomena has led to the universal adoption of the hypothesis, that the most active principles which operate on the material world, may exist in a dormant state, denominated latent. Thus we speak, for instance, of latent heat; Carus is of opinion that life may be placed in a similar condition, and certainly in the seeds of plants it continues in a quiescent state that almost justifies the analogy. Here the germ is already impregnated, and the matter forming the seed contains, incased within its envelopes, a something which exhibits however no evidence of its existence, until that matter is exposed to the effects produced by certain physical agents, heat, moisture, air, &c.; then, indeed, the quiescent principle immediately asserts its empire, and every subsequent change, which the

* Müller's Archiv, Heft. vi. 1834.

matter forming the seed is henceforward destined to undergo, is evidently dependent on vital influence. That the power of germination may be retained for a great length of time, is proved by numerous facts, many of which are mentioned by Decandolle, in his *Physiologie Végétale*. Thus it is more than sixty years since a bag of seeds of the sensitive plant, was brought to the Jardin des Plantes, and it is found that they still grow when sown. Pliny mentions that wheat 100 years old has germinated; and Horne had an opportunity of trying the experiment with wheat 140 years old, which grew very well. Gerardin took the seeds of French beans, preserved in their pods in Tournefort's *Hortus Siccus*, and consequently 100 years old at least, and found that their power of germination was unimpaired. These facts are sufficient to warrant the conclusion, that the period during which the seeds of plants are capable of preserving the power of germination, might be indefinitely prolonged, provided that the physical influences to which they are exposed be favourable, and we are consequently led to reflect on a singular and marked difference between latent and manifest life; the former may exist, I had almost said for ever; the latter, once commenced, has its appointed end and termination. Thus the curious fact has been observed of a bulbous root taken from the hand of an Egyptian mummy, having germinated when placed in the soil; how happened it that this bulb remained for several thousand years in contact with the fingers of death, without its own vital principle being either extinguished or called into active operation? What power at once preserved that principle, and held it in abeyance? And yet so it was, and age after age passed away without summoning into action that wondrous spell, which could thus convert this long-enduring tenant of the tomb, into the *lily of the field*, the scriptural emblem of beauty, and the honoured type of the glories of vegetable life, beside the purity and brightness of whose hues, even the raiment of Solomon appeared dull and faded.

If the latent principle may thus co-exist, combined with matter during so many centuries, there can be no reason why this association of that which *is*, and that which *is to be*, should not continue for ever, provided the physical medium in which the organized mass happened to be placed, was calculated like the cool, dry, dark air of the Egyptian Sarcophagus, to preserve its mysterious inhabitant unawakened, uninjured! In this point of view we may almost award to life the attribute of eternity. How wonderful the arrangement of matter which can thus hold, incarcerated in its organized recesses, a principle that waits but the genial influence of heat and moisture to burst its prison. How fleeting the existence of life once actually commenced, compared with the durability of life thus dormant, but ever ready to begin its mortal race? But here the question arises, can the ova of animals be preserved like the seeds of plants; can their latent vitality resist the lapse of ages; can they, too, lay claim to so wonderful a power? There is reason to believe this not to be impossible, even with regard to the ova of vertebrated animals, for it is recorded that under peculiar circumstances hen-eggs have been kept for weeks, months, or even years, before being hatched. Nature has, indeed, intended that in the ova of most animals, the epoch of impregnation should precede but by a brief period that of incubation, whether performed within, or out of the body of the parent; and consequently the apparatus of protection, the matter containing and associated with the latent principle of life, is not calculated to endure, like that of seeds, unchanged. On the contrary the physical influences to which its material arrangement is usually exposed, are of a nature fitted either at once to destroy, or at once to force it into manifest life; but were it otherwise, it is more than probable that the latent vitality of the animal germ, would not be found inferior in longevity to that of plants.

The most remarkable instances of life preserved in a latent state, are exhibited by certain infusory animalcules, as the *Macrobiotus hufelandi*, which Schultze preserved for many years dried so as to appear as a particle of dust, and surrounded with some dry sand; this desiccated little being, to all appearance so long inanimate, immediately revived when placed in a drop of water. Leeuwenhoek's experiments on the revival of dried *wheel animals* are equally curious; but it is needless to multiply examples of latent life in infusory animals, when obvious instances may be found in other classes. Thus what more remarkable instance of long suspended animation, or of latent life, is there than that recorded by the celebrated Dr. MacBride of Dublin, who having one day opened a chest in his museum, for the purpose of *washing with warm water*, some snail shells it contained, was called away for a time, and on his return found the snails creeping about on the sides of the vessel; these shells, with their dried inhabitants, had certainly been in the collection nearly forty years! Many stories, some probably unfounded, have been from time to time related, concerning toads imbedded in wood, or in rocks. Dr. Edwards relates several experiments performed in France, in which these animals were imprisoned in plaster of Paris, and were, after many years, still alive when the plaster was broken. At the last meeting of the British Association, Mr. Sturge of Birmingham, read a highly interesting paper on the recent discovery of a toad, in sandstone rock, in Park Gardens, Coventry. The sandstone was tolerably porous, but quite free from damp from which the animal could derive nutriment, or any fissure by which it could draw air for respiration. In fact it must, as was remarked, have been hermetically sealed up in a state of torpor, *or of latent vitality*. How long the animal had been so situated it is impossible to determine, but certainly it had been there for ages, and there can be little doubt that its latent vitality might have continued for ages longer. Humboldt relates that in some of the immense tracts of country exposed to the annual inundations of the great American rivers, the swamps and marshes are teeming with life for a long time after the waters of the river have retired. As the dry season continues, however, many animals desert the more arid plains, while others, among the rest various species of reptiles, remain in the desiccated and hardened mud, awaiting in a state of torpor another overflowing of the river; when this takes place, they revive, and the moistened mud seems to give birth to animals. It is probable that the observation of facts similar to this in the neighbourhood of the Nile, or of some Asiatic river, originated the generally received opinion of the ancients, that slime and mud are capable of giving birth to broods of noxious reptiles, by an act of equivocal generation. The question of equivocal generation presents, as is well known, many difficulties incapable of being solved, without a knowledge of the important part performed by latent vitality; for without admitting that the ova of vast numbers of infusory animalcules, and the germs of many of the cryptogamic class of vegetables, are capable of preserving their vitality for an indefinite period when dried, we could not explain the almost universal appearance of these organized beings, in every situation favourable to their development, at the moment that animal or vegetable matter, mixed with water, undergoes a certain degree of decomposition. To conclude, the hybernation of certain of the mammalia, and the apparently lifeless state of torpor produced by cold, or by incomplete asphyxia; and, in fine, the almost suspended animation observed in the trances of hysterical females, are all, more or less, connected with the subject of latent vitality.

I have dwelt upon the most obvious and interesting considerations connected with the subject of latent vitality, without following Carus in his ingenious, but speculative and fanciful notions concerning the latent vitality of certain diseases, and the more extensive signification he attaches to the idea of life; a term he would apply to many of those powers which act on matter, and give rise to various modifications of its form and properties, such as crystallisation, chemical attraction, &c. Without at all assenting to the analogy which Carus seeks to establish between the causes of living motions, and those producing crystallisation, I may remark that a wide and interesting field of inquiry has been lately opened, in the discovery that the internal skeletons of many of the *poriphera* consist of numerous spiculæ, in some species siliceous, in others calcareous. Now Professor Grant has shewn in his *Outlines of Comparative Anatomy*, that these spiculæ have in each animal a distinct form serving to characterise them. He asserts that the form of these crystals, whether they consist of silex or of carbonate of lime, is always constant in the same species, and he gives delineations of ten different forms of siliceous spiculæ, each belonging to a separate species. Some of these spiculæ have all the appearance of ordinary crystals, and their formation can be readily referred to the operation of the causes which preside over the arrangement, and juxta-position of the particles of matter in siliceous crystals that occur in rocks, and in unorganised matter. But there are other forms of curved siliceous spiculæ represented by Professor Grant, and to which no analogues, I believe, exist among siliceous crystals, whose formation has resulted from the common laws of crystallisation unconnected with vitality. This is in truth a very curious and very interesting subject, for if it should appear that living bodies contain a group of siliceous or calcareous crystals, arranged in forms not occurring in crystals formed beyond the influence of vitality; if this be the case, I say, shall we not be justified in concluding, that whatever be the nature of the forces which preside over crystallisation, these forces may be generated as *functions of living bodies*, and that they may, when produced by the living organs, undergo modifications, such as do not occur in unorganised matter. In fact we may almost anticipate the division of crystals into two groups, one formed by and obeying the laws that preside over inanimate matter, the other resulting from influences originating in, and generated by the living principle, and in which, perhaps, there may be found crystals oftentimes similar to those of the former class, sometimes different. Here is a new point of contact between the kingdoms of animated and dead matter, a new set of facts indicating an analogy between the forces which preside over each. Whether electricity in its multiplied modes of action, be not the chief agent, is a subject of curious, but hitherto, unproductive investigation. This matter of vital crystallisation becomes of importance, not merely on account of its abstract philosophical interest, but on account of the richness and variety of the products eliminated in the animal laboratory. In human bones and teeth we have the phosphate of lime, as Breschet has shewn, not merely amorphous, but crystallised. As yet, however, no investigations have been made to ascertain whether the crystallised principles that enter into the structures of the higher animals, assume forms peculiar to themselves. I may take this opportuntiy of remarking, that Mr. Coldstream, in in his excellent article on the Acalephæ, published in the *Cyclopædia of Anatomy and Physiology*, although he refers to Professor Ehrenberg's recent discoveries relative to the supposed eyes of the *Medusa aurita*, has omitted mentioning the actual discovery by that naturalist, of crystals composed of the carbonate of lime, and which lie enclosed in a little vesicle or bag connected with each organ of vision. However problematical the hypothesis of Ehrenberg may be in considering the minute red points as eyes, there can be no doubt as to the existence of calcareous crystals, which, according to him, possess a great variety of forms, some tabular, some pyramidal, and some with other figures. The formation of crystals under the influence of vegetable life, presents another fertile field of investigation.

The best account of the researches hitherto made on this subject, is found in Treviranus, *Physiologie der Gewächse*, published in 1835, and Raspail, *Nouveau Système de Chimie Organique*, 1833. Crystals occur very abundantly in the substance of many living vegetables, sometimes in the form of spiculæ within the cells, and adhering to their parietes, and sometimes in the intercellular spaces ; in the latter situation they are deposited only on plants belonging to the tribe of *Orchidæ*, such as *Cypripedium insigne*, and *Neottia discolor*. The crystals consist usually of phosphate of lime, as in the genera *Narcissus, Hyacinthus, Orchis, Ornithogalum, Phyto-*

lacea, &c., or of sulphate of lime, as in many of the *Leguminosæ*. Oxalate of lime crystals occur in the bulbs of the *Iris florentina*, in the leaves of rhubarb, and in the *Cactus peruvianus*. In some plants these crystals are so abundant in the tissue of the leaves, that they must there discharge an important office, analogous to that performed by the siliceous spiculæ of sponges. Raspail remarks that we cannot obtain oxalate of lime in crystals by the processes usually employed in our laboratories, while the same substance is frequently found crystallized in plants, whose living tissues seem thus capable of exerting an influence we cannot imitate, and which he is inclined to attribute to an electric agency, a view supported by the experiments of Becquerel, who succeeded in producing, by the application of electro-dynamic forces, the crystallisation of substances which could not be procured in the crystalline form by any other method.

To conclude, this subject appears to deserve more attention than has hitherto been bestowed on it, particularly with reference to the forms which siliceous and saline substances assume in the tissues of plants and animals, as compared with the forms of the same substances when they occur as unorganised matter. If, for instance, a substance capable of assuming so many distinct secondary forms of crystallisation, as carbonate of lime, always occurs in a certain animal tissue in the same form, we must then attribute to that tissue powers capable of modifying the crystallisation of that substance, and must acknowledge a new link connecting the phenomena of life, with some of the more subtile agencies that influence matter.

NOTE.—Recent researches on the latent life of seeds, make it probable that, in these climates at least, its permanence is not so great as might be inferred from the observations in the text. See the final report on this subject, in the Transactions of the British Association for the Advancement of Science, 1857, by Professors Daubeney, Henslow, and Lindley. In no case was the power of germination found to exist beyond a period of between forty and fifty years. How far the hygrometric state of our atmosphere may have produced this result, is worthy of inquiry.—ED.

ON DOUBLE AND SINGLE VISION.

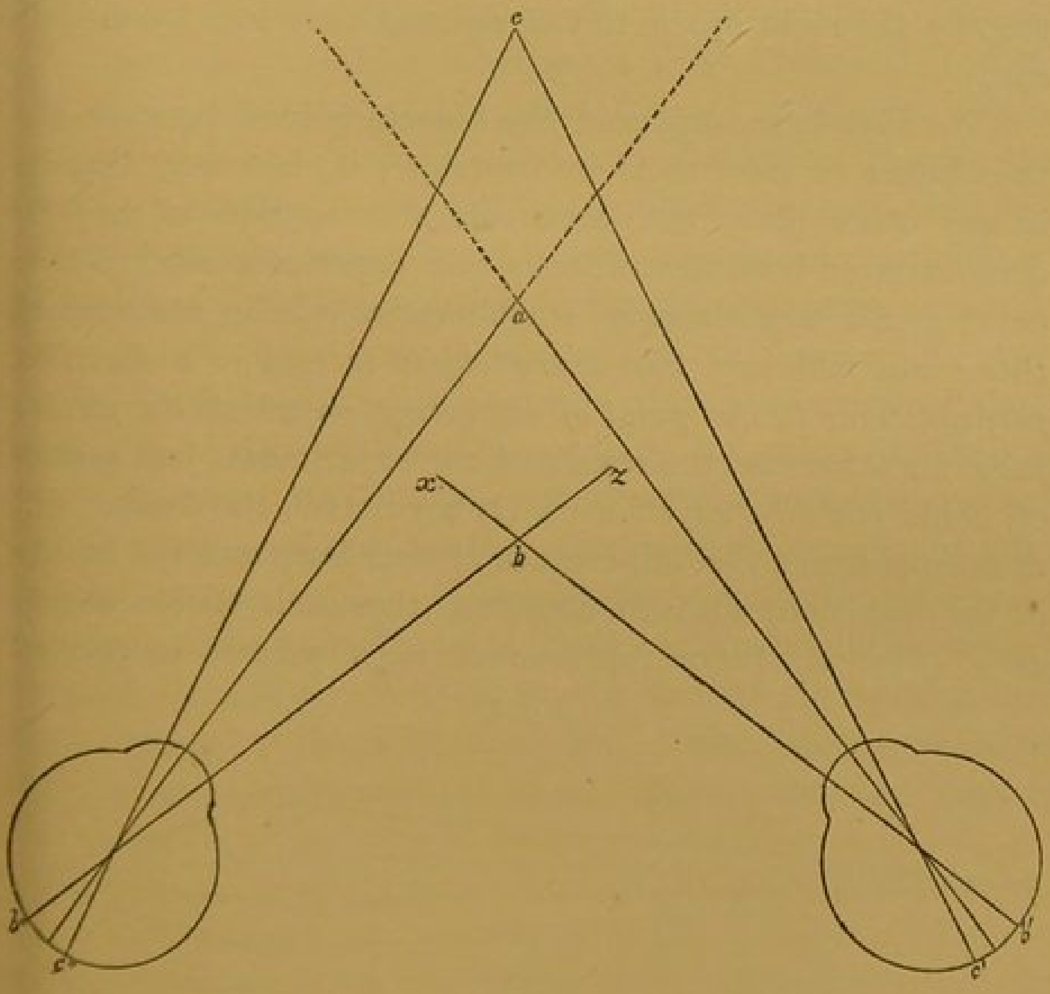
Buffon, Doctor Gall, and many other authors, have noticed the common observation, that under certain circumstances an object appears double when viewed with both eyes; these circumstances are detailed with precision by Dr. Arnott, in the following passage of his work on the *Elements of Physics**:—

"When the two eyes are directed to any object, their axes meet at it, and the centres of the two retinas are opposite to it, and all the other points of the eyes have perfect mutual correspondence as regards that object, giving the sensation of single vision; but the images formed at the same time, of an object nearer to or further from the eye than the first supposed, cannot fall on corresponding points, for an object nearer than where the axes meet, would have its images on the outsides of the eyes, and an object more distant would have its images on the insides of the eyes, and in either case the vision would be double. Thus if a person hold the two forefingers in a line from his eyes, so that one may be more distant than the other, by then looking at the nearest, the more distant will appear double, and by looking at the more distant the nearer will appear double."

* Vol. ii. p. 217.

In making this experiment it is singular that no one has noticed the very remarkable difference which exists between the relative position of the images in the two cases here spoken of. Thus, when the object is nearer than where the axes meet, the image on the left hand is that seen by the right eye, and that on the right hand belongs to the left eye; whereas, when the object is more distant than where the axes meet, the left hand image is seen by the left eye, and the right hand image by the right. The annexed diagram will enable the student to understand this experiment and its explanation.

Fig. 1.

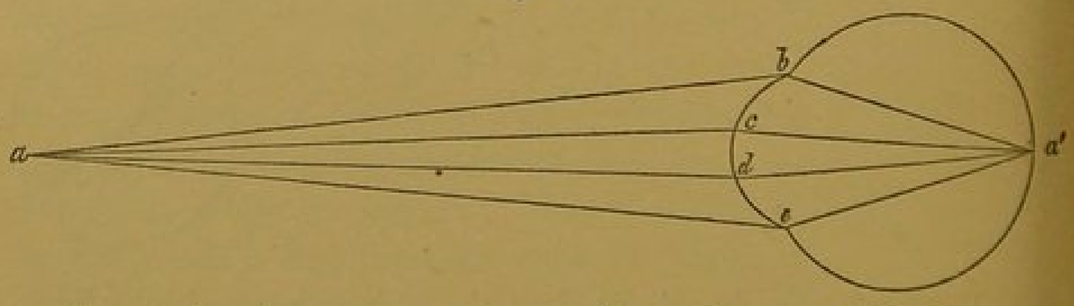


Let both eyes be directed to the object *a*, at which therefore their axes may be supposed to meet (if produced), then a nearer object, *b*, also visible to both eyes, will have its picture on the retina of each at some point to the other side of the axis from itself; but as b is inside each axis, its picture will consequently be outside each, say at b', b''. Now, as every object is seen in a direction perpendicular to the point of the retina on which its picture falls, the object b will be seen in the direction $b'\ x$ for the right eye, and $b''\ z$ for the left, and consequently as these directions cross each other, the image seen by the right eye is to the left of that seen by the left eye.

If the object c be beyond the point to which both eyes are directed, then it is plain that being outside both axes, its images will be inside them, as at $c'\ c''$, and they will appear in directions $c'\ c$ and $c''\ c$; therefore in this case the image seen by the right eye is to the right of that seen by the left eye.

We have here supposed the objects placed between the axes before or after their intersection; if, however, they be in any other place the same rule still applies, as may be demonstrated both theoretically and experimentally. These experiments are strongly corroborative of the accuracy of those who maintain *that every object is seen in a direction perpendicular to the point of the retina on which its picture falls*, for otherwise the results of the experiments just spoken of, could not be always accurately predicted; the student will at once perceive the importance of this law, and the beauty of its operation, when he considers that each visible object, as a (*Fig.* 2), (here represented as a point), is painted

Fig. 2.



on the retina by means of a number of rays which the refracting powers of the eye cause to converge to form its picture a'. Now, if every ray, $b\ a'$, $c\ a'$, $d\ a'$, $e\ a'$, converging to a', were to produce a sensation in its own direction, the object would be seen in as many different directions as there are converging rays, (for each of these arrives at the retina in a different direction,) and thus not only would the true direction of the object be mistaken, but each of its images would be very indistinct, being produced by only a single ray.

In consequence of the law of visible direction, however, these inconveniences are obviated, and all the converging rays are made to unite in producing the desired effect. It may be remarked, that the sense of touch present us with something analogous, for no matter what has been the direction of a moving point, when it arrives at the skin, it excites a sensation unconnected with that direction, and apparently perpendicular to the skin at the point of contact.

This law of visible direction is fully explained, and its importance pointed out, in the *Library of Useful Knowledge*,* and Dr. Brewster, in his admirable *Treatise on Optics*, published in Dr. Lardner's *Cabinet Clyclopædia*† has established the same law of visible direction, and by its means has fully succeeded in explaining the cause of single vision with two eyes,‡ as well as the cause of erect vision from an inverted image.§ The real cause of erect vision has also been well recognised by other writers, as Dr. Mayo in his *Outlines of Human Physiology*. It is to be remarked that neither this important law, nor the conclusions to which it leads, have been dwelt on by Professor Lloyd in his able *Treatise on Light and Vision*,|| a book deservedly in high repute in our University, and much read by the students. Mr. Lloyd indeed offers no explanation whatsoever of erect vision, and has adopted

* Page 42, Article, *Optics*. † Page 292.

‡ l. c., p. 294. § l. c., p. 300.

|| The following is the only sentence in Mr. Lloyd's *Chapter on Vision*, which conveys the least intimation of such a law: "From all this it manifestly follows, that the only thing necessary to enable us to judge of the position of external objects by sight, is, that there should be a steady correspondence between their positions and the impressions which the rays proceeding from them produce on the retina."

that of the justly celebrated Mr. Herschel on the subject of single vision, viz., that it is entirely the result of habit.

Mr. Herschel thus expresses himself:* "As we have two eyes, and a separate image of every external object is formed on each, it may be asked why we do not see double; and to some the question has appeared to present much difficulty. To us it appears, that we might with equal reason ask, why, having two hands and five fingers on each, all endowed with equal sensibility of touch, and equal aptitude to discern objects by that sense, we do not feel decuple?"

With all the deference due to so high an authority as Mr. Herschel, I do not think that the inference he draws from facts connected with the sense of touch, can with justice be extended to the sense of sight. Indeed there are points of difference between the two cases so material, as almost entirely to destroy the force of the analogy. Thus, when we look at a single object with both eyes, we at once perceive it to be single; the perception of its being so is in every case decided and certain, and so far as our sight is concerned, no further experiment is required to convince us, that this our first judgment is correct. But with regard to the sensation imparted to us by two fingers, or ten fingers, it is altogether different. Here no positive knowledge is conveyed to the mind concerning the matter touched, as to whether it is in one mass or in several, whether it is a single object or many, two objects or ten.

Nor can experience here, as it is said to do in the case of vision, instantly correct a sensation in itself erroneous, and derive from it an accurate perception; nor can we by its intervention at once decide whether we are feeling one, two, or ten bodies, in the same way that, by the aid of experience, (according to Mr. Herschel,) we instantly correct the perception derived from our two eyes concerning a single body. Let any one, for instance, apply the tops of all his fingers simultaneously to ten small pieces of ice, and undoubtedly he will receive ten distinct impressions, one from each finger.

* *Encyclopædia Metropolitana,* Part 19.

It is exactly the same when we apply our fingers to one large piece of ice, and consequently here we actually feel decuple. But as our previous experience has warned us against the errors consequent on conclusions drawn from such data; we immediately commence a further investigation of the matter, and institute several successive examinations with our fingers; we feel the intervals between the parts first touched, ascertain whether they are separate or continuous, and thus, finally, by the aid of the sense of touch alone, arrive at an accurate conclusion. Again, if we touch ten pieces of metal of very different temperatures, each is distinctly felt at the same moment, and if it were possible to heat a piece of metal in narrow zones to different temperatures, the feeling not being exactly similar, would induce us to think that we were feeling ten pieces, not one, and so we would feel decuple. It is thus we always judge: when the surfaces felt by our different fingers produce sensations in every respect similar, we infer that they proceed from one and the same body, but when they are dissimilar, we guess that they are caused by different bodies, and beyond this, our experience is of no service as a guide. To be accurate, we must in every case institute a further examination, and there the case differs materially from the perception of a single object imparted to us by our two eyes, a perception correct in the first instance, and not requiring the aid of further experiment. There is likewise another point connected with Mr. Herschel's argument to which I cannot assent; he says, "the case is exactly the same with the sense of touch; lay hands on a globe and handle it; it is *one;* nothing can be more irresistible than this conviction. Place it between the first and second fingers of the right hand in their natural position; the right side of the first, and left of the second finger feel opposite convexities; but as habit has always taught us that two convexities so felt belong to one and the same spherical surface, we never hesitate or question the identity of the globe or the unity of the sensation. Now, cross the two fingers, bringing the second over the first, and place the globe on the table in the fork between them, so as to feel the left side of the globe with the right side of the second finger, and the right with the left of the first. In this state of things the impression is equally irresistible, that we have two globes in contact with the fingers, especially if the eyes be shut, and the fingers placed on it by another person. A pea is a very proper object for this experiment."

To prove that the sensation produced by the pea placed as above described, in the fork of the crossed fingers, has nothing to do with its convexities, as Mr. Herschel supposes, it is only necessary to make the experiment with a flat body instead of a pea. Thus, if a rectangular piece of card in breadth equaling the diameter of a pea, be used, its two corners will give an impression of two separate bodies not less distinct than that derived from the pea. In both cases, the experiment admits of a very easy explanation quite unconnected with the shape of the body; the inside surface of each finger so constantly touches bodies at the same moment in contact with the outside of its neighbour, that impressions derived simultaneously from both of these surfaces, are habitually considered as proceeding from one and the same body. In this case experience has taught us to look upon the double sensation excited by the double point of contact as the sign of the presence of but one body; but when the fingers are crossed, two surfaces, not thus habitually associated in feeling a single object together, are now brought into contact with it, and consequently the first impression, that there is a separate object for each point of contact, predominates, and we seem to feel two bodies, not one.

In support of the influence of habit in producing single vision with two eyes, Mr. Herschel observes, "those who have one eye distorted by a blow, see double, until habit has taught them anew to see single, though the distortion of the optic axes still exists."

The case to which Mr. Herschel here probably alludes, is quoted by Buffon from the works of Cheselden; and other similar cases have been recorded, but they admit, in my opinion, of a very different explanation.

Although the assertion of some physiologists, that we always look with one eye alone,* cannot be admitted, yet it is true that we all do so occasionally, and that under the influence of certain circumstances, this habit may become permanent.

Thus experienced sportsmen use chiefly the right eye in taking aim, although the left remains open, and persons who suddenly become affected with squint of one eye, soon learn to attend only to the impressions they receive from the sound eye. At first, that is so long as they attend to or see the images suggested to the mind by the contorted as well as the sound eye, they see double, because they are unable to direct both eyes to the same object; this error they find cannot be corrected, except by attending solely to what they see with one eye, and they invariably prefer using that whose motions are unimpaired. Hence, a person with a bad squint, such as in the case alluded to by Mr. Herschel, is enabled to see single by force of habit, but it is to be observed, that in producing this

* Gall and Spurzheim, *Physiognomical System*, p. 299, observe on this subject, "There is no doubt that we look with one eye alone; if we place a small stick, a pencil, a goose-quill, or another thin body between our eyes and the light, if we keep both eyes open, and point out the right line between our eyes, the stick and light, then if we looked with both eyes the stick should occupy the diagonal, and its shadow should fall upon the nose. But the shadow falls away upon one eye, upon that of which the person who repeats the experiment ordinarily makes use of in looking with attention."

There is certainly a most happy confusion of ideas and absurdity of expression in this passage: he must have accurate notions of the properties of a right line, who, placing a stick and candle before his face, expects to find, and be able to point out, *a right line between our eyes, the stick and light!* as to what *diagonal the stick ought to occupy if we look with both eyes,* I must confess myself totally in the dark. The experiment in question is extremely simple, although it does not afford a shadow of evidence in favour of the conclusion drawn from it by Gall and Spurzheim. In fact, it proves nothing more than the practicability of placing a small object between one eye and a distant candle, in such a manner as to intercept its light and prevent its being seen by that eye. To place the object so as to be between both eyes and the candle is impossible. When its shadow falls on the nose, it will not to either eye appear to cover the candle.

effect, habit does not operate in the way Mr. Herschel supposes, for single vision is gradually acquired in such cases, not by new points of both retinas becoming associated together, or rendered *corresponding*, as it is termed, but by so complete a cessation of all association and correspondence between both retinas, that the mind receives impressions from the one, but none from the other. Indeed, it seems to me, that the phrase, "corresponding points of the retinas," ought to be abandoned altogether, for it is probable that no such points exist. A picture of a given object on one retina can never be accompanied by an image coincident with that of its fellow picture on the other, unless both pictures happen to fall at the extremities of the optic axes; therefore no other points of the retinas are corresponding; no others can ever become by habit, or by any other means, so associated, that similar impressions made on both together, are perceived by the mind as one. Indeed, facts are not wanting to prove that single vision with two eyes, so far as we enjoy it, is totally independent of habit. Thus Cheselden operated on a young man blind from his infancy, and gave him the sight of one eye. At the expiration of a year, a similar operation put him in possession of the sight of the other eye likewise. And what was the consequence? According to Mr. Herschel's theory, double vision ought to have been then produced; but it was not; an apparent increase in the size of objects, probably owing to the increased vividness of the impression, was the only result.

All these considerations induce me to join with Gall, Mayow, and Brewster, in the opinion, that single vision with two eyes, has nothing to do with previous experience,* and that in this case the sense of sight owes nothing to that of touch. Indeed, the power we possess of correcting the

* Dr. Gall observes very judiciously, "Moreover nobody recollects to have seen objects double in his infancy; no person born blind who has recovered his sight by the operation for cataract has seen objects double. We have also never observed or heard that animals take single objects for double ones. Animals which live a short time, and which never can rectify their vision by touch, are not deceived by the number of objects."

errors of vision by means of the sense of touch, has been much exaggerated. If we look at one of our fingers through a multiplying glass, it will *appear* to the eye many fingers, not one finger, notwithstanding the thorough conviction we have that it is but one. If we put the finger into water, it will appear to the eye to be bent at the surface of the fluid, *though we feel* that it is not so; and no matter how often such experiments are tried, the contradictions between these two senses will remain as strong as ever. In connection with this subject, I may observe, that the sense of touch has been said to give more accurate ideas of shape, than those derived through the medium of vision. A globe at a distance, it has been remarked, may appear to the eye flat, or a flat surface properly shaded may appear globular; and thus vision may induce us to form erroneous conclusions, which the sense of touch afterwards corrects. This mode of considering the subject is evidently unsound; for in the first place, we cannot by the touch alone decide as to the globular or flat shape of the surface in question, until we have felt it all over, until we have applied our fingers to it on every side; now, if we take similar pains with regard to the evidence derived from vision, if we approach the surface, and regard it in various positions; in fact, if we look at it, not merely in front, but in profile, we shall be at no loss to distinguish that which is flat from that which is globular.

But to return to our subject. From what has been stated, it appears that no object is seen single, except both eyes be directed to it, in other words, except it be placed at the intersection of the optic axes. When an object is so placed, it seems to the right eye to be exactly in the same place as it does to the left eye, and consequently, its two images perfectly coincide, and appear to be but one. If the object be moved out of this position, its two images no longer overlap each other; and if it be very small and bright, it will soon appear double. From this it follows, that in truth we enjoy single vision in its perfection with both eyes, only with respect to one object at a time, and that all the remaining objects within the field of view common to both eyes, are seen with their images not perfectly coincident, but more or less overlapping each other, or else completely separate; and consequently, such objects appear, if I may use the expression, more or less, or completely double. To most persons this assertion will appear paradoxical; they will consider it impossible that so curious a circumstance should have escaped their notice; nay, they will at first disbelieve it altogether, as contradictory to their previous experience; but, nevertheless, the fact is so, and we fail to perceive it only because *no object but the one is ever seen distinctly by the eyes at the same time.* Thus, when we look at a printed page, we see only one letter clearly; the letters on each side of it are seen, but much less distinctly, and those at a considerable distance excite no accurate perception whatsoever of their shapes. The amazing rapidity with which the motions of the eyes are performed, it is true, prevents us from feeling any practical inconvenience from this indistinctness of objects seen obliquely, and the attention we always for the moment bestow upon the object directly before our eyes, prevents us from perceiving the comparative indistinctness of all others within the field of view. It is obvious also, that objects near the intersection of the axes are not seen double, for their images although not coincident, still very nearly overlap each other. To be seen truly double, therefore, an object must be removed to a certain distance from this intersection, and in proportion to this distance, it is less and less attended to; and consequently, the circumstance of its appearing double is entirely overlooked, unless our attention be forcibly drawn to the fact.

THE LAMINATED STRUCTURE OF THE CRYSTALLINE LENS.

The researches of Treviranus are of extreme interest on this subject, and are calculated to confer most important benefits on the science of physiological optics.

The question, as has been observed by Treviranus, as to how and by what contrivances the eye is enabled to see one and the same object at different distances, without the least apparent variation either in the correctness of its outline, or the disposition of its parts; and how the eye can even distinguish at considerable distances the shape of this object with remarkable precision, has excited much discussion since the time of Kepler, but has never yet been satisfactorily answered. Porterfield is the only writer who has bestowed much attention on the effects, which the laminated structure of the lens must produce in changing the course of the rays of light. After much labour, and after having made a great number of mathematical and analytical calculations, Treviranus has at length succeeded in solving this important problem in the fullest and most satisfactory manner. The steps by which he arrives at his conclusions, and the difficult analytical processes necessary for the solution of each step, can be understood only by those who have studied mathematics more profoundly than most professional men have done; I must, therefore, necessarily confine myself to a condensed summary of his views and conclusions, leaving the mathematical details to the consideration of persons who have devoted themselves more particularly to the science of optics, and recommending them strongly to bestow upon this work, the attention which the talents of the writer, and the novelty and importance of his views, justly claim.

The first chapter is devoted to the solution of the question, what course does light pursue through a transparent globe consisting of strata increasing in density from the surface to the centre? The number of *laminæ* in the human lens must be estimated at more than 1500, and the thickness of each at about 0·0005 of a line. Treviranus proves that the course of a ray of light through the lens, must be necessarily a curve, and he investigates at great length the nature of this curve, and the consequences which result from the various curves which different rays must necessarily describe, according as they are incident on the lens at different angles, and enter it at a greater or less distance from its axis. These investigations have enabled him to arrive at some very interesting results, one of the most important of which may be stated thus in general terms: it is well known that the rays of light proceeding from a luminous point, are refracted by a double convex lens, in such a manner as to form an image of that point; now, when the spherical surface turned towards that luminous point is tolerably large, as for instance, the crystalline lens, the image formed by the converging rays, after leaving the lens, is not a mathematical point so long as all those rays enter into its composition; it is in fact a circle, and is termed the circle of smallest diffusion. Now it is of great importance to consider the manner in which light is distributed over the surface of this circle of smallest diffusion; for as the circles representing the different adjacent points of distant objects, must necessarily interfere with each other by overlapping at their edges, it becomes a matter of interest, to ascertain whether much light falls on the circle towards its circumference. This interference must give rise to an indistinctness of vision, proportioned to the number of points whose circles of diffusion interfere; that is, to the area of these circles, provided that the light is uniformly diffused over them. But if it be very rare at the circumference, the impression made by the circles belonging to the adjacent parts must be less sensible, that is, their interference with each other (technically termed the spherical aberration) will produce less indistinctness of vision. Accordingly, Sir Isaac Newton, supposing that the light is incomparably rarer at the surface than towards the centre of these circles, was of opinion that this interference could not give rise to much indistinctness. This opinion seems to be held by Treviranus. In page 30, he says:

"That an homogeneous sphere or lens, forms a circular image of a point, over which the light is very unequally diffused, and towards the circumference of which the fewer the rays that go, the more the circle becomes enlarged.

"The laminated or stratified sphere or lens, on the contrary, has certain limits beyond which it refracts the rays in the same manner as the homogeneous lens, but within which it effects a much more equable diffusion of light, by transmitting to the focus, the rays in the same order in which it receives them from the luminous point. The result of this property is, that the image of the point is more accurately illuminated to the very edge of the circle of smallest diffusion."

If I had not the most implicit reliance on the superior accuracy of Treviranus, I would be almost tempted to believe that on this point he had been misled by Newton, and that he was not aware that in 1767 Boscovich corrected Newton's error, and by a beautiful analysis showed the distribution to be very different from what Newton had stated; and that the light is extremely dense at the borders of the circle of smallest diffusion, as well as at the centre; and that there is a space between them in which it is much rarer. As far as I can understand Treviranus, he appears to have succeeded in proving, that in the stratified lens, the circle of diffusion is more equally illuminated throughout, and what is of great importance, that the circle is of smaller diameter, and consequently the image produced is less influenced by the spherical aberration. With respect to the position of the luminous point at different distances from the eye, Treviranus has demonstrated, that it is owing to the stratified structure of the lens, combined with the power which the pupil possesses of enlarging or contracting according to the distance of the point, that we have an image of the point formed, always equally well defined, and always nearly at the same distance from the posterior surface of the lens, or, in other words, in contact with the retina.

I am not prepared to say how far his analytical reasoning may be approved of by mathematicians; but his investigations seem to demand their most attentive consideration, and I shall, therefore, willingly consign to more competent persons, the thorough sifting of the calculations which he has made, with reference to the solution of this most interesting problem, contenting myself with the humble merit of being the first to draw the attention of British opticians to his labours. I would also invite the special notice of physiologists to his observations on contraction and dilatation of the pupil, and to the solution which he gives of a question hitherto unexplained, viz., how it happens that the eye can distinguish plainly, and with equal precision, an object at eight or ten inches distance, placed in lights of different degrees of brightness, although the pupil varies in size, according to the intensity of the light.

ANOMALIES OF ORGANISATION.

THE publication which bears the title, given in the note,* dedicated to the illustrious father of the author, is the first volume of a work undertaken with the express purpose of instituting, under the name of *Teratology*, (from *Τέρας*, *monster*, and *Λόγος*, *history*), a new science, the object of which is to embrace the consideration of all irregularities of form or structure, occurring in man and animals, whether designated by the title of anomaly, monstrosity, variety, or malformation; and to explain them according to physiological principles.

In the introduction, the author divides the history of monstrosities, which embraces the science of Teratology, into three periods.

The first period, which he calls the *fabulous*, extends to about the middle of the 17th century. In this period, which commenced with the history of the human race, monstrosities were regarded as manifestations of the Divine wrath, or presages of some public calamity; and some of them were supposed to be produced by the influence of an evil spirit.

* *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux.* Par M. Isidore Geoffroy Saint Hilaire, tome i. avec planches, pp. 739. Paris, 1832.

The cruel laws of ancient Greece and Rome, which condemned monsters to death, were probably due to the influence of such feelings, and had not become obsolete in Europe even in the 17th century; for we find it laid down in a work published by Riolan, in Paris, in 1605, that monsters resembling the devil, *if allowed to live*, should be kept closely confined in a chamber, while those which were half man and half some other animal, should be put to death.

The second or positive period of the history of monstrosities, comprises about the first half of the 18th century, when owing chiefly to the labours of the learned Academicians, Mèry, Duverney, Winslow, Lémery, and Littre, the characteristics of monsters were carefully studied and more clearly pointed out, and a discussion arose on the question, whether monstrosity was an original or an acquired condition.

The third or scientific period was commenced by the illustrious Haller, who, submitting to a strict and careful examination, the facts advanced by his predecessors, compared them with his own observations, and distinguished those which were attested by the concurring evidence of numerous observers, and which accorded with his own experience, from those which appeared fabulous, and not sufficiently well authenticated. The conclusions which he drew from the consideration of the former, invested the study of this subject with a new degree of interest in a physiological point of view.

"The work of Haller (*De Monstris*) having established a confidence in the facts relating to monstrosities which was not before given to them, the importance of their study to the progress of physiology was no longer doubted, and numerous applications of them were made to that science. The absence of brain and spinal cord in the anencephali, which notwithstanding could live for some hours after birth; that of the entire head, of the heart, and of a great number of the viscera in the acephali; imperforation of the mouth, and occlusion of the œsophagus, are facts frequently adduced by ancient physiologists in support of their theories. Whatever were the conclusions they drew from the above facts, they never suspected the richness of the mine which they opened, they never perceived in the phenomena of monstrosity, experiments given to us by nature ready made and freed from those numerous causes of error, which, in ordinary cases, complicate and obscure the results."—*op. cit.* p. 13.

It is only within a period of comparatively recent date, that through the laborious investigations of Meckel, Treviranus, Tiedemann, Geoffroy St. Hilaire, Blainville, Serres, and other distinguished German and French anatomists, in comparing the adult man with the embryo, and other animals with both, we have ascertained some of the true laws of organic formation, and applied them with such happy effect to the explanation of monstrosities.

"Philosophical anatomy," says St. Hilaire. "by *the theory of unity of composition*, had shown animals to be composed of materials always similar, and always disposed according to the same laws; it pointed out between beings on the most distant degrees of the scale, curious and unforeseen relations; in fact, it taught us to perceive in all animals of the same branch, only the self-same animal, and to distinguish, amidst the infinity of differences of sex, age, and species, one common fundamental condition, from which nature, faithful to unity, never departs."

"The possibility of referring monsters to a common type was an easy deduction, an indispensable corollary of the theory of unity of organic composition. When it was perceived that entire classes of the animal kingdom were established on a single type, it became difficult and almost absurd to admit the existence of many types in the same species. However, it was not sufficient to establish theoretically so important a fact; and, besides, the doctrine of *unity of composition*, far from furnishing the basis of other theories, itself demanded new proofs at this period. Philosophical anatomy alone could then settle the question. A solution was demanded of embryogeny, and it replied by the *theory of arrest or suspension, and retardation of development.*"—pp. 16, 17.

The theory of arrest of development, it is obvious, explains only the occurrence of monstrosities in which a defective formation is observable. Monstrosities, characterised by an excess of development, are explained by referring to another law of embryogeny, the *theory of eccentric development,* which shows that when an organ is double, the artery nourishing it is double also, and that the absence of a part indicates the absence of its artery.

My limits confine me to a cursory notice of some other interesting particulars respecting double monstrosities, the most remarkable of which is, that the two individuals constituting a double monster, are always united by homologous surfaces, as back to back, side to side, &c., and that each part and organ of one corresponds exactly to a similar part or organ of the other. Every vessel, nerve, or muscle of one individual, placed on the line of junction, is, to a corresponding vessel, nerve, or muscle of the other individual, as one-half of a symmetrical part of a normal being is to the other.

We thus perceive that double monsters are the result of an extension of the *law of fusion of parts,* which is exemplified in the mode of development of all organs placed on the median line, as, for instance, the bodies of the vertebræ, and the pieces of the sternum and os frontis, which, originally formed of halves, at first distinct, are afterwards fused and united together.

The first chapter of St. Hilaire treats of the definition of anomalies and their classification.

"All species, especially man and the domestic animals, like him exposed to the influence of different climates and to the action of a number of modifying causes, are subject to a multitude of variations in the form and proportional size of their organs. The same individual, observed at two different ages, or in two different seasons, often presents numerous and remarkable differences. There exists, however, in the midst of these diversities, an assemblage of characters common to the majority of individuals which compose a species, and it is this assemblage of common characters which constitutes the *specific type*.

"Every deviation from the specific type, or in other words, every organic peculiarity which an individual presents, compared with the great majority of individuals of its species, age, and sex, constitutes what is called an *anomaly*."—pp. 29, 30.

The terms *anomaly* and *monstrosity* have often been employed as synonymous. According to the view thus indicated every alteration from the specific type, such as the irregular branching of an artery or nerve, or the impermeability, change of form, of structure, of number, and of the connexions of organs, should be considered a monstrosity.

The author employs, very judiciously, the term *anomaly* in a general sense, comprehending all irregularities, and including four principal groups or divisions.

1st. HEMITERIES (from ἡμι, *half*, and τέρας, *monster*), which include *varieties*, as the presence of a supernumerary muscle or double renal artery; and *malformations*, as hare-lip, hypospadias, or congenital phymosis. Anomalies of this class do not prevent the exercise of the functions of the parts.

2nd. HETEROTAXIES (from ἑτερος, *other*, and ταξις, *order*), anomalous arrangements of organs which do not interfere with their functions, and are not indicated by any external deformity, as in the case of transposition of the viscera.

3rd. HERMAPHRODISMS.

4th. MONSTROSITIES proper. These are the most serious of the anomalies which affect internal organs, implying an interference with their functions, and indicated by certain external appearances, which are signs of the internal derangement. Thus the absence of the head, as remarked in a foregoing quotation, indicates the absence of the heart, and of many other viscera.

I shall not follow the author through the interesting discussion into which he enters, to prove that monstrosities, with all their apparent irregularity, and amidst all their varieties, present a certain determinate series of characters or conditions, by which they can be classified with as much regularity as any normal order of animals.

We proceed to notice anomalies in the order in which the author treats of them, commencing with HEMITERIES, which are divided into five classes, viz., 1. *anomalies of volume*; 2. *anomalies of form*; 3. *anomalies of structure*; 4. *anomalies of disposition*; 5. *anomalies of number and existence.*

The first book is devoted to the consideration of anomalies of volume, which the author classes under the four following heads:—

I. Anomalies consisting of a general diminution.
II. Anomalies consisting of a general augmentation.
III. Anomalies consisting of a partial diminution.
IV. Anomalies consisting of a partial augmentation.

An anomaly falling under any of the above heads may be *temporary*, or found to exist only during fœtal life or infancy; or *permanent*, when it continues up to the adult period.

St. Hilaire illustrates anomalies of general diminution in a chapter on dwarfs, restricting the application of that term to individuals whose size is considerably below the medium growth of their race, and who present lessened dimensions of all their parts. Persons below the average size, in consequence of having short or imperfect lower limbs, while the trunk is of the ordinary dimensions, and those of short stature, the result of deformity produced by rickets, are therefore excluded by this definition, from coming under the denomination of dwarfs proper.

Passing over the fabulous stories of the pigmies, for a full account of which I may refer to Tyson, whose treatise on this subject our author does not notice, dwarfs appear to have been at remote periods objects of great attraction; and even in less enlightened times, much sought after by princes who made their infirmities subjects of amusement. This barbarous propensity was indulged in, not only by some of the most tyrannical and depraved of the Roman emperors, but was common among European princes in times less remote. In the 18th century we find Catherine de Medicis and a certain Electress of Brandenburgh, amusing themselves by promoting marriages between dwarfs, which were always unproductive of offspring.

The particular history of some dwarfs has been better authenticated, especially those of Jeffrey Hudson, Borwilaski, and Nicholas Ferry, otherwise called Bebe, who was the most celebrated person of this description.

Jeffrey Hudson was born in 1619, at Oakham, in Rutlandshire. At the age of eight years he was presented by the Duchess of Buckingham, in a pie, to Henrietta Marie of France, the Queen of Charles I. He was then only 18 inches high, and for many years was remarkable for the smallness of his stature; but at the age of thirty he grew rapidly to the height of 3 feet 9 inches. Having been the subject of much curiosity and mirth, he died in prison in 1682, after the Restoration, having been accused of a political crime. He was inferior, neither in courage nor intellect, to the courtiers of that degenerate period.

There was less incident in the life of Bebe than in that of Hudson, but in a scientific point of view his history is more interesting. His parents were of good size and well made, and had several other children; he was born in Vosges, in 1741, he was a seven months' child; and at birth was between seven and eight inches long, and weighed a pound. His mother's labour continued 48 hours; he was presented at church, for baptism, on a plate, and his first cradle was his mother's shoe; his mouth was too small for his mother's nipple. He began to speak at 18 months, but did not walk until the second year. At five years old he was carefully examined by the physician of the Duchess of Lorraine; he weighed at that time nine pounds eleven ounces, and was twenty-two inches high, but he possessed the attributes of a more advanced age. At this period he was brought to the court of Stanislaus, ex-King of Poland, Duke of Lorraine, who paid him much attention, and to whom Bebe became very much attached. His intellect was always weak, he could not be taught to read, nor to appreciate religious instruction, and did not recognise his mother after an absence of some years. He was vivacious in his movements, very irascible, and jealous of greater attention being shown to any other person; he had an ear for music, and was a proficient in dancing.

At 15, the period of his puberty, his health began to decline rapidly, and he died at 22, having all the appearance of old age.

His skeleton, which is to be seen in the Museum of Natural History at Paris, is remarkable for the great prominence of the forehead, and for a decided distortion of the vertebral column in the dorsal and lumbar regions. The bones of the skull are almost all completely ossified; the sagittal suture is obliterated; the parietal bones are thin and reticulated on their external surface, like those of some of the Chelonian reptiles. The skull is much depressed between the parietal and occipital protuberances, the nose prominent, the nasal bones broad at their lower extremities, and the great toe unusually long. The whole height of the skeleton is 2 feet, 9 inches, and 6 lines.

Borwilaski, who was a cotemporary of Bebe, was a Polish gentleman, learned and intellectual, who wrote his own life; at the age of 22 his height was 28 inches and he was in good health. He came into the world at the ordinary time. His parents were above the middle size. He had four brothers, of whom the eldest was of small stature, being only 34 inches high, while the other three each exceeded 5 feet 6 inches. He had a sister, who, at six years old, was only 20 inches high. It is remarkable, that Borwilaski, his sister, and eldest brother, were deformed at birth, but became well proportioned afterwards.

The preceding observations show that there are many varieties in the physical and moral endowments of dwarfs.

Some pass from infancy to old age and infirmity in a quarter of a century; others enjoy good health to an advanced age. Some, like Bebe, are almost idiots, while others, like Borwilaski, possess more than an ordinary share of intellectual powers. There are, however, several physiological conditions common to a great number of dwarfs, which deserve to be particularly attended to.

1. Dwarfs are in general irascible, and when in good health are of a lively and active disposition. It is a well known fact that little men are more irascible and active than those of large stature. I have been informed by military friends, that during the Spanish campaign, the battalion and light infantry men of the British army were less fatigued after a severe day's duty than the Grenadiers. We all know the restless activity of children, and it may be taken as a general rule, that the smaller animals are more vivacious and active than the larger. This has been often referred to the circumstance of the blood returning more readily to the heart in consequence of its circulation being more circumscribed; but the influence of the nervous system in this case is very considerable.

2. Dwarfs have generally short legs and a large head, with a sour, disagreeable expression of countenance. They are particularly liable to rickets either in infancy or at puberty.

3. Dwarfs are in most cases incapable of propagation with individuals of ordinary size, and even with each other, as the experiments tried by Catherine de Medicis and the Electress of Brandenburgh, already mentioned, would go to prove. It is perhaps wisely so ordained by providence, as a means of preventing the increase of a feeble and degenerate race of mankind. Sensual indulgence enervates dwarfs, and often proves fatal to them. It was to this cause that the premature old age and death of Bebe were attributed.

4. Dwarfs generally come into the world after the ordinary term of gestation. Twin births of dwarfs are rare. Their mothers have been generally well proportioned, often above the ordinary size, and remarkable for fecundity; in

many instances the same mother has given birth to two or more dwarfs, as in the family of Borwilaski.

5. Dwarfs are not more rare among races of mankind of large than those of small stature, nor are they more frequently of one sex than the other. They are commonly very small at birth, as Bebe; sometimes, however, they are of the ordinary size when born, but seem to have their growth checked after birth. The growth of many animals appears often arrested, particularly when deprived of the nourishment derived from the milk of their mother, or when otherwise stinted in their food.

The author, after noticing the absurd theory of the ancients, who considered that the cause to which dwarfism is owing, was a deficiency in the quantity or quality of the seminal fluid, assigns as the more probable cause of this condition, some impediment to the nutrition and development of the fœtus, arising from a defective conformation of the uterus of the mother, or to a disease attacking the young being itself during its fœtal state. The circumstance that dwarfism is frequently conjoined with rickets, and that it has never been observed in any of the lower animals except in a state of domestication, in which their nature is considerably modified, are strong arguments in favour of this condition depending on one or both of the above causes.

The second chapter treats of anomalies of general augmentation of volume, and contains the history of giants, and a discussion on the conditions which distinguish them from persons of ordinary size.

A vague opinion was at one time entertained in Europe, and still prevails to a certain degree, that the men of ancient times were of larger stature than their present descendants: "The Academician Henrion, a zealous supporter of this opinion, formed, in 1718, a table or chronological scale of the variations of the human stature from the Creation to the Christian era. According to him Adam was 123 feet 9 inches high, and Eve 118 feet 9 inches and 9 lines, Noah was 20 feet lower than Adam, Abraham was between 27 and 28 feet in height, Moses 13 feet, Hercules 10, Alexander 6, and Julius

Cæsar 5: the human race, progressively diminishing, were it not for the interposition of Providence, would have dwindled to the size of microscopic beings by the present time." These reveries of the learned Henrion were founded on the tradition of the Rabbins, according to which Adam was at first 900 cubits high; but that after he had sinned, God caused a considerable diminution of his size.

The mention made of giants in the books of Genesis and Numbers, was considered as a proof of the existence of a larger race of men in former times; but Hebrew scholars differ as to the true signification of the word "Nephîlim," which is translated "giants." By some the word is supposed to mean violent or barbarous men; moreover the text, "there were giants in the earth in those days," taken literally, in no wise warrants the conclusion, that the whole race of men, or any particular nation or tribe, was of gigantic stature.

The allusions to the giants of old, which occur in profane history, may be regarded as merely poetical.

In the middle ages large bones were discovered in various parts of Italy and France, and it is not extraordinary, considering the then imperfect state of anatomy, that they should be taken for those of giants.

A large skeleton, found at Trapani, in Sicily, in the 14th century, was supposed to be the remains of Polyphemus, and it was calculated that his height must have been at least 300 feet, a moderate size, perhaps, for a Cyclop. The remains of other giants were afterwards discovered in various places. The bones of Antæus were found at Tingis; those of Orion in Crete. The bones of the mastodon, when first found on the banks of the Hudson, were supposed to be undeniable proofs of the existence of a race of giants in remote times.

Riolan, and other anatomists, refuted the opinion, that these bones belonged to human beings; and it is superfluous to notice here, the result of the researches of Cuvier, by whom the bones of these pretended giants were proved to have been those of the elephant, the mastodon, the rhinoceros, of whales, and large reptiles.

According to Meckel, the size of giants never exceeds eight feet. Our author doubts the correctness of statements regarding giants, whose height has been said to exceed eight and a half feet.

The general remarks of St. Hilaire on giants are less interesting than those on dwarfs. Giants resemble dwarfs in some particulars, as in having, in most cases, a weak intellect, a defective power of re-production, and in being short lived. They are not so vivacious or irascible as dwarfs, but on the contrary, are mostly dull and stupid. They are usually of a lymphatic temperament, and fair complexion, and have generally, a smooth, soft skin. Most of them have been children of women remarkable for fecundity, and were members of families distinguished by great stature.

The causes which produce a gigantic growth, are not clearly known; Haller supposes it may arise from abundance of food, a flexibility of organisation, and a slow circulation. A gigantic stature is of still rarer occurrence among animals than among men.

Note.—The older Hebraists and some of the Jews, took the word Nephîlim as derived from the root *Naphal* to fall—and explained it to mean, those who *caused others to fall*, or who *fell upon* others—but this is now exploded. We now know that there is a root (although not found in the Hebrew Bible) *phal, phul*, or *pal, pul*, which signifies to be strong, powerful—hence Pul, king of Assyria, 2 Kings, xv., 19. Sanscrit, pîlu, an elephant, and hence also the name of the god *Baal*. The root *na-phal* therefore had the signification of being strong, huge, powerful, and the substantive *Nephîl*, derived from it (which is only found in the plural *Nephîlim*, in the Hebrew Bible), was a giant, a man of huge stature. See the curious passage, Num. xiii., 33—"And there we saw the Nephîlim, the sons of Anak, who were of the Nephîlim. And we were in our own sight as grass-hoppers, and so we were in their sight." This puts it beyond all doubt that men of large stature were intended: and perhaps the meaning is that the children of Anak were descended from the Nephîlim mentioned Gen. vi., 4. The word occurs only in those two places in the Hebrew Bible. In the parallel passage, Deut. ii., 11, the word used for giants, is Rephaim, formidable, terrible ones—the people there spoken of were only men of large stature, and so were formidable—but were not descendants of the Nephîlim, as the Anakim were. The constellation Orion is called by the Jews Naphla (Chaldee), "the giant."

For the above note, the Editor is indebted to the kindness of a distinguished Hebrew scholar.

THE FUNCTIONS OF THE LYMPHATIC SYSTEM.

In endeavouring to obtain a knowledge of the use and functions of the lymphatic system, it is necessary, in the first instance, to compare the classes of animals which possess lymphatics, with those in which they are wanting, in order that we may obtain data to direct us in this important and difficult inquiry. In animals with brain and spinal marrow, including the four superior classes, mammalia, birds, amphibious animals, and fishes, we find a distinct system of vessels, containing a comparatively colourless fluid, and termed lymphatics; in addition to which all these animals have arteries and veins for the circulation of red blood.

In animals without brain or spinal marrow, including zoophytes, mollusca, and articulata, we do not find two sets of vessels in which fluids circulate towards the heart; in these there is no such distinction between the vessels of the general circulation, and the system in the higher animals termed the lymphatic; whatever the office of the latter is, it is performed in the invertebrata by the veins of the general circulation. In other words, the functions of both veins and lymphatics are in these animals discharged by one set of vessels, which have been usually termed veins.

The division of the animal kingdom provided with a lymphatic system, is still further distinguished from that in which this system is wanting, by the red colour of the blood; and two of the higher orders are remarkable for the warmth of the blood, while the inferior classes have a comparatively cold and colourless fluid circulating, or at least moving within the sphere of their vascular system.

This great and marked distinction may therefore be made between vertebrated and invertebrated animals, that the vascular system of the former includes two parts, one containing red blood, circulating in arteries and veins; and the other containing a transparent colourless fluid, conveyed towards the heart by the lymphatics; while the vascular system of the invertebrates is single, being confined to vessels circulating a colourless fluid.

The solids of red-blooded, compared with those of white-blooded animals, present a difference corresponding to that of the fluids; for as the vascular system of the superior classes contains both red and colourless fluids, so we find both red and white structures or tissues in the solid portions of their bodies. In the mammalia the muscles both of voluntary and involuntary motion, which constitute so great a part of the bulk of the body, belong to the red structures; among the white tissues may be enumerated, the cellular, serous, synovial, and fibrous membranes, ligaments, cartilages, the animal basis of bone, &c. In the invertebrata, on the contrary, the whole solid system belongs to the class of colourless tissues, or at least includes nothing similar to the red solids of vertebrated animals.

Let us next consider, whether in the four superior classes, the quantity of red blood is proportioned to the quantity of red solids.

In the *mammalia* we have a large proportion of red blood, and a corresponding extent of development in the red solids.

In *birds* we have a rapid circulation of very warm and highly coloured red blood, and a consequent preponderance of the muscular system, which is also very dense and red, with the exception of muscles but little used, such as the pectoral muscles of the gallinæ.

In the *amphibia*, the proportion of red blood is small, when compared with that of the mammalia and birds, and accordingly the muscular system is proportionably paler, or in other words, the white parts predominate over the red, even in the muscular system. In some of the amphibia, however, as the frog, the amount of red blood is greater, and the colour of the muscles higher.

In *fishes*, the proportion of red blood is still smaller, and the muscular fibre usually soft and colourless, and so sparingly supplied with red blood, that an extensive incision into the great lateral muscles is followed by but a slight effusion of blood.* In several fishes the muscles of the fins are of a redder colour, and more abundantly supplied with red blood; and in the salmon they are of a bright red colour about the head, immediately below which the heart is placed.

It may therefore be looked on as established, that in animals provided with a vascular system, one part of which contains a red blood, and the other a colourless fluid; the quantity of red blood is proportioned to the quantity of red tissues.

Applying the same method to the investigation of the quantity of white fluid contained within the vascular system, as compared with the amount of white tissues, we observe that accordingly as the red blood and red parts diminish, the white fluids and white structures increase. Thus in the mammalia, although the lymphatic system is extensive, yet it does not bear at all the same relative proportion to the vascular system of red blood as in fishes; in which the investigations of Fohmann have shown a great preponderance of the lymphatic over the venous system.†

From these facts we are inevitably led to conclude:—

1st. That the functions of the lymphatic system of red-blooded animals is intimately connected with the white structures or tissues of these animals.

* Carus' *Comparative Anatomy*.

† Magendie has very erroneously denied the existence of lymphatics in amphibious animals and fishes. The testimony of Hewson and Munro has been fully confirmed by the investigations of *Fohmann*, in the first number of his valuable work, *Das Blutadersystem der Wirbelthiere*.

2nd. That a similar connexion exists between the red portions of the vascular system of these animals, and their red solids.

At this stage of the enquiry, the following questions naturally present themselves:—

1st. Whether, in their natural state, any red-blood circulates in the white tissues?

2nd. Whether a colourless fluid circulates in these parts?

To the first question we may confidently answer, that no red blood circulates in the white structures during health; for although it is possible that *red blood* might circulate in a single capillary, so small as to have no perceptible colour, yet no considerable number of such capillaries could exist in any structure, without producing collectively a perceptible red colour: for many white parts possess so great a density and bulk, that if they contained such minute red vessels, although the latter might appear white individually, yet they would give a red colour when viewed together.

The second question is not so easy of solution. Some physiologists, with the celebrated Rudolphi at their head, have denied all proper vascularity to cellular, serous, fibrous, and other white structures; and maintain, that the fluids exhaled from the serous and cellular membranes are the products, not of any secretions from the vessels of the white parts themselves, but of the tissues in connexion with, or covered by, these white structures, and that they merely transude through the latter, just as the sweat passes through the epidermis. In a similar way they endeavour to account for the products of inflammation, which have been commonly referred to the white structures.

Thus they attribute the exhalation of serous membranes in health, and their exudations in disease, to the vessels of the subjacent parts, and not to any vessels of their own, the existence of which they deny, on the ground of its being impossible to inject them.

The following reasons seem to me conclusive as proving, not only that the white tissues have a proper circulation of white blood, but also that they are capable of undergoing a twofold species of inflammation:—

1st. When we irritate a white part, it soon becomes red, from the appearance of minute vessels carrying red blood. These vessels appear often so suddenly, that we are forced to admit their previous existence in the part; and the existence of vessels being thus proved, it follows that the fluid circulating in them must have been white, for, otherwise, they would have been visible. This simple experiment on the living animal enables us to prove the presence of minute vessels in white parts, in health conveying a white fluid, and being directly continuous with the arteries, as is shown by the immediate entrance of arterial blood into them, when the part is stimulated.*

2nd. We find that the pseudo-membranes so often formed between the pleura pulmonalis and pleura costalis, are capable of becoming vascular, red, and inflamed, and are sometimes found covered with an exudation of coagulable lymph.

It is quite evident that in such membranes, totally unconnected as they are with any red part, the vascularity observed during inflammation must belong to themselves. When this condition subsides, the vessels into which red blood had found its way, again convey a white fluid, and consequently become invisible.

3rd. Where a serous membrane covers another white structure, as in the case of synovial membranes attached to cartilages and capsular ligaments, we often find that the internal surface of the joint becomes, when inflamed, highly red, and we must hold this morbid vascularity to reside in one or other of the white structures, for in this case no other structure enters into the composition of the part.

4th. The synovial membranes furnish us also with conclusive evidence against the opinion, that the serous exhalation is not derived from, but is merely an exudation through the serous membrane, and that this exhalation is

* See the experiments of Hunter, in his treatise on Inflammation. Also Thompson on Inflammation.

derived from some part furnished with red vessels, for the synovial membranes in health are covered by a copious exhalation, serving to lubricate the articular cavities; and which secretion cannot have been produced except by a white structure, as none other enters into the composition of the joint.

5th. The exhalations of cellular and serous membranes are closely allied in chemical composition to the serum of the blood, and are therefore probably derived directly from it, as it is this latter which circulates in the white parts.

6th. That a circulation is carried on in the white parts, has been proved by the experiments of Meyer, who, in a few hours after he had injected a solution of prussiate of potash into the pulmonary vessels of animals, detected this salt in the tendons, ligaments, and other white structures. All these reasons seem conclusive in proving that the white tissues are, during health, provided with vessels continuous with the arteries, but conveying only the serous portions of the blood; and that in disease these vessels admit red blood, and thus become the seat of red inflammation.

In the higher order of animals, as the mammalia, the whole of the blood is sent from the heart through the arteries, to be distributed to all parts of the body. This blood consists of two portions; a red fibrinous, and a white albuminous portion. The two circulate together through the arteries, and are returned by the veins, passing through parts of a red colour and fibrinous composition; while a part of the serum enters into the minute arterial branches, which, supplying the white parts, do not admit the red or fibrinous portion; and thus a serous or white blood is distributed to the white structures, whose albuminous secretions and albuminous basis agree so exactly with the composition of the fluid thus destined to support their nutrition and carry on their functions.

As a serous or white blood is conveyed from the heart to the white parts, it is evident that some means must be provided for its return towards the heart; and for this purpose, we find these parts plentifully supplied with lymphatics, vessels which discharge the office of conveying back the white blood from the white structures, and which may therefore be called the *veins of the white parts.*

They agree, indeed, with the veins of the red parts in several respects.

Both are provided with valves. In both, the contained fluid flows towards the heart, and is in both propelled in a constant and equable current.

As the lymphatics return the white blood from the white structures of the body, their contents also require to be submitted to the aerating action of respiration; and hence that portion of their fluid, which had not joined the red veins sooner, is emptied into these latter before they arrive at the heart.

A fact discovered by Fohmann, concerning the distribution of the lymphatics in fishes, is almost decisive on the point of their being white veins; for he has found a considerable lymphatic trunk conveying lymph to be aerated in the gills, while a separate trunk conveys venous blood to be aerated in the same organ.

This fact evidently accords as much with the idea of the lymphatics conveying back white blood, to be renewed by respiration, and rendered again fit for the nutrition of the white parts, as it is irreconcilable with the commonly received opinion, of their containing the useless *débris* absorbed from the various organs.

Many objections, indeed, of great weight, have been urged against the opinion, that the lymphatics convey back the *débris* of all parts of the body, or, in other words, serve the purpose of removing, by absorption, all that has become useless in the different structures. The fluid they contain is colourless, and is too simple and uniform in its composition, to allow us to suppose it to be formed by the union of particles absorbed from structures so various as those of the body.

That the lymphatics perform the office of returning the white blood, (by white blood, I mean a fluid not absolutely colourless, but destitute of the peculiar colour of red blood,) is further rendered probable by the fact, that when in disease, red blood finds its way into the white capillary arteries of white parts; the lymphatics are found to carry red blood from the inflamed parts,* and in suppuration, purulent matter has been found also in the lymphatics.†

The nutrition of the red parts is accomplished by the constant circulation of red blood through them, that of the white parts by the circulation of the serous portion of the blood; and to effect these two different purposes a portion of the serum is separated in the smaller vessels. When, however, the red blood and the white blood have circulated through the red and white parts, there is no longer any necessity for their being kept altogether distinct from each other: in the mammalia the conglobate glands in the first instance, serve to promote the reunion of the red and the white blood, and the larger lymphatics, which open into the subclavian veins, finally complete the reunion of these two portions of the blood. In fishes, Fohmann has pointed out numberless communications between the venous and lymphatic system, almost at the roots of the latter.

The white structures of the higher animals resemble the solids of white-blooded animals, not only in health, but disease. Thus the power of reproduction of parts destroyed by accident or disease, so remarkable in the lower orders of animals, is in the higher enjoyed only by white structure, such as cellular membrane; for proper muscular fibre, when

* Meckel.

† Magendie, who relates that in a dissection performed by Dupuytren, fluid, in its physical properties resembling pus, was found in the lymphatics coming from the suppurating part, endeavours, but I think on insufficient grounds, to make it appear that the fluid was not really purulent.

In his zeal to advocate the absorbing powers of the veins, he has also denied the facts reported by Cruikshank and others, of blood having been observed in the lymphatics, but it is evident, that as white parts are not provided with veins, the only channel through which the red blood, that certainly finds its way into them during inflammation, can be returned towards the heart, is by the lymphatics.

once destroyed, is not reproduced, condensed cellular membrane being employed to repair solutions of continuity, in this as well as in all more highly organised tissues.

In white-blooded animals, we often see a new limb appear in the place of one destroyed by accident, and in man, it is not unfrequent to observe a *new white organ* produced, when the old has become useless, or has been destroyed. Thus, in unreduced dislocations, we have new bursæ mucosæ, capsular ligaments, synovial membranes, &c., produced so as to form almost all the appendages necessary to the strength or motion of the new joint. The same happens in ununited fractures. Cartilage is thrown out to supply the place of bone removed by operation or disease, and under favourable circumstances this cartilage itself becomes ossified, and, as happens in necrosis, an entirely new bone is sometimes produced. In all such cases, the mould of the bone, or that part of it to which the new bone owes its form and bulk, is composed of a white structure, chiefly coagulated albumen; this is first formed, and afterwards the bony particles are deposited in it from red vessels.

This facility of reparation forms a very striking analogy between the white parts in man and other red-blooded animals, and the general structure of the solids in white-blooded animals. In point of vitality, the analogy is most striking. The white parts in man, when not inflamed, for then they for a time become red parts, and have a corresponding increase of vital energy, enjoy but a low vitality. They are scarcely, if at all, sensible; do not possess irritability; and probably, also, the circulation of the white blood through them is much slower than that of the red blood through the red parts; at least, the circulation of the white venous blood in the lymphatics, appears much less rapid than that of the red venous blood in the veins.

Hitherto it has not been demonstrated that the minute lymphatics open into the minute veins of man. These systems, however, have a free communication by means of the conglobate glands; and hence, there cannot be much apphatics, than veins; for it is more consistent with analogy to suppose, that in the lower animals the portion of the circulating system still existing, corresponds with the lymphatics; as in the superior animals, the latter are connected with parts, which in their degree of vitality, most resemble the structures of those in a lower scale.*

In the higher classes of animals there are not only two circulating systems, one of red, and another of white blood, but also a twofold system of nerves, the cerebral and the ganglionic; the latter of which, in invertebrated animals, seems to perform all the nervous functions necessary to their state of existence, while these animals are also remarkable for possessing only a simple vascular system.

We find, therefore, a correspondence between the vascular system of red blood, and the nervous system of the brain and spinal marrow. These systems are most perfect in animals abounding in a highly aerated red blood, and decrease according to a descending scale, proportioned to the decrease of red blood, until at last we arrive at the invertebrated animals, possessing no red blood, and no brain or spinal marrow.

It is not easy to determine what place in the scale of animals we ought to assign to the fœtus of red-blooded animals, as, for instance, the mammalia. The fœtus in utero, is an animal evidently of an inferior order, for, as is proved by the occurrence of full-grown acephalous monsters, it may exist and grow without a brain, and as the lungs are not used, it may be considered in the light of an animal without any proper pulmonary apparatus These considerations seem to place the fœtus rather among the invertebrated, than among the lower orders of vertebrated animals, which was the place assigned to it by Bichat in his celebrated work, *Sur la Vie et la Mort*. Destitute of the functions connected with the brain

* In amphibious animals, the valves of the lymphatics are not so strong or so close together as in the higher animals; in fishes the lymphatics do not present any glands, and have no valves. In these respects they evidently appear to approximate to the vascular system of the inferior classes.

and spinal marrow, for the full performance of which highly aerated or arterial blood seems necessary,* the fœtus does not require the circulation of highly aerated blood, and, accordingly, most observers agree in denying the presence of arterial blood, properly so called, in the fœtal system. On the other hand, it is very improbable that the fœtus forms an exception to the general law observed in all animals and plants, as to its system not being influenced, either directly or indirectly, by the chemical constituents of the atmosphere. In the placenta, the fœtal blood is probably aerated to a certain degree by the arterial blood of the mother, but it is evident that this mode of oxygenation is very incomplete when compared with that of direct pulmonary respiration. The process in question, however, although comparatively incomplete, produces an aeration of the blood sufficient for the functions of fœtal life, and corresponds with the degree of respiration enjoyed by many invertebrated animals. This view of the subject makes me unwilling to adopt the opinion that there is no difference between the blood transmitted from, or returned to the placenta, and that the blood in both the umbilical arteries and the umbilical vein is *venous;* for I conceive that the blood in the latter must be somewhat more aerated than in the former. On the other hand, I cannot subscribe to the opinion of those who maintain that *arterial blood,* properly so called, enters the fœtal system by the umbilical vein. The weight of authority is against the fact; and the functions of fœtal life do not seem to require the presence of an highly aerated blood.

If the lymphatics discharge the office of veins to the white parts, we should expect to find an ample supply of these vessels in white structures; and, indeed, such is the fact, for no parts so abound with lymphatics, as the serous membranes, and other white tissues.

* Late experiments seem, however, to prove, in contradiction of those of Bichat, that the functions of the brain and spinal marrow may, to a certain degree, be carried on with venous blood.

As to the want of lymphatics in the brain, it is to be observed, that this objection would apply to every use we might assign to the lymphatics, and evidently militates as much against their being absorbents as white veins. The mechanism of the cerebral circulation differs in so many remarkable particulars from that of the circulation of other parts, that we need not be surprised at finding in it, anomalies also with regard to the lymphatics.

As to the functions of the lymphatic glands, I confess myself unable to give any satisfactory explanation. It has been proved by Fohmann and Lauth, that the opinion of the elder Meckel was correct so far as regards the anastomosis which takes place between the veins and lymphatics within the conglobate glands. Dutrochet has assigned to these glands the office of assisting in the circulation of the lymph; and Fohmann has conjectured that they serve to aerate the lymph, by bringing it into contact with the small arterial ramifications within their substance; but the reasons advanced by these distinguished physiologists, do not appear satisfactory.

As the circulation of white parts differs from that of red, so do their diseases. Time will not permit me to enter on this important subject at present, concerning which Broussais has already made some well-founded observations; we may remark, however, that inflammation of white parts observes a peculiar character, and seems to have little influence on the sanguiferous system of red blood,* unless it becomes so violent that red blood finds its way into their vessels. When this takes place, we find the albuminous and serous products of white, exchanged for the fibrinous products of red, inflam-

* Dr. Bostock (Elementary System of Physiology, vol. i, p. 199) says, that "in some cases where I had an opportunity of examining the fœtus immediately after its extraction from the uterus, the different colours of the blood in the funis appeared quite obvious."

In the cases observed by Dr. Bostock, it is evident that many minutes must have elapsed between the first exposure of the funis to the air, and his examination of it. This circumstance alone is sufficient to account for the difference of colour in the blood of the umbilical arteries and veins. Magendie has shown (Journal de Physiologie, tom. i, p. 17) that the blood contained within the jugular vein in young animals, very soon assumes the arterial mation. As to the sensibility of these parts, it is but slight so long as white blood circulates in their structures, but when they are inflamed to the point of admitting red blood, their sensibility becomes exquisite.

To conclude these remarks, hastily thrown together for the purpose of eliciting further inquiry on the subject, it is necessary to observe that Magendie has approached to the view of the functions of the lymphatic system which I have given. He states it as his opinion, that a portion of the serum of the blood is returned to the heart by the lymphatics; he does not, however, even hint why this should be so, nor does he seem to have had any notion of that fluid being the venous blood of the white parts of the body.

colour, when the vein is exposed to the air, and the course of the blood in it is retarded by pressure. When the abdomen of a living animal is opened, he says that in the course of a few seconds, a similar change of colour may be observed in the blood of the mesenteric veins. As the coats of the umbilical vein are thinner, and consequently more permeable by the air than those of the umbilical arteries, a very short time will be sufficient to make an obvious difference in the colour of its contained blood.

NOTE.—The above paper was printed in 1828, eight years before the appearance of the work of Treviranus: "Neue Untersuchungen ueber die organische Elemente der thierischen Körper und deren Zusammensetzungen," (New Researches on the Organic Elements and Intimate Structure of Animal Bodies), Bremen, 1836. This paper was reviewed by Dr. Graves, see *Dublin Journal of Medical Science,* vol. x, p. 113. He notices with more than ordinary pleasure the opinion of Treviranus, as confirming the views originally put forward by himself, that the lymphatics are the veins of the white tissues. "In some parts of the body," says Treviranus, "I observed circumstances attending these minute and simple vessels, which render it probable that they terminate in tubes of such a degree of fineness, that they are incapable of admitting the globules of the blood, *and consequently contain a serous fluid only.* This is the case with those branches of the central artery of the retina, that proceed to the posterior surface and lateral edges of the capsule of the lens. Even at their origin from the central artery, these vessels become at once incapable of carrying red blood, the very presence of which, in these parts, would be destructive of the transparency so essential to vision."—ED.

MISCELLANEOUS ESSAYS.

THE STATE OF MEDICINE IN EUROPEAN AND ASIATIC TURKEY.

THIS work* (the title of which is given in the note) relates to a country but imperfectly known by the more civilized nations of Europe, and rarely visited by medical men of great scientific attainments, such as Doctor Oppenheim. This gentleman, educated at Göttingen and Heidelberg, is well known in Germany by various medical essays, particularly an Account of the State of Medicine and Surgery in Italy, which appeared originally in the *Journal of Foreign Medical Literature*, published at Hamburgh, by my friends Dr. Julius and Dr. Gerson, and from which I made copious extracts in the *Edinburgh Medical and Surgical Journal*, for January and April, 1826. Dr. Oppenheim visited the medical schools of France and Great Britain, and in Hamburgh had distinguished himself as a skilful operator and excellent physician; when, stimulated by a desire to investigate the state of medicine in the eastern parts of Europe, he left his native

* Ueber den Zustand der Heilkunde und ueber die Volkskrankheiten in der Europäischen und Asiatischen Türkei, ein Beitrag zur Kultur und Sittengeschichte. Von Friedrich Wilhelm Oppenheim, Doctor der Medicin, &c., &c. 1833, 8vo.

city, at a time when his private practice was daily on the increase, and joined the Russian army at the commencement of the Turkish campaign in 1828. His surgical ability, and the high testimonials he brought, soon raised him to a situation of trust and rank in the medical staff of the Russian army; and he proved himself worthy of confidence not only in the field, but during the devastations of the plague at Adrianople and Varna. The account of the nature, progress, and symptoms of the plague, which he is shortly about to publish, will, no doubt, add a vast fund of information to our stock of knowledge concerning this dreaded epidemic. The opportunities which Dr. Oppenheim enjoyed of making himself master of the important subjects he wished to investigate, were such as have, perhaps, never fallen to the lot of an enlightened Christian physician; for, at the request of the Turkish authorities, he obtained permission from the Russians to enter the service of the Sultan, and thenceforward attended the army of the latter, in its various expeditions in Europe and Asia, during a period of nearly three years. He was honoured not merely with the acquaintance, but the friendship of some of the most eminent commanders and statesmen of Turkey, and became so great a favourite, as to live on terms of intimacy with several Turkish families, whose high respect for his attainments induced them to waive their objections to him as a Christian. With such a talent for observation, and such opportunities, it is not a matter of surprise, that the results of Dr. Oppenheim's labours have furnished a much more accurate view of the state of medicine and surgery in European and Asiatic Turkey, than any before published. It is proper to remark, that Dr. Oppenheim's observations apply only to the provinces and not to the capital; the state of general knowledge and of medicine, is, of course, very different in Constantinople, where the presence of the court has collected and concentrated the few straggling beams of light, which here and there shoot through the intellectual darkness that broods over the vast dominions of the Sultan.

Of the capital Dr. Oppenheim says nothing, but refers us to the account given in *Hufeland's Journal*, last year, by Prince Demetrius Maurocordato, whose description of the state of medicine in Constantinople, Dr. Oppenheim represents as very accurate and satisfactory.

The father of medicine in Turkey was an Arabian, named Lochmann, appointed in the seventeenth century by Mahammed, to discharge the sacred functions of physician. The miracles performed by Lochmann were numerous, and tradition has recorded them in glowing colours; he was a wandering dervise, and taught his art to the brethren of his order, who, retaining to this day the precious secrets he revealed, continue by birth-right to be the practitioners of Turkey.* As might be expected, this religious order of physicians, are greater proficients in superstition than in practical medicine, and except being acquainted with the virtues of a few plants, they absolutely know nothing. It is true, indeed, that they attempt to acquire confidence by appealing to supernatural agency, divination, astrology, talismans, and cabalistic figures.

Sometimes they attribute the origin of disease to the special wrath of God, in others to the interference of devils, but never perform the ceremony of deprecation or exorcism, without a multiplicity of rites and sufficient pay. When money is given in the expected quantity, their prayers are endless, their beads are told *ad infinitum*, papers containing picked sentences of the Koran are sewn together and given to the patient to swallow; or when a fluid menstruum is preferred, the holy words are written with chalk upon a piece of board, this is washed, and the water with which the ablution is performed, forms a draught, potent in proportion to its impurity. Amulets, however, form the favourite charm of the Turks, and over the whole of the east, Mahammedans,† Jews, and

* The Turks, with a happy knack of distorting Frankish names, have confounded Hoffmann with Lochmann. Thus, Hoffmann's liquor they call Lochmann-Rouch.

† The name of the prophet is pronounced *Mahammed*.

Christians, appeal to their protection, when threatened or overtaken by misfortune. Hence, few die without wearing two or three amulets, to whose safe guardianship they had intrusted their lives. These generally consist of a scrap of paper, containing a sentence from the Koran or Bible, embellished with cabalistic figures, and folded in a triangular shape, enclosed carefully in a little bag, and worn next the skin, either by means of a string hanging from the neck, or by being stitched inside the turban. Some amulets, supposed to possess a spell capable of protecting from bullet and dagger, are sold at an enormous price. Thus, says Dr. Oppenheim:—

"After the defeat and death of Wihli-Beg in Monastir, an amulet (Nusko) was found on his body, which he had purchased for sixty thousand piastres. The Selictar (sword bearer) of the grand Vizier, had its virtues renewed by a dervise, and then wore it himself; I asked him how it happened, that the fate of its late possessor had not rendered him sceptical concerning its protective powers. He answered, that nought, save the holy will of the Sultan, exceeded this Nusko in power, and that so long as he who wears it refrains from provoking the displeasure of his sovereign, he is secure against the hottest fire of the enemy, or the poignard of the assassin."

The unsuccessful Turkish suitor, invokes his amulet to soften the obdurate heart of his mistress, and those who are afflicted with ophthalmia, ague, and various other diseases, often place their whole reliance upon the virtues of a scrap of consecrated paper. As the dervises who practise the healing art, can alone infuse power into these amulets, they foster the public credulity, and by selling them at an enormous price, contrive to lose nothing by the confidence of their patients being transferred from themselves to the amulets they manufacture. This is silly and melancholy enough; but after all, while the newspapers of Great Britain advertise every day hundreds of specifics; while there are purchasers in abundance for quack medicines, such as Morrison's pills, which heal every disease; while the aristocracy of the country besiege the door of St. John Long; when a nobleman and a member of parliament, still considered sane by his constituents, has sworn in a court of justice, that St. John Long's frictions caused globules of quicksilver to exude from his skull; when a barrister of reputation in Dublin believes and asserts that the same liniment drew a pint of water from his own brain; when half the community of Dublin believed the miracles of Hohenlohe; when a commission, appointed by a grave and learned society of physicians in Paris, has reported favourably of the miraculous effects of animal magnetism; when we recollect all this, I say, ought we to indulge too freely in ridiculing the Mahammedans for their trust in amulets, or the Turkish matrons for their dread of the evil eye of the stranger, and their belief that all the maladies of their offspring proceed from its blasting influence? Another superstition of the Turks is an observance of lucky and unlucky days for prescribing or taking medicine, and it is singular enough, that they consider Friday, the most unlucky day of the week with ignorant Christians, as the most propitious, while Tuesday is regarded as peculiarly unlucky, and no one thinks either of the exhibition of drugs or the performance of operations, even in the most urgent cases, upon a Tuesday. It was on a Friday that the memorable flight of Mahammed took place, by which his life was saved. Every one in society, who can afford to pay for such useful information, takes care to purchase from the astrologers an interpretation of his destinies, as fixed by the stars that presided over his nativity, and each person has his own lucky and unlucky day of the week. It is well known, that even the mighty genius of Napoleon was enslaved by a somewhat similar superstition. The total ignorance and incompetence of the native practitioners have not altogether escaped the observation of their countrymen, for it has been long ago remarked, that a foreign physician, particularly if he be a Frank, is supposed by the Turks in general, to be possessed of far superior knowledge, and accordingly he is eagerly followed. Whoever appears in any part of Turkey dressed like a Frenchman, an Englishman, or a German; in fact, whoever wears a hat and not a turban, is immediately looked on as the possessor of medical knowledge, and is at once called "Hekim Baschi," and must *nolens volens,* forthwith enter upon practice, for the Turks crowd round him, and hold out their hands that he may feel their pulses, which, in their opinion, is all that is necessary to enable the physician to form a correct diagnosis, and they believe, therefore, that when the pulse has been felt, nothing more is required to give an insight into the nature of their disease, and the proper method of treatment. Others of the crowd, thinking themselves sufficiently acquainted with the nature of their own maladies, seek in the physician only a person to supply them with the remedies they themselves indicate, and accordingly, one applies to him for a vomit, another for a purgative, a third for a medicine to produce wind, another for one to expel it; for the ancient pathology, that diseases are caused by an excess or deficiency of wind in the various organs and cavities of the body, is still common; thus, a headach is caused by wind in the head, dyspnœa by wind in the chest. The physiology of respiration is thus rendered very simple, and the trachea becomes the air-pipe not merely of the lungs, but of the whole body.

The encouragement thus given to foreign practitioners, has generated the greatest abuses, for as there are no means of ascertaining the acquirements of strangers, many, induced by sordid views, embark on a system of barefaced quackery, and thus persons who have followed other employments at home, suddenly become physicians in Turkey. Dr. Oppenheim was invited to attend a consultation with an eminent French physician at Smyrna, who candidly told him, that the only preparation he had for the profession was service in the army as drum major! Among the staff surgeons of the Turkish army, was a Maltese, who had been a letter-carrier at Corfu, and an Italian captain of a merchant vessel, who had been shipwrecked on the coast of Asia Minor. A Genoese gentleman, implicated in the late revolutionary attempts in Piedmont, and who had long served in the army, applied to Dr. Oppenheim, who gave him sixteen recipes, by means of which he was set up in the world, and was soon afterwards appointed physician to the governor of Jambul! Nothing can exceed the heterogeneous materials of which the mass of practitioners is composed; foreigners from all countries, and of all trades, but chiefly Greeks, Jews, and Armenians, the religious orders of all the different forms of worship that are professed in Turkey, besides gipsies, barbers, and old women. Of the foreigners some are well educated, and a few, whose names Dr. Oppenheim mentions, are excellent surgeons and experienced physicians, but such are "few and far between." It is a pity, that the state of medicine is so low in a country, where the inhabitants esteem the medical art so highly, and where all are inclined to respect physicians. By the Turks, a skilful physician is almost ranked as a saint, and the appellation "Hekim," is the surest protection against either religious or political persecution. In the last campaign against the Russians, "often," says Dr. Oppenheim, "was the uplifted sword of the half barbarous Turk arrested on the cry of 'Hekim' being uttered by his vanquished foe." The modern Greeks give the title of Excellency to the physician, and old Homer estimated the value of a good surgeon and physician very precisely, in saying, that he was worth half a dozen colonels!* It may be here mentioned, as a curious fact, that the formation of the immense empire of Great Britain in the East Indies, was, in its infancy, greatly aided by the respect entertained for the acquirements of an English physician named Boughton, the successful exertion of whose medical skill enabled him to obtain from the native princes, what the East India Company had for forty years in vain struggled to possess, the liberty to make a permanent settlement and build a factory. There is a particular district of Greece called Sagor, in the Pascha-

* It is difficult to assign their proper rank to many of the chiefs and minor heroes of the Iliad. In calling them colonels, I mean no offence to the dead.

lick of Janina, where the profession of medicine is, as it were, the national characteristic and the chief occupation of the inhabitants, whose right to practise is hereditary, and whose knowledge consists in recipes and rules of treatment, handed down from generation to generation. Three or four villages in this district are complete medical hives, sending forth their annual swarms of physicians, who spread themselves over Macedonia, Albania, and Rumelia, and, in short, over the whole Turkish empire. They follow the good old Greek fashion, which sanctioned this lazy sort of hereditary diploma, and looked on the descendants of Æsculapius as accomplished physicians from their very birth. In other states, it is not rare to find a predilection for certain trades and manual occupations, which are cultivated almost exclusively by the inhabitants of certain districts, who migrate in multitudes over the whole of Europe in search of employment. Thus, Bavaria supplies broom-girls, Savoy organ-players and bear-dancers, Lombardy her workers in plaister of Paris and makers of images, to all neighbouring and even many distant countries, while in France, every shoe-black is a native of Auvergne, every gate-porter is from Switzerland, and in Spain, every water-carrier comes from Gallicia; formerly, Ireland supplied London with sedan-chairmen, and now with coal-heavers.* It was reserved, however, for *Sagor* to stand forth as the productive mother of doctors, an offspring scarcely less dangerous than that which the soil of Bœotia yielded, when the crop of armed men sprang up before the astonished eyes of Cadmus.

Jewish physicians abound in Turkey, and are not a whit better informed than the Albanians. They wander about the country, with their apothecary's shop upon their back, and are, in fact, perfect medical pedlars. Their traffic is not confined to the sale of medicines alone, for they vend cosmetics of all sorts, soaps, oil of roses, charms, and colours.

* In the reign of Charles the Second of England, the number of Scotchmen who carried on the trade of pedlars in Poland, amounted to 25,000 !—Vide article Pedlar, *Encyclopædia Britannica*.

The poorest of this class carry wallets, and walk the streets and bazaars, at every place uttering the shrill cry "ei Hekim!" "ei Hekim!" (*a physician, a physician.*) Now and then you may see them stopped in the street by some unhealthy-looking Turk, whose pulse they feel, and instantly roar out, "bilirim senin hastalik," (*I know thy disease,*) and without asking the patient a single question, they open their wallets, give him a pill or a powder, which he swallows on the spot, after bestowing on the physician two or three half-farthings (paras) for his advice and medicine! Knowledge came from the East, it has travelled slowly to be sure, but here it has arrived at last, and lo, our fees, formerly paid in gold, are *changed* into silver, and undergoing the rapid process of depreciation, the distinct tinkling of brass may be heard even now by the ear, practised in the sounds of coming events!* As long as the fates permit, let the profession struggle against the adoption of this oriental custom, let it, in this instance, prefer the usages of the West to the wisdom of the East, let it not be said of us, that we are "avari, ambitiosi, quos oriens non occidens satiaverit."†

Strange as may appear the Turkish physicians, they are almost exceeded in singularity by their patients, who require the most extraordinary qualifications on the part of their medical attendants. Thus, nothing so enhances in their eyes the value of a physician, as his being able to tell everything after feeling the pulse. By the pulse alone, he must know not merely the nature of the disease, but be able to say whether the patient slept well the night before, what he ate during the day, whether the bowels are open, &c., &c. After having once felt the pulse, the physician must put no question to his patient, for it is considered as a sign of ignorance: at his very first visit, he must declare, from the pulse, at what precise time the patient will die or recover. The governor of Adrianople, Halisch Pacha, once visited the tent of the Russian General, Paulin, where Dr. Oppenheim

* Coming events have shadows, why not sounds?

† Tacitus—*Agricolæ Vita.*

and two other physicians were attending at levee. Each of the three successively was presented to the Pacha, who made them feel his pulse; and when the ceremony was over, he immediately declared, that one of them was incomparably a better physician than the others, "for," said this wise Pacha, "he felt my pulse much better!"

"Often," says Dr. Oppenheim, "on presenting my passport to a Turkish officer, the moment he read the words '*Hekim-Baschi*,' has he turned out the guard and drawn them up, in order that I might feel the pulse of each. This, of course, I used to do with vast gravity and apparent attention, and the men were quite pleased upon being informed that they were in excellent health!"

Many of the knavish Greek physicians pay the domestics to give them private intelligence, concerning the diet, evacuations, and habits, of their patients, whom they afterwards impose on by making them believe that their sole source of information was the state of the pulse. When the physician, by means of the pulse, has declared the precise nature of the disease, and the exact moment of its termination, the Mussulman requires him to give a certain medicine, to have a particular effect in determining some evacuation, which is to prove critical. No medicine gets the least credit, or in their eyes can be the least effectual, unless it produce sweat, urine, or purging. The Turk is fond of large doses, in order to produce more decided crises, and he always prefers medicine in the shape of a draught, or rather drink, (sherbet). He dislikes emetics, and nothing will induce him to allow the exhibition of an enema. It is quite vain to endeavour to make him alter his diet, of this he cannot conceive the use. In the month of May, it is not unusual for the Turks to submit to what is termed the spring cure. An active purgative is first taken, and afterwards the expressed juice of certain plants, such as Taraxacum, various grasses, &c., are taken daily, along with a drink of whey. The favourite purifier of the blood, however, is *viper broth.* The most esteemed vipers are caught in the neighbourhood of Adrianople, and are sent thence in great numbers to Constantinople, and other parts of the empire. They are kept in wooden vessels, and when wanted for use they are drawn out through the bung-hole. It is needless to remark, that this operation requires much caution and skill, in spite of which, as happened in an instance witnessed by Dr. Oppenheim himself, the poor apothecary is sometimes bitten. The bite often, but not always, proves troublesome, or even fatal. When this dangerous article of the materia medica has been safely extracted from the vessel, his head and skin are instantly taken off, and the animal is cut into thin slices, which are boiled with water to make broth. The principal means employed either for the prevention or cure of diseases by the orientals, is the bath (*Haman*). The long-continued frictions employed, the stretching, drawing, kneading of the limbs and flesh, the pulling and working of the joints, &c., all tend to exercise a healthful influence; it is astonishing what a command over the joints an experienced attendant at the baths possesses. He twists them in every direction, and the bather feels almost as if he had performed on him a number of successive dislocations and reductions, following each other with surprising rapidity. In chronic diseases of the skin, gout and rheumatism, these baths are held by the Turks to be of great value.

The public baths are very handsome, capacious buildings, of which there are several in each town. The bather undresses in a large and spacious hall, provided with benches, and having a fountain playing in the centre. He ties a silken girdle round his loins, and puts on a pair of wooden sandals, and is then introduced into the first chamber, which, like the rest, is lighted from above, and is flagged with marble. Its heat is moderate, and is intended to prepare the bather for the higher temperature ($99\frac{1}{2}°$ Fahr.) of the second chamber, which is arched, and has the flags all heated from below. In the centre of the second chamber is an extensive platform of marble, elevated about a foot above the floor, on which the bather stretches himself at full length, while the attendant goes through the various manipulations already spoken of. These being finished, he proceeds to one of the numerous alcoves or recesses with which the chamber is provided, and here the process of bathing, properly so called, begins; warm water flows from a pipe into a marble basin, the bather sits down naked on the warm floor, and his attendant, with a piece of cloth made of camel's or horse's hair, which he dips frequently into the water, forms a lather of a sweet scented soap, and with this he rubs every part of the body; and finally, pours warm water over the bather and so completes his purification. The bather is then covered with warm cotton cloths, and conducted into the outer hall, when he lies down for half an hour on a bench, takes a cup of coffee or a glass of sherbet, and then dresses himself.

The expense of such a bath is so trifling, that it is in the power of even the poorest Turks to make use of it. Everywhere the baths for the different sexes are in different parts of the town. To the women they afford not merely the luxury of bathing, but the opportunity of meeting their friends and acquaintances. These baths have been described by Lady Wortley Montague, in colours more glowing than might appear seemly in the pages of a scientific journal, and therefore, it may be prudent to omit the subject altogether, merely observing, that, as is natural, they are the chief strongholds of gossip and scandal, and afford the anxious mothers ample opportunities not merely of showing their daughters to other matrons, but of seeking wives for their sons. In Turkey, the practice of letting blood in spring, formerly common in Great Britain, is still prevalent.

With regard to the manner in which the more respectable part of the medical profession is paid, it evidently evinces a great want of confidence, or rather extreme distrust. In England, it is commonly believed, that the word of a Turkish gentleman or nobleman, once given, may be implicitly relied on; but it is too clear, from the narrative of Dr. Oppenheim, that a most lamentable want of principle prevails even amongst the upper ranks. Woe to such a nation, for mutual distrust among individuals prevents all unity and energy of action on the part of its rulers; private corruption inevitably portends the public downfall.

"There is," as Burke beautifully remarks, "a confidence necessary to human intercourse, and without which men are often more injured by their own suspicions, than they could be by the perfidy of others."

The sick Turk, says Dr. Oppenheim, makes promises; the convalescent Turk breaks them. In consequence of this disposition, the physician is often obliged to draw up a specific contract in writing, and according to a legal form, before he undertakes the treatment of a case, or the performance of an operation. The contract is deposited in the hands of a magistrate, who can enforce payment, and whose zeal in the discharge of this duty is quickened by the legal fee of ten per cent., to be deducted from the stipulated sum. It is not very rare, however, for the patient to evade the ends of justice by paying the magistrate twenty per cent.; when this is done, the physician's contract too often proves but waste paper. These contracts, however, in general afford the physician tolerable security, and are especially necessary when capital operations are performed, as without them, in case his patient dies, he may lose, not merely his fee, but his life; for the Turk considers the knife of the surgeon in the light of a weapon wielded by an enemy, and thinks himself called on to avenge the death of a relative after an operation. This is hard enough upon the poor surgeon, who, to avoid more fatal consequences, is often obliged to pay blood-money to appease the wrath of relatives. To avoid these consequences, the surgeon and one of the nearest relatives of the patient, repair together in the first instance to the *cadi*, if it be a small, or to the *mufti*, if a large town, and obtain from him a protection (*fetwa*), by which the surgeon is secured against all persecution if the patient dies. Dr. Oppenheim, himself, felt the force of this Turkish antipathy to the performers of unsuccessful operations. After the battle of Monastir, on the 24th of August, 1830, he amputated the leg of a wounded Deli:* the Deli died. In a few months, Dr. Oppenheim was sent by the Grand Vizier to inspect recruits at Pristina, and was invited to the house of the Cadi.

"After the customary compliments, he asked me, 'Are you physician to the Grand Vizier? Did you operate on the Deli, Soliman-Aga?' I answered in the affirmative. 'Then,' said the Cadi, 'you behold here the father of Soliman-Aga, who claims blood-money from you, which money it is most just you should pay him.'"

Dr. Oppenheim being sufficiently acquainted with the usages and manners of the Turks, and depending upon the protection of the Vizier, was no way intimidated, and by means of a few wholesome threats, soon brought both the Cadi and the father of Soliman-Aga to reason.

When a physician has treated a patient who dies of internal disease, he incurs no risk, unless the deceased held some important and lucrative government post; in such cases, the relatives and dependants of the deceased, being deprived by his death of their station and emoluments, are apt to wreak their vengeance on the physician, who, however, generally takes care to be out of the way on such occasions. At other times, medical men are employed to give opinions, concerning not the living but the dead! This may appear strange, but it is the fact, and it is for such opinions that they are sure to be best paid, for they have it in their power to make what conditions they please with their employers. In Turkey, whenever a governor of a province, or a mufti, or any other *employé* of the Government dies, the whole of the treasure in his possession immediately finds its way into the coffers of the state, therefore it becomes an object of paramount importance for the family to conceal, if possible, the death of their relative, until they have either made off with his money, or what is a safer method of proceeding, until they have used one portion of it to bribe the members of the

* The Delis form the flower of the Turkish cavalry. They are so called from their frantic impetuosity in battle, the word Deli meaning *madman*.

divan into conniving at their keeping the remainder. The father of the present Pacha of Uskup, it is now ascertained, was buried four years before his death was announced. During the interval, his son had carried on the public business in the father's name, and the signature of the latter was affixed to all official documents. Throughout this period, medical advice was sought for in every quarter, and eminent physicians were brought even from Constantinople. They were consulted, but for obvious reasons were never permitted to see their patient, a matter esteemed of little consequence in Turkey, provided the state of the pulse is accurately described.

"I must confess," says Dr. Oppenheim, "that being at the time but little acquainted with Turkish manners, I was anything but pleased upon being sent for by Abduraman, the Pacha of Kalkandehl, to treat some patients in his harem. I was received by the Pacha with all those marks of distinction, which the Turk of consequence bestows on a Christian physician, when he has occasion for his services. After he had complimented to excess myself individually, and had extolled the wisdom of the Franks generally, he informed me that his whole harem was sick, but that with my aid, he had little doubt that his three wives would be speedily cured. The first lady I visited was about twenty-four years of age, who laboured under catarrhal fever. I promised to cure her in a few days. The second was nearly twenty years old, and of a well marked strumous diathesis. She laboured under a chronic ophthalmia and herpetic eruption. My prognosis was, in her case, more cautious, though favourable; but I specified no fixed period for her recovery. In the third apartment lay a lady about thirty years old, who had anasarca and ascites, and was in the last month of pregnancy; her breathing was so much affected, that I feared also the existence of hydrothorax. As I afterwards learned, three months previously she had used the strongest medicines to produce abortion, but in vain, and in addition, she had for the last year been afflicted with a badly treated ague.

These circumstances led me to suspect organic disease of some of the abdominal viscera; I say suspect, for no examination of the abdomen would be permitted. I told the Pacha that she would probably be delivered of a still-born child, and that she would not survive its birth many days. *Bakkalom! Allah Kaerim! Insch Allah!* (we shall see; God is great—God be merciful) exclaimed he, and inexperienced as I was, I little dreamed that these were mere stereotype* expressions. The Pacha appeared to take the liveliest interest in this lady's state, and required me to feel her pulse four times a day, and to send him as often a report concerning her health. Whenever I spoke to him on the subject, his uniform reply was, 'Give her, I beg you, the best medicines that you have; right strong medicines, and she will yet recover—God is great!' The dreaded day came at last; she was delivered of a dead child, and in two hours the harem resounded with the cries of the female slaves. In the east, the females are the first to announce either joy or sorrow. If anything happy occurs, they utter a cry of joy, modulated by a rapid and quivering motion of the tongue against the palate and teeth. When sorrow is to be expressed, the cry is longer and sharper: the shrieks of the slaves in question were decorously loud and protracted, and they rent their garments and tore their hair. I sought not to be the first bearer of the news to the Pacha, whose anger I dreaded; when I arrived at his apartment, I found that he had already learned the sad news, and I felt greatly astonished at finding the man, who had been all anxiety and alarm at my former visits, now quite composed and tranquil. When I entered, he exclaimed *Allah Kaerim.*"

In the course of a short time, all the courtiers and principal officers had come in successively, each, as he entered, using the same invariable phrase addressed to the Pacha, "she is dead, thou shalt live."

The mother and child were consigned to the grave before evening, for in Turkey, among the great, there is no lying

* In the original "*diese stereotypen Ausrufungen*," stereotype exclamations—a strong and original expression of Dr. Oppenheim.

in state; among the poor no waking. The believer in the Koran hastens to inter the body of his relative, with as little delay as possible, for every moment that the body remains above ground, is spent by the soul in agony. The corpse is wrapped in cerecloth, and committed without a coffin to the grave. The grave is about two feet deep, and is covered over with boards, on which the earth is heaped; the head of the body is turned towards Mecca. This practice of burying so quickly, must, in many cases, occasion persons to be buried alive, for it is followed by the whole population of the country, Jews and Christians, as well as Mahammedans. The day of his chief wife's death was marked by no unusual occurrence in the house of the Pacha. The inmates conversed, followed their occupations, and eat their meals just as if nothing had happened: one alteration was indeed observable; during the lady's illness, every one had spoken of her state, and evinced the greatest sympathy for her sufferings, now not a syllable was uttered about her. It was the same in the harem, where Dr. Oppenheim, who had now learned the use of the expression, "she is dead, you shall live," found the other two wives of the Pacha very well pleased at what had happened, for they said that their departed friend, who, as the eldest, held the reins of authority in the household, had not led them a very comfortable life of it. These ladies made Dr. Oppenheim a present of garments embroidered in the harem, and the Pacha, well contented with his services, sent a guard of honour to accompany him two days' journey from his residence.

Apothecaries there are none in Turkey, and no shops for the sale of medicine, except at Constantinople, and one or two other large towns. Indeed in a country, where the physician is seldom able to write, such shops would be useless. Every physician, consequently, compounds the medicines for his own patients, and is surrounded in his office by a chaotic confusion of gallipots, pill-boxes, drugs, &c. The labels are most curious, and present a truly polyglot assortment of

Greek, Latin, Hebrew, Italian, &c. The correctness of the orthography and grammar of these labels, may be judged of by one specimen, "*unguenti diversi,*" which adorned a box in one of the best shops in Adrianople. Good medicines are to be had at Smyrna, Salonica, and Constantinople, to which places they are imported from Marseilles, Trieste, and Venice; as they find their way into the interior, they are more liable to be adulterated. Where there exists nothing like a medical police, nor any check upon such malpractices, and where no restraints are placed on the sale of poisons, it may be readily conceived that poisoning by design and poisoning by accident are very frequent. Indeed, it occasionally happens, that a patient coming to a doctor, gets medicine weighed in a scale still soiled with corrosive sublimate or arsenic, in quite sufficient quantity to dispatch the unfortunate sufferer. Often too, it happens, that inexperienced beginners and ignorant pretenders, give powerful medicines in poisonous doses, in which case the writhings of the patients are interpreted as symptoms of their being possessed, and forthwith the Turkish dervise and the Christian priest are in requisition, and proceed simultaneously with their different forms of exorcism. The precaution of having recourse to the rites of two different religions, is taken to avoid the possibility of mistake or failure, for say they, we cannot *a priori* tell, whether our friend is possessed by a Mahammedan or by a Christian devil.

Poisoning by design is still more frequent than poisoning by accident, and our good honest Irish practitioner, who regards the oath of Hippocrates to be quite as unnecessary as the oath he is obliged to take against the Pretender, will understand better the necessity of many of the clauses ascribed to the father of physic, when he is told, that in the east, the physician is to this day, too frequently the venal instrument of such heinous malpractices. Indeed, according to the religious views of many Turks, it is no sin to give poison to an enemy, for the attempt will assuredly fail, if he is not fated so to perish! Besides, it is merely a measure of self-defence, for if you do not anticipate your enemy, he is sure to poison you.

"Melancholy as it is," says Dr. Oppenheim, "to witness such mischievous misinterpretation of a Mahammedan dogma, it is still more melancholy to see persons who profess Christianity engaged in the same guilty course, for it cannot be denied that too many of the native Christians of the Greek Church, are willing agents upon such occasions. In truth, no honest person ought to engage himself as domestic physician to any great man in Turkey, for if he be called on to poison, and refuses, it may cost him his life. Of this I myself had a convincing proof. The late campaign of the Turks against the Albanians was brought to a successful conclusion, not by superior courage, numbers, or discipline, but by craft and treachery. Two of the most powerful foes of the Sultan, Whely Bey, and Asslan Bey surnamed the Lion Chief, were invited, during a truce, to witness a review of the Turkish regular troops, which to them was a matter of great interest and novelty. The Vizier had it so arranged that they were both shot dead as they were passing in front of one of the battalions. The Vizier's son, Emin, Pacha of Janina, ensnared and dispatched some of his most formidable opponents in a nearly similar manner at Janina. One evening, at levee, the Grand Vizier made a sign for me to remain; and when all the courtiers had left the room, he ordered in coffee, pipes, and a chess board, and I then found myself alone in company with a man, who expected and received unconditional obedience from every one of his attendants, and at whose nod more than one hundred thousand heads had fallen. Having signified that I should be seated on the divan, he smoked, but according to etiquette, I left my pipe untouched; and when we had made a few moves at chess, he raised his head, looked fixedly into my eyes, and said, 'Hekim-Baschi, I have enemies, you can, and will assist me!' He then made the sign for me to retire, which of course precluded the possibility of my replying. I made my obeisance, and rode home greatly agitated and alarmed, for the meaning of the Vizier's words was but too intelligible. At that time I was attending two Albanian Chiefs of note, who were afraid to trust themselves to the care of the Vizier's physician, and who had applied to me as an officer of the staff for advice. The Vizier was aware of this, and wished me to dispatch my two patients. I revolved in my mind the difficulties of my situation, and saw no other method of escaping than by making large pecuniary sacrifices, in the way of bribes, to the Vizier's avaricious *Seraff* (Pay-master), and his *Grammatiko* (Secretary). In the meantime I feigned sickness, and remained at home. Twelve days had elapsed since my interview with the Vizier, and nothing remarkable had occurred. On the morning of the thirteenth day, my servant brought in my pipe and coffee as usual; I had nearly finished the cup when I perceived an unpleasant taste, which excited my suspicion; I immediately took an emetic, and hurrying to the apothecary of the forces, he immediately recognized in the cup nearly two drachms of corrosive sublimate, upon which I swallowed the whites of several eggs, and experienced no further bad effects. Though the favour I enjoyed at court, and the prominent station to which I had been advanced in the medical department of the army, had made me an object of envy to many, each of whom might wish to see me removed, yet it was but too evident, that the blow aimed at my life had descended from a higher quarter, and, accordingly, I used every exertion to obtain a passport (*buerouldi*), and, at last succeeding, hastily quitted Turkey."

Such attempts as that made on the life of Dr. Oppenheim are very frequent in Turkey, and are too often successful. Hence, it is usual, when speaking of any one who has become remarkable for power, influence, or wealth, to observe, "*He will probably soon die of poison!*" Hence, also, the avidity with which the rich cultivate the friendship of every newly-arrived physician, particularly if he be a Frank. They are anxious to purchase his services, in order that he may not be employed by others to poison them. Of course, where poisoning is so frequent an occurrence, the feelings of a

Turk of rank are by no means enviable, especially when he is sick. It is then that he suffers mortal fear of being poisoned, and to prevent such a disaster, he always takes the precaution of making either the physician or a slave take part of the medicine by way of trial. The illness of the master thus sometimes undermines the constitution of the slaves, who are found in this extraordinary service to undergo a long-continued series of vomitings and purgations. Of course, they at least must offer up sincere prayers for his recovery. When a bottle of physic is opened, and the dose measured out, it is again immediately sealed up with the master's private seal, to prevent the introduction of any poison. It is for this reason also, that the Turks are so fond of getting medicine from the hand of the physician who has made it up, for they thus render him responsible for its effects. In this country, such a precaution, would perhaps only render a patient more liable to be poisoned. Our author next relates the particulars of a visit to another harem, which are so characteristic of Turkish manners, that I cannot refrain from giving the details in his own words:—

"Like everybody else, I felt a strong curiosity to get a peep at the beautiful females annually imported in such numbers from Georgia and Circassia to Constantinople, where they are brought at a very early age to be sold and distributed all over the empire, to serve their masters as servants or as mistresses. I was also extremely anxious to witness the domestic arrangements of these little female colonies: fortune was propitious, and soon afforded me the desired opportunity. The favourite wife of Kiaja Bey, an officer high in the confidence of the governor of Adrianople, fell sick. The Pacha, who had great confidence in me, recommended my services, which were accepted, and a black eunuch was sent to my quarters to accompany me to the harem. It lay about an English mile from the residence of Kiaja Bey; we first knocked at a small wicket, which was opened, and on entering, we found ourselves in a garden, tastefully ornamented, and containing a light and airy summer-house, near which the cooling waters of a fountain played into a beautiful basin of white marble. I was directed to seat myself near the fountain, and was immediately served with a pipe and coffee, while preparations were made in the harem for my reception. In a quarter of an hour, I was conducted through the garden to another door, which was opened by a female covered with a veil, who, it seems, was the guardian and turnkey* of the harem. I was now led through another garden to the building of the women, which was evidently very populous, and I could distinguish the curious faces of children and slaves, white and black, peeping at me in every direction. At last the door of the sick lady's room was opened, and I entered into a very handsome but small apartment, with closed blinds, and hung in red. The patient lay on pillows, placed on the carpet near the divan, and was so entirely covered from head to toe with white cloth, that I could only guess that she was present. I seated myself on the divan, close to her head, and now all unnecessary attendants were ordered to withdraw, so that I was left in company with my patient and the interpreter†—the matron already spoken of, and two little children of the sick lady. All the questions I asked were answered from under the cloth, with simplicity and clearness, and many of them, which, in some of our young ladies, might have excited *mauvaise honte*, were replied to in the most natural and easy manner. On my desiring to feel her pulse, one small white hand, and then another, made its appearance from under the cloth, and when I asked to see her tongue, she raised the cloth, so as to disclose the face of a beautiful brunette, about twenty years of age. This last act, apparently, was an effort which shocked the prejudices of my fair patient, for immediately, like a snail that suddenly withdraws itself into its shell, she shrunk back under the cloth, and I then quitted

* This is not exactly the word used by Dr. Oppenheim—it seems, however, appropriate.

† Probably the black eunuch.

the apartment, and having put some necessary questions to the matron, I was brought into the *selamlick* or the *boudoir* of the master of the house, where I was again regaled with a pipe and coffee.

"Quite pleased with this visit, I was brought into the presence of Kiaja Bey, who, on being informed that if my patient followed the prescribed directions, she would be well in a few days, ordered me to be honoured with a pipe and coffee, and a purse of five hundred piastres. My prognosis was confirmed, and the recovery of the lady contributed greatly to raise me in the estimation of the Pacha."

Dr. Oppenheim's other visits to harems were not always so agreeable as that just described. Although this section of our author's work can scarcely be considered as strictly medical, yet the information it contains is so novel, and so highly illustrative of Turkish manners, that I cannot resist the temptation of transcribing it:—

"The Pacha, for several days in succession, required me to prescribe for a patient, whose name, sex, or age, he would not tell; and concerning whom I got no other information than that the person in question complained of pain in the head and palpitations. I, of course, guessed that my patient was a female, but, nevertheless, for several days refused to prescribe, until told my patient's sex, age, appearance, &c., &c., alleging truly, that without being made acquainted with these particulars, my medicines might do more harm than good. My obstinacy extorted from the Pacha a confession, that the patient was a lady about thirty years of age, who had been ill nearly a year. Conjecturing that her ailment was hysterical, I prescribed nervous draughts, but finding she did not improve, I soon refused to send any more medicines. The credit I had obtained by the cure of Kiaja Bey's wife at last prevailed, and the Pacha acknowledged that my patient was his own wife, and consented that I should visit her. She resided at a considerable distance, and when I arrived at the gate of the harem, I was kept waiting outside for at least a quarter of an hour, in order that everything might be arranged and properly concealed from observation before I entered. When the gate was opened, I was received by the matron of the harem, and conducted through the house to a door, when we again stopped; presently it was half opened, and two tall negresses wearing veils came out, and placed themselves one at each side of the door, which they again nearly closed, leaving space enough to admit one's arm. Through this aperture a hand made its appearance, emaciated, and painted of various colours; the nails were stained bright yellow, while each finger, as far as the first joint, was painted green on the back, and black on its other side. I felt the pulse for some time, but the moment I withdrew my finger from the wrist, the hand and negresses vanished, and the door closed. I was now called on for my diagnosis, prognosis, and plan of treatment. It was in vain that I requested the matron to make me acquainted with other particulars of the case; her invariable answer was, "Thou hast felt the lady's pulse, and must now know all!" At last, after a persevering system of interrogatories and cross-examination, I was enabled to elicit that the patient had a cough and expectoration, and above all, that she was blind! It was for this blindness that she sought advice, and it was this disease that I was expected to recognise by feeling the pulse! I now explained to the Pacha the utter impossibility of curing the defect of vision, without previously examining her eyes. He obstinately refused permission to do this, but still insisted upon my giving some medicines. With this request I complied at last, and sent powders composed of white sugar, &c.

"I did not fare much better in a visit I soon after made to a third harem. I was received with the customary ceremony, and treated with the usual hospitality; walking in the garden with the husband of the sick lady, I asked him concerning her symptoms. He answered that he knew nothing about them, but that the information I required was not necessary, for he intended to let me feel her pulse. I found her lying on the floor supported by pillows, like the lady I had first visited, but much more scrupulously covered and concealed from view, so that indeed it seemed scarcely credible that such a mass of pillows, bolsters, and shawls, could be piled on a human being. I was not permitted to ask any questions, but when I was seated beside the patient, her husband said, 'the physician is there;' whereupon the hand and arm, most carefully shrouded and covered, except at the wrist, where a bare space was left for the finger of the physician, were protruded from the mass of pillows. When I had felt the pulse I was conducted out, and it then took me more than an hour to obtain answers to the necessary questions; for a special message had to be sent into the harem to inquire about each particular symptom and circumstance, such as the patient's sleep, the state of her bowels, thirst, uneasy sensations, &c., &c. In the end, it turned out to be a case of simple catarrhal fever, and yielded to a sal-ammoniac mixture.* During the three years and a half I practised in Turkey, I had at least an hundred attendances in harems, and have always found that the young and beautiful are the least careful of concealing themselves from view, while it was always impossible to get a glimpse at the more elderly and faded. When the veil is allowed to perform its duty undisturbed during the whole of his visit, the physician may be be sure that the wearer's beauty is on the wane. The jealousy of the husband seems to increase with the number of his wives, and when his harem contains but one, the physician is admitted with more facility. Still it is not in the power of any husband to prevent the visits of the physician, for, let his jealousy be ever so vigilant, it will be eluded, and, as a last resource, the lady has nothing to do but fall sick during her visit to the bath, and send for a physician; at certain periods, the use of the bath is inculcated by the Mahammedan ritual, and no husband dare, therefore, debar his wives from this enjoyment. When a physician has a patient

* The muriate of ammonia is much used in Germany, in various febrile and chronic complaints. It appears to be a remedy deserving of attention, and I shall therefore take an opportunity hereafter of explaining its medicinal virtues.

in a harem, it is his duty to send every morning to inquire how her ladyship (*channem*) has slept, &c. In answering the enquiry, the lady informs him at what hour it is her wish to see him. This ceremony goes on until the patient recovers, when the physician receives, in token that his services are no longer required, a present of a silk shirt, a pair of silk trowsers, an embroidered girdle and handkerchief, and a pair of knit socks. This present is a mark of the lady's gratitude.

The Turks have a very different taste with regard to female beauty, from the inhabitants of the more northern parts of Europe. An excessive *embonpoint* is an essential ingredient in the composition of a Turkish beauty, and, in general, by means of taking little exercise, frequent bathing, and over-eating, their ladies attain, at a very early age, a rotundity of figure, which, to a German eye, appears anything but attractive. Black hair and black eyes, with black eyebrows running together over the nose, are highly valued, and when nature has not conferred these attractions, the aid of art is invoked, the eyebrows are stained, and the skin between them painted of an appropriate colour. A Turkish beauty must not have a single hair on any part of the body, except the scalp and brow. In the baths, their female attendants spend hours in removing the forbidden hairs, not by eradication or shaving, but by means of a composition which softens, corrodes, and destroys them, after which the whole surface of the body is rubbed and polished by means of a powder, consisting of alum and other ingredients. When this process has been successfully and skilfully performed, and when the nails of the fingers and toes have been stained orange by means of the leaves of henna (*Lawsonia inermis*) then the Turkish beauty is irresistible in the eyes of all true Moslems."

The Turkish ladies make use of a cosmetic which Dr. Oppenheim strongly recommends to such of our fashionables as are in the habit of employing the deleterious substance called *rouge*. It consists of a peculiar preparation in the form of a powder, derived from the bulbs of the *Iris florentina.* The bulbs are dried and powdered, and the powder is macerated in water, after which it is squeezed through fine soft linen. This is twice repeated, and the residual powder which remains in the bag is carefully dried and kept in bottles. A little of this powder is placed on the cheek, and the part is then gently rubbed for several minutes with the palm of the hand; a sensation of heat in the cheek is thus produced, which is accompanied by a natural-looking red blush, which lasts for several days without fading, and is not spoiled by perspiration or heat. The antimonial cosmetic which they call *surmeh,* is used for dying the eyelashes and edges of the eyelids, and they dye the hair of a beautiful black, by means of a paste formed with burnt nutgalls, boiled with vinegar, and applied very hot. The pulvis depilatorius, *rusma,* so generally used in Turkey, consists of orpiment and quick lime, and is applied, as was before observed, for the purpose of destroying the hairs of the axilla and of other parts in females. It is formed into a paste with warm water, and laid on in a thin layer, which is then washed off in a few minutes. It does not destroy the roots of the hair, and consequently does not prevent its subsequent growth. Another preparation, used for the same purposes, and whose active ingredients are the same, is called *oth;* in consistence it resembles very fine aluminous clay, and is made into a soft mass by means of trituration with scented soaps and rose leaves.

Although moderation in both eating and drinking is very general among the Turks, and the use of wine is forbidden by their religion, yet it does not appear that they are longer lived than any other European nations. The inhabitants of Chios* indeed, both Turks and Christians, are celebrated for their longevity. Dallaway conversed with a bridegroom in Chios, who was 120 years of age, and whose son, then an octogenarian, had just been felicitated on the birth of a child.

* This beautiful island counted 90,000 inhabitants in 1822, before the devastations of the Turks, who destroyed 89,000.

The belief is almost universal in Turkey, that such a thing exists as an *elixir vitæ*, and even Ali Pacha, the celebrated tyrant of Janina, employed a company of alchymists for five years in his fortress, during which time they worked diligently in search of an elixir capable of prolonging life. They failed, and Ali, enraged at the expense he had so foolishly incurred, hanged them all.

"The oriental women are like hot-house plants, which blossom quickly and quickly go out of blow; at ten they menstruate, at twelve they marry, and at thirty the catamenia cease. There is with them no intermediate stage, no twilight to soften the abruptness of the passage from youth to old age."

Dr. Oppenheim makes an interesting remark on this subject. He says that this early development depends not on climate, so much as on the race of mankind. Thus among the Bulgarians, a Sclavonic race, who have settled in Turkey, the females menstruate late, and seldom marry before five and twenty or thirty, while, on the other hand, among the Jews, settled in the north of Europe, in Russia and in Poland, the females arrive at puberty two or three years sooner than the Sclavonic inhabitants of the same countries.

Although the Turks are naturally a strong, healthy people, yet, at the present moment, the population is far from being on the increase, a circumstance which may be accounted for by the prevalence of certain habits and customs, such as polygamy, and the abuse of coffee, opium, and tobacco. When to this we add the amount of native blood shed so abundantly under a government long tottering and unstable, and the devastations of the plague, it is easy to credit the assertion of Dr. Oppenheim, that the population of Turkey undergoes a considerable annual diminution. In Turkey the mortality among children is very great, in consequence of inoculation being much more generally practised than vaccination. In the Asiatic provinces indeed, inoculation is almost exclusively employed, and this operation is intrusted to old women, who perform it very adroitly. A great number are carried off by the small-pox, which Dr. Oppenheim partly attributes to the heating regimen of medicines employed for its treatment. He mentions that in Tunis, it is usual, in this disease, to rub the whole surface of the body with fresh butter, in order to soften the skin, and facilitate the appearance of the eruption, and he observes that the custom so prevalent in hot countries, of anointing the body with oil, fat, or butter, is founded upon the experience of its utility. Thus Burckhardt, the celebrated traveller, assures us, that when exposed to the heat of the sun, he experienced great refreshment from oily inunctions, and when tired by a long day's journey, he used to feel benefit from rubbing his feet with butter. Dr. Oppenheim reserves for his forthcoming work, numerous proofs of the utility of oily inunctions in the plague and in dysentery, and he remarks, that in military hospitals they have the additional advantage of destroying pediculi.

The scarlet fever commits frequent ravages in Turkey; the following remarks by Dr. Oppenheim are well worthy of attention, and prove that the prophylactic virtues attributed to belladonna, merit further investigation:*—

"At Monastir, in 1829, scarlatina raged, both among our troops and the inhabitants of the towns and villages where we were quartered. The Grand Vizier, who had expended much time and money on the discipline of this his favourite *corps d'armée*, gladly accepted my proposal to try the effects of belladonna. As the soldiers were generally very young men, and totally unaccustomed to narcotics, the dose I gave was comparatively small: thirty-six grains of the extract of belladonna were mixed up with one pound of the extract of liquorice, and ten grains of this compound were given every morning and evening to each soldier. The success of the experiment far exceeded my most sanguine expectations, for after this plan was adopted, not more than twelve men out of twelve hundred sickened; of these twelve, six died, and it is to be remarked, that the disease continued unabated among the inhabitants of the district where the soldiers were quar-

* Brande, in his *Pharmacy*, scouts the idea of its prophylactic powers.

tered, after it had ceased among the latter, although they lived in the same houses."

This experiment appears almost conclusive, and should encourage a further trial of the same practice. I had lately an opportunity of putting this prophylactic property of belladonna to the test, in the case of a young gentleman whom I attended along with Dr. Jacob, and who was at the very crisis of a violent purulent ophthalmia with ulcers of the cornea, when scarlet fever made its appearance in the family. In his extremely reduced state, a new disease would have destroyed his eyes, if not his life. We immediately put him and his brother, who was recovering from common fever, on the use of belladonna, and they both escaped scarlatina, while two other children were attacked. It is true, that after the first case of scarlatina had appeared in the house, our patients were separated from the rest as carefully as it was possible to effect in a numerous family; the evidence is, therefore, so far incomplete, and indeed no positive inference can be drawn from an experiment on so small a scale.

The following interesting observation concerning the epidemic of scarlet fever at Monastir, deserves notice:—

The disease commenced invariably with symptoms bearing all the characters of the true inflammatory type, and consequently some of Dr. Oppenheim's colleagues were tempted to make use of very energetic antiphlogistic measures—measures sure to be followed by a typhous state, which generally ended fatally. A few years ago it would have been very injurious to any writer's reputation, even to hint at a typhous state being induced or accelerated by antiphlogistic treatment, in the commencement of any disease whatsoever. The Brunonians, who treated all febrile diseases with stimulants and opiates, were scarcely more destructive practitioners than their lancet-wielding successors. As in most controversies, truth lies between the extremes. It is singular enough that Dr. Oppenheim did not see a single case of measles during his residence in Turkey; nor had any of his medical acquaintances, several of whom had practised many years in that country, ever witnessed one.

Urticaria and herpes, the latter particularly in the form of *herpes zoster*, are very frequent in Turkey, as are also miliary and petechial eruptions, neither of which are dangerous, unless when symptomatic of the plague.

Of chronic cutaneous complaints, the most common are impetigo, porrigo, and scabies, all of which are treated by the popular remedies, oily inunctions and sweating baths. Worms, and the diseases they produce, are very common among the Turkish children. A popular remedy is a powder formed of the kernels of wild apricots, a fruit which grows in great abundance in Asia Minor. A decoction of the seeds of the *Ricinus*, which Dr. Oppenheim says is indigenous in Turkey, is also used in worm complaints. Tape worm is very common, and every town has its quacks, who vend specifics for its expulsion; and, in truth, as Dr. Oppenheim testifies, they often succeed. It is from the Turks that we have lately learned the properties of the *brayera anthelmintica*. Acute hydrocephalus is almost universally mistaken for worms, and is by no means unfrequent. At Janina Dr. Oppenheim performed the operation of paracentesis in the case of a boy a year and a half old, who laboured under chronic hydrocephalus. The operation excited the astonishment of the whole harem, and was repeated six times at intervals. The head diminished in size remarkably, and the child recovered—a very rare but not unexampled occurrence. Hooping-cough is common and very fatal, particularly when it coincides with dentition; scarification of the gums is frequently resorted to when dentition is difficult and painful. Scrofula, rachitis, bowel complaints, tabes mesenterica, and protuberant bellies, are much less common among Turkish children than in other countries of Europe, a circumstance which Dr. Oppenheim attributes to their using a nourishing diet, consisting chiefly of rice, and to the more free ventilation, which the mildness of their climate permits them to enjoy in their houses.

Sedentary habits, an immoderate use of strong coffee, and an over-indulgence in sensual gratifications, render the males among the higher classes of Turks very liable to hypochondriasis, while among the females of the harem, hysteria reigns with despotic sway.

"The chief causes of hysteria are a sedentary life and confinement, restraints with respect to intercourse, the too frequent use of warm baths, the interference of unskilful midwives during parturition, and the too common habit of taking medicines to procure abortion. Barrenness is the greatest misfortune that can befall a Turkish wife, as it entails contempt on the part of acquaintances and neglect on the part of husbands, which often ends in their putting away their wives,—an irreparable calamity, for a woman divorced for such a cause, is looked upon as unsound and degenerate, and can never expect to get another husband. Hence the harems are head-quarters for all manner of contrivances and means supposed capable of promoting female fertility; and the physicians, old women, and midwives drive a lucrative trade in this branch of science. Injections, washes, and suppositories are successively tried, and in this manner they introduce the most stimulating substances, such as aloes, myrrh, musk, bezoar, cinnamon, opium, &c. &c. As might be expected, these means often defeat the hopes of the misguided female, and produce abortion.

"Abortion is very often brought on intentionally, and attempts to produce it are legal and sanctioned by the ritual of the Turks, provided the fœtus is under five months old, for at that period the fœtus is supposed to have life! Hence, married women frequently ask their acquaintances or physicians for medicines to procure abortion, and do not appear to think that they are doing wrong. Their object in such cases is to gratify husbands who are unwilling to have more children, or who fear that another parturition and nursing, would spoil the personal appearance of their ladies. The men administer these medicines to their female slaves, to prevent the inconvenience of an illicit offspring, and unmarried females who have become pregnant,—a crime punished with death in Turkey,—of course use every possible means of avoiding a discovery. Often have I been entreated to give medicines capable of producing abortion, and my refusal was attributed invariably to ignorance, for it never struck them as possible that I could have any objection on the score of morality. Saffron and savine are esteemed well suited for this purpose, but the medicine on which they place their chief reliance, is an infusion made of orange leaves and jalap; they say this seldom fails; it has the disadvantage, however, of being liable to occasion dangerous hemorrhage. It need scarcely be remarked, that this unnatural practice has a decided tendency to produce serious derangement of the uterus, such as prolapsus, schirrus, cancer, fluor albus, &c.; prolapsus ani is also not an unfrequent effect of such medicines.

"Hemorrhoids are very common among the Turks; I have often seen them administer, for this complaint, a strong soup made of the flesh of porcupines, and when the piles are external they sometimes touch them with the actual cautery.

"Apoplexy is not common, but asphyxia, from carbonic acid, is a frequent occurrence, for they are much in the habit of using little vessels containing burning charcoal to warm their rooms and beds in winter, and are not always attentive in taking the necessary precautions to prevent accidents.

"They seldom administer emetics, but very often purgatives, in the bilious and liver complaints, to which they are so subject. When an emetic is preferred they have recourse to some species of euphorbium, or ipecacuanha, or to tartar emetic, which, however, has been only lately introduced. On the whole, they have a great prejudice against emetics. Their mild purgatives are manna, tamarinds, and that species of rhubarb (*Rheum rhaponticum*) which grows wild in Bulgaria and Macedonia. They are also fond of recommending the seeds of the *ricinus communis*, which grows plentifully in Turkey, and which, when two or three are swallowed at a dose, often act rather powerfully on the bowels. Drastic purgatives, such as senna, jalap, scammony, colocynth, are much more in vogue, and are used in many cases to such an extent, that the unfortunate patients die of hypercatharsis. I remember being called to see a Turkish gentleman, who had been several days under the care of an eminent Arabian physician, who was a man of long standing, and venerable appearance. The latter besought me to bring some patent purgative, for he alleged that he had, without effect, administered for five days in succession, the most powerful aperients in his possession. What was my surprise at finding the patient worn out, emaciated, and feverish, labouring under an attack of dysentery, attended with most violent tenesmus, and passing at least forty stools in the day, consisting of blood and mucus! The patient said that he felt something still irritating his bowels continually, and adhering to them so fast that all his efforts, and all the medicine he had taken, were unable to dislodge it.

"In another case of hepatitis, where I prescribed calomel powders and blood-letting, I underwent a curious examination before the whole family of the patient. 'What,' exclaimed the physician, a tall lean man, with fiery eyes and dark brows, a Persian by birth, and a zealous hater of infidels, 'What! darest thou deny that his entrails are diseased?' Surely not. 'And where are his entrails situated?' In a sac. 'False,' cried my interrogator; 'they swim in water. In our patient this water has been dried up, and consequently his entrails are in danger of mortifying. This drying up of the water in which the entrails swim causes his thirst, dryness of tongue, heat of skin, and scantiness of urine. Therefore, hast thou most ignorantly treated this sick man in drawing fluid blood from his system, and in giving him dry and arid powders!' All the spectators who listened to this impassioned strain of pathological reasoning, seemed struck with the depth of knowledge displayed by my antagonist. 'Affärim, Affärim,' (bravo! bravo!) resounded through the hall, and I mounted my horse and rode off."

The above is a fair specimen of the good old humoral pathology. In the treatment of diarrhœa (*issal*) and dysentery (*züreck*) opiates are much used, particularly when made into pills with starch and wax, a formula probably worthy of imitation.

Phthisis (*werem*) is not common, and appears very rarely as an idiopathic complaint, being generally a consequence of pneumonia or catarrh injudiciously treated.

The Turks still place unlimited confidence in the efficacy of Bezoar-stones, an article so much used, that to meet the demand for these natural concretions, found in the stomachs of certain animals, pseudo-bezoars are sold in Constantinople. This remnant of oriental superstition has not been long expelled from the British Materia Medica, and such stones brought a high price in London less than a century ago. The tears of Turkish saints are in good repute, but being scarce, are administered only in extreme cases, and in very minute doses! I know not whether it may increase the reputation of animal magnetism among the Parisian philosophers, to be told that it is a favourite remedy with the Arabian dervises and jugglers.

The orientals place much reliance on the efficacy of saliva, in curing diseases, and Dr. Oppenheim was forced frequently not merely to give proper medicines, but to spit on the affected part, a superstition derived from the circumstance of some of Mahammed's miraculous cures having been wrought by the direct application of saliva.

Ague, in all its forms, is common in Turkey; in the Asiatic provinces it is universally believed to be the result of demoniacal possession, and exorcism is considered the surest remedy, but in the European provinces, and chief towns, sulphate of quinine is preferred.

A popular medicine, which Dr. Oppenheim has often known to be effectual, is the following:—Half an ounce of fresh roasted coffee is infused with two ounces of hot water, and afterwards mixed with an equal quantity of lemon juice. This dose is taken warm during the intermission.

Her gueinlueck zitma, zitmai muesellesse, and *zitmayi rib,* are the names given to quotidian, tertian, and quartan agues. Gout (*wedjai mefassel,*) and rheumatism (*nikris,*) are also attributed to demoniacal possession, but luckily, in these cases, the physical means employed to expel the evil spirit, such as pinching, kneading, and pummelling the patient's flesh, stretching his limbs, cracking his joints, together with the warm bath, &c., often act extremely well, and promote a real cure.

Dr. Oppenheim next proceeds to describe a very curious and remarkable form of gouty or rheumatic disease, which he saw very frequently in Turkey, and a variety of which I myself have witnessed last winter in a gouty patient treated in the Meath Hospital. As this disease has escaped the notice of former observers, I shall give Dr. Oppenheim's account of the matter :—

"The disease arises in some without any previous illness or obvious exciting cause, but in others it is evidently produced by cold, suppressed perspiration, &c. The patient goes to bed well, but awaking in the morning finds one or more tumors on his limbs. They are generally situated at some distance from the joint, and on the inner or flexor side of the limb. They are globular, but not very sharply circumscribed, hard, scarcely moveable, and very painful to the touch, but not at all discoloured or red, nor are they hotter than other parts. In size they vary from that of a filbert to the bulk of a fist, and attain to this magnitude in the course of a few hours, after which they become stationary. They appear on the upper, oftener than on the lower extremities, and more frequently on the fore-arm than above the elbow, and on the leg below the knee, than on the thigh. Occasionally they spring up thus suddenly from the palm of the hand or sole of the foot, and are at times met with arising from a toe or a finger.

"It is not very common to find more than one such tumor on the same person, occasionally, however, several are met with. No *prodromi* are observed, nor after their appearance does the patient's general health seem affected; in some the tongue is foul, and dyspeptic symptoms are present. The seat of the complaint seems to be the cellular substance immediately outside the superficial muscles. Strong, robust, and young subjects are attacked more frequently than the old, infirm, and cachectic, men oftener than women, and children very seldom indeed; strangers not acclimatized are very subject to this affection. When neglected, the disease is apt to continue for life, and by their pressure these tumours occasion not merely pain, but stiffness and inflexibility of the limb, which in time wastes from want of muscular exercise. The treatment adopted by the Turks is sufficiently effectual, and consists essentially of a very persevering and diligent use of frictions, which are often continued for five or six hours in succession, and cause, during their continuance, much pain to the patient. This process is generally carried on in the air-bath."

Gout is not near so common in Turkey as in other European states, and the physicians employ for its cure no remedy but the warm bath. Hippocrates, in his Aphorisms, asserts, that eunuchs are never attacked with gout, but Dr. Oppenheim says, that he never witnessed so painful and violent an attack of podagra as in the case of an eunuch, a water drinker, and eschewer of opium to boot; in fact, a perfect model of sobriety, temperance, and chastity! It is curious enough, that the treatment of erysipelas by stimulants, such as the nitrate of silver, blisters, &c., lately introduced into British practice, is employed also by the Turkish common people, who, however, use a stimulant of a different nature, viz., heat. Some spread a silk handkerchief tightly over the affected part, and cover it with very porous shreds of cotton, which they set fire to; these are consumed, but the handkerchief escapes,* and during the combustion of the wool, a sensation of heat and pain is felt in the erysipelatous portion of the skin: others prefer puncturing the erysipelas

* On the same principle that a red coal placed on a handkerchief, stretched over a poker, does not burn the handkerchief.

in many points, with sharp spiculæ of wood, and immediately applying to each puncture the point of a burning stick. Dr. Oppenheim asserts, that he has seen both these methods successfully employed, for the purpose of *fixing* the erysipelas, by which, of course, he means that the disease was prevented from spreading.

Dr. Oppenheim corroborates the testimony of those who assert, that dogs never became mad in Constantinople or Egypt, although the prejudices of the people allow the canine species to multiply in a manner quite anti-Malthusian. He remarks, that the dogs and birds of prey, the scavengers of the East, are justly entitled to the regard of the philosophers, for without their aid the "land of the sun" would soon become uninhabitable, so averse are the Turks to the removal of nuisances. Dr. Oppenheim quaintly observes, that while every city in Greece claims to be the birth-place of Homer, every country in the civilized world, refers the origin of syphilis to its neighbour. So it is with the Turks, they say it is a disease altogether of Frankish origin. It is extremely diffused, particularly in the towns, where it affords a rich harvest to the quacks, who profess to cure the disease by warm baths and purgatives, continued for twenty or thirty days in succession. The regular physicians do a vast deal of injury, by an injudicious use of mercury, which they exhibit both internally and externally in the form of calomel, corrosive sublimate, red precipitate, &c., in frightfully large doses. The chancres are in general touched with lapis infernalis, or with arsenic. The practice of circumcision, and the frequent employment of the bath, to a certain degree, diminish the chance of contagion, a source to which the Turks are extremely unwilling in any case to attribute the disease. Thus, a gonorrhœa is always accounted for by their catching cold, as indeed the name of the disease *belzouk*, implies (a cold in the back, from *bel*, back, and *zouk*, cold). Their treatment of gonorrhœa is worthy of notice, but not of imitation, for they give cantharides in the form of pills or tincture, in such considerable doses, as often to produce violent irritation of the urinary organs: they are likewise in the habit of recommending astringent injections in the disease. Notwithstanding this injudicious practice, strictures of the urethra are very rare, a circumstance worthy of observation. Dr. Oppenheim discloses many circumstances, which prove the almost incredible prevalence of the worst vices in Turkey, not only among the ignorant and uneducated, but among the highest functionaries of the state. In short it is evident, that the standard of morality among the Turks, is not higher than it was among the Romans in the time of the emperors, whose tyranny was well deserved by subjects so generally destitute of private virtue. If other proofs were wanting of Turkish sensuality, the enormous prices given for aphrodisiacs would alone establish the fact. Dr. Oppenheim has seen several thousand piastres given for recipes, of which, though consisting of many ingredients, cantharides, musk, ether, and aromatics were the principle constituents.

Dr. Oppenheim knew of a large price being given in Cæsarea for a powder, made by incinerating the brains of male and female sparrows in equal quantities. He makes some very interesting observations on the practice so prevalent in Turkey, of eating opium, to which is added, in confirmed cases of this dreadful habit, corrosive sublimate. Some take the latter poison to the extent of ten grains daily. Strohmeyer is quoted, as having lately published in Vienna an account of a Tyrolese peasant, who was in the habit of mixing ten grains of arsenic with his daily portion of food. Quite as extraordinary is the fact, lately stated that in one of the islands of the Pacific, the inhabitants have no other water to drink but sea-water. Mackenzie or Hooker, I forget which, relates that in Iceland, the cows are often fed with dried fish during the winter! Those who indulge in opium, always avoid drinking water or any fluid at the time, as doing so often occasions colic. It is particularly worthy of notice, that Dr. Oppenheim himself was attacked in Turkey with intermittent fever, which at first had the quotidian form, but soon changed its type, so that the paroxysm came on every seventh and afterwards every fourteenth day. In one of the clinical lectures, published in the *London Medical and Surgical Journal*, I have noticed this strange species of ague as occurring in some parts of Russia.

The following account of the effects of opium is extremely interesting:—

"In the month of May, 1830, I attended Abduraman Pacha, on his journey from Koniah to Kütaja. We bivouacked one night near a little village called Karako, and, as usual, I slept without covering my head as the Turks do, when they spend the night in the open air. Next morning my dragoman awoke me, just in time to depart with the rest; but I was unable to move, being affected with a violent pain in the head, and feeling myself stupid and giddy like a drunken man. I heard the voices of those around me, but did not understand a syllable of what they said, I could not speak, and again fell asleep. In a few minutes I was astonished by a violent shock and the dashing of cold water on my head: this aroused me, and I found that my companions had hastened to bring up one of the camels, and had emptied one of the skins upon my head, thus promptly and ingeniously finding a substitute for a shower bath. In fact I had been in a state of narcotism, induced by the neighbourhood of an opium field, in which the poppies were in full blow. In the course of an hour, I was enabled to pursue my journey. The occurrence showed me, that they were long aware of the utility of the cold dash in Turkey, a practice only lately recommended in Germany, on the authority of the English physicians, Copland and Wray, in cases of poisoning by narcotics. On another occasion I slept near Brussa, in an open field to leeward of a large caravan of camels, laden with opium, and again I awoke in the morning with nearly the same symptoms."

Dr. Oppenheim's observations upon the causes which render insanity and mental derangement so extremely rare in Turkey, are very interesting, and well worthy of being studied by those who devote themselves to medical statistics. Here it is sufficient to remark, that the habitual suppression among the Turks of the feelings of extravagant joy or sorrow, the fatalism inculcated by their creed, the contempt with which they regard all scientific or practical improvements, their total ignorance of passion-stirring literature, the absence of all scepticism with regard to the truth of the Koran, and the want of the sentimental feelings of love; all these circumstances combined, cause each individual to look upon the wants of life with comparative apathy; in consequence of which, suicide and madness are almost unknown in Turkey. Suicide is most frequent in highly civilized nations, where murder is rare; while in countries where ignorance prevails, murders are very frequent and suicides rare. France is an example of the former, Ireland of the latter. It is excessively rare to hear of a suicide in Ireland, an Irishman indeed scarcely ever thinks of killing himself, but he frequently kills his neighbour.

Dr. Oppenheim met with only three examples of persons committing suicide in Turkey. Two of the individuals were Chrisitans, and one a renegade. Of the degraded state of Christianity in the East, no one can form a notion who has not witnessed the ignorance and superstition of the priests of the Greek Church: Tournefort's travels in the Levant elucidate this assertion most amply. Among these Christians too, insanity is much more frequent than among the Turks; a fact which clearly proves, that the fatalism inculcated by the Koran exercises a decided influence over the mental constitution of the Moslems. Religious madness is unknown among them, for their religion consists, not of spiritual doctrine, but of blind obedience to a code of laws, which embraces, not motives, but mere actions, and which promises the enjoyment of paradise to all those who believe in God and his prophet Mahammed. A non-observance of these laws, and occasional criminality, may retard, but cannot finally prevent their entrance into paradise. They pass their lives in the fancied security of ultimate happiness, and consequently, they consider the misfortunes of this life, as transient, and unworthy of exciting deep or lasting emotions. Still the feelings of nature cannot be wholly exiled from the human breast, and the Turk who regards the near approach of personal misfortunes, or even death, with calmness and apathy, often exhibits symptoms of most intense feeling, when a beloved child or wife is attacked with an acute and dangerous disease. Then he calls in the assistance of every physician he can procure, and to remunerate them he is willing to make the greatest sacrifices: should the disease continue, however, for many days, his religious tenets resume their wonted sway, the physicians are dismissed, and the patient is resigned into the hands of destiny. Some new medical man comes into the neighbourhood, when again the voice of affection is listened to, and the immutability of fate for the time forgotten. Sceptics in religion are scarcely ever met with in Turkey; Dr. Oppenheim witnessed but one instance; he was in attendance, during the last few days of his illness, upon Œmar Effendi of Kütaja, who was not afraid of death, but was very anxious to know exactly how long he had to live. "Shall I," said he, "see the sun rise and set to-morrow?" "You cannot live until sunrise," replied Dr. Oppenheim. "Then before sunrise I shall know whether Mahammed is an impostor!"

Although insanity is so rare, weak-mindedness and idiotcy are not so unfrequent; and, occasionally, idiotcy is produced in children artificially, by means of giving the child, from its very infancy, small doses of narcotics; a practice which, by stupifying the sensorium, prevents the mental development, and ends by producing a state of fatuity. This is an extremely curious fact, and I believe that Dr. Oppenheim is the first who has given us authentic information upon the subject. This practice of rendering persons idiotic, is the source of great emolument to some; and Dr. Oppenheim says, that it is carried into effect, not merely upon children, but upon adults, when it is judged necessary to render them incapable of conducting their affairs, while, at the same time, their removal by death appears to be, for certain reasons, impolitic and inexpedient.

The present Sultan is said to have had recourse to this infamous proceeding, in the case of his son and heir-apparent to the throne, Abdul-Medschid, a boy nearly thirteen years old. He committed this act, lest the Janissaries and their friends might seize an opportunity of dethroning himself, and of elevating his son in his stead; a fear of which had led him, at a former period, to sacrifice his eldest son, then a boy of tender age. The reigning Sultan is the last of his father's thirty children, and is the sole remaining descendant of the family which sprung from Mahammed, and has hitherto been in hereditary possession of the throne. The loss of such gentle blood would be irretrievable; and therefore it is to be hoped, that some of the kings and emperors who, on all sides, press forward to prop up the falling fortunes of the Sultan, will be able to persuade him to abandon this Saturn-like propensity. A moral lesson on the subject of the ties of blood, would come particularly well from the autocrat of all the Russias, own brother of the *deceased* Constantine, father of regenerated Poland.

The only hospitals of any sort in Turkey, are those appropriated to the reception of idiots, institutions better regulated than could be expected, in a country otherwise so backward in civilization. The inmates are generally persons afflicted with fatuity or epilepsy, and the idea so universally prevalent, that these diseases partake of a sacred character, operates very favourably in increasing the amount of alms contributed to their support, and, consequently, these hospitals abound in Turkey.

Surgery has hitherto scarcely deserved the name in Turkey, and indeed it could not be otherwise, in a country where dissection, or even the opening of a dead body, is expressly forbidden by the Koran; "thou shalt not open the body even of a criminal, who has stolen and swallowed pearls of price," are the emphatic words of the prophet. The present Sultan has caused to be published at Constantinople, a large folio, a sort of cyclopædia of practical medicine, surgery, and anatomy, with anatomical plates, which is used in the medical school established under his auspices, but is ill understood by the pupils, on account of its containing many Greek and Latin phrases, either un-translated, or translated very badly.

Turkish surgeons have no instruments but a lancet, scissors, searing-iron, and a forceps for extracting balls. Except bleeding and cupping—in the latter they are great adepts—they never perform an operation, as they dread hemorrhage, which they are totally unable to control; their only resource being, the application of some styptic powder, or else of the iron ore, called hematite, to the bleeding part. In some cases, they sear the wound with the actual cautery. When the limbs are chopped off by the executioner, (the only person who ever performs an amputation in Turkey) the criminal's friends arrest the bleeding in this manner. He who is caught in the act of thieving, has his hands cut off; the Koran is explicit in enjoining this punishment, but for slight offences, the Turks nail the ear to a post, at such a height, that the sufferer just touches the ground with his feet, a position by no means enviable. Scarifications of the skin are very frequently used, and often with great benefit: they apply them to relieve pains in all parts of the body, and use them in persons of all ages. I have known this operation to be performed in the country parts of Ireland, with great benefit, in a bad case of sciatica: the operator made twenty or thirty very superficial, but long incisions in the skin, close to each other, so as nearly to cover the calf of the leg; much blood flowed from the wounds.

The Turks treat abscesses with poultices made of figs and honey, and never venture to open them. They pour oil or melted butter into gunshot wounds; inflamed and painful wounds they cover with the hot flesh of an animal recently killed, or else apply to them an ointment, made on the spot, by beating up white lead with eggs. When an ulcer is relaxed or indolent, they lay chewed figs upon its surface, which they sometimes sprinkle with a little arsenic, or red precipitate. In cancerous sores, they often adopt the use of animal charcoal, which they apply, not in substance sprinkled over the sore, but made into a liniment with oil. Being totally unacquainted with the use of either charpie or lint, they employ cotton, as a dressing for sores; a practice which, as Dr. Oppenheim remarks, has deservedly found advocates in Germany, as well as in England, particularly when the sores are extensive, and the process of scabbing may be attempted with a prospect of success. Dr. Oppenheim says, that he has found nothing so effectual or so convenient, for the cure of the ill-conditioned surfaces occasionally produced by blisters, as dressing the part with very fine cotton wadding; this must be kept applied by means of a bandage; the exudation from the blistered surface soon concretes, and causes the cotton to stick closely, forming a sort of scab, under which the part often heals without further trouble. This process has been likewise adopted with great advantage, in our manufactories and hospitals, in cases of extensive scalds and burns, and is founded on most rational principles. In cases where the external surface is extensively denuded by wounds, I have little doubt that the process of scabbing might be often facilitated by a similar treatment. Poisoned wounds the Turks suck, excise, and cauterize. There are many of the Turks who profess only a single branch of surgery. Thus there are bone-setters, operators for cataract, hernia operators, and lithotomists; such persons often enjoy a great reputation, which is handed down from father to son. They observe strict secrecy as to their modes of operating, and boast unceasingly of their success. Dr. Oppenheim does not deny, that on many occasions he witnessed results, which proved them to possess considerable expertness; as is often the case with respect to the professed bone-setters of our own country. Yet here, as in the East, they often do irretrievable mischief. The quack is never blamed, however, in such cases; this is his privilege all over the world. The Turkish bone-setters use bandages and splints innumerable, and have the merit of introducing the very curious method of keeping the ends of broken bones in apposition by means of plaister of Paris, applied soft, and left on until it sets, thus securing the proper position of the limb. The Turkish surgeons hold amputation in abhorrence, and so great was the prejudice of all ranks, from the soldier to the Vizier, against this practice, that Dr. Oppenheim was unable to introduce it even in cases of gunshot wounds, with comminuted fracture. Cases of this nature, altogether desperate and hopeless unless amputation was immediately resorted to, the Turkish surgeons engaged to cure without it; and because Dr. Oppenheim could not promise with certainty that the patient would, in every case recover, he was soon prevented from performing the operation in any!

As to operations after battles, in the Turkish campaigns, none were performed on the wounded prisoners, except that of decapitation, as they were universally beheaded the next day, by command of the Vizier, to whose army Dr. Oppenheim was attached; occasionally, the clemency of the conqueror exhibited itself in rather a singular way, for he ordered the prisoners who were wounded in the back to be spared, as an encouragement to flying enemies! On one occasion, after the battle of Monastir, the wounded and other prisoners were included in a treaty, and twenty Turkish piastres a head were paid by the Albanians, as ransom for their captive countrymen. As soon as the money was in the pocket of the Vizier, he beheaded the wounded, and sent the rest to be sold as slaves at Constantinople!*

Tooth-drawing is entirely in the hands of the barbers,

* An able writer in the *Dublin University Magazine* for July last, has taken upon himself the defence of the moral character of the Turks and of the Sultan, and invokes Europe to protect the latter from the barbarous Egyptians! He speaks of the Sultan's paternal affection, and asserts that the eldest son of that sovereign died of the small-pox. Let him read Dr. Oppenheim's book in the original, and I think he will feel as little inclined to plead the cause of Sodom and Gomorrah, as that of the Sultan and his Pachas; I am glad to see the true character of the Sultan exposed, in a letter from Constantinople, published in the *Standard* of July 8th, 1833.

who may be seen in the streets, employed in boiling coffee, which they sell by the cup, or in drawing teeth with the forceps, the only instrument they use. Hernia is very frequent in Turkey, and often proves fatal: the early age at which the Turks all practise horsemanship, their bad saddles, and bad roads, make them liable to be violently shaken in riding; this, probably, accounts for the frequency of hernia. There are no trusses made in Turkey, and consequently the poor are totally unprovided with them; a few of the wealthy procure them from Vienna, France, or Italy, but these, in the course of time, being repaired in a bungling manner, look like anything but trusses, and injure, rather than serve the wearers. The Turkish surgeons are totally unacquainted with the operation for freeing strangulated hernia, but they frequently attempt the radical cure of ruptures, by means of ligature, or the actual cautery.

"I had an opportunity of witnessing, at Jenetschär (Larissa), this operation performed by Surgeon Michalaki, of Sagor. The patient was a robust man, about forty years old, who had the hernia for many years, and was now resolved to get rid of it, on account of the inconvenience it caused when he rode. When the operator had convinced himself that the gut could be easily returned, he tied the patient on a board, forming an inclined plane, so that the patient's feet were much higher than his head.

"With one hand he pressed against the neck of the sac, so as to prevent the gut from re-entering it, with the other he made an incision into the tumour, extending from about one inch above Poupart's ligament, to two inches below it. He thus brought to view the proper hernial sac, or as he termed it, the bladder of the rupture. This he pulled forcibly, with both hands, out as far as possible, tied a strong silken string round the neck of the sac near the ring, and cut away the sac below the ligature. The spermatic chord was evidently included in the ligature, which I remarked to him; but he stoutly denied the possibility of his having committed so unfortunate a mistake!"

Generally, this gentleman and others, who perform similar operations, avoid including the spermatic chord in the ligature, by pushing both it and the testicle into the abdominal cavity. The ancient cruel method of using the actual cautery, to produce the inflammation necessary to close the hernial aperture, is now seldom resorted to. Some of the rupture doctors affect all the state of our ancient quacks; when they enter a town, they proclaim their approach with sound of trumpet, and ostentatiously display, like a standard, a long pole, from which hang the numerous hernial sacs they have amputated.

Hernia and the stone, probably on account of the pain they occasion, are the only two diseases in which the Turks permit operations. Calculus is very frequent in some provinces of Turkey, particularly Macedonia, Epirus, and Thessaly, and Dr. Oppenheim mentions several instances, where the disposition to the disease seemed to be hereditary. The operation of lithotomy always used, is that described by Celsus, formerly called *cutting on the gripe*, or the *lesser apparatus*. The after treatment is altogether neglected, antiphlogistic remedies are never applied, and the absurd regulation is enforced, of keeping the patient from sleeping for four-and-twenty hours after the operation. This is effected by means of music and various noises, perpetually kept up in his chamber. Unfavourable as are all these circumstances, the mortality is by no means so great as might be expected, and Dr. Oppenheim saw many large calculi thus extracted, with a happy result. The Turks, he observes, are much less liable than the Franks, to suffer bad consequences from wounds or operations; this was strongly exemplified among the wounded of the Russian and Turkish armies; the habitual abstinence of the Turks from spirituous liquors, and their moderation in the use of animal food, may contribute, he thinks, to render the consequences of inflammation less violent and dangerous. Diseases of the testicles and their appendages are very frequent, and Dr. Oppenheim justly attributes this to the narrow curved shape of the Turkish saddles, and the peculiar mode of riding, in consequence of which the testicles receive a great shock each time the horse is suddenly checked; a practice the Turks are very fond of, in showing off their horsemanship. Dr. Oppenheim's observations on eunuchs are extremely interesting:—

"Jealousy, the natural effect of polygamy, has rendered Mahammedans extremely watchful of their wives, and has multiplied the number of eunuchs. These sufferers are brought in their youth from Africa, where they are purchased as slaves in Sennaar and Darfour, and are delivered into the hands of the Coptic monks in Egypt, who almost exclusively cultivate this branch of national industry. This occupation is detested by the Egyptians, but the government, nevertheless, protect those who are engaged in it, on account of the profits derived from so lucrative a trade. The Pacha of Egypt has conferred certain privileges and immunities on the village *Zawyet el Deyr,* near *Saout,* because its inhabitants (who call themselves Christians!) have obtained great celebrity in this operation. The number annually thus mutilated is certainly considerable, but it falls far short of the estimate of Tavernier, who says, that in 1659, twenty-two thousand eunuchs were sold in one province alone. Many, no doubt, die of the operation; the age generally selected as the safest for its performance is from six to seven. The operator encloses the testicles and scrotum with a tight ligature, and then cuts them off at one stroke with a sharp razor. The actual cautery, or a styptic powder, the composition of which is a secret, are used to restrain the bleeding. Although the best-looking boys are selected, yet they never grow up well looking, and the adult eunuch may always be distinguished, not merely by his childish piercing voice and want of beard, but by a certain expression of premature old age, together with hollow eyes and prominent cheek bones. The opinion entertained by some, that eunuchs, being deprived of enjoyment themselves, hate the rest of mankind, and are cruel and unfeeling, I must positively deny, for I have known many of a kind and most benevolent disposition, nay I have watched with surprise, how contented and happy they seemed to be. It is true, that when provoked they are hasty and revengeful, but what African is not? The number sold annually at Constantinople is about 300; they generally cost about 20,000 Turkish piastres a piece, while a common male slave is sold for one or two thousand."

Dr. Oppenheim had several opportunities of witnessing the performance of circumcision in Turkey. In a surgical point of view, the operation offers nothing of interest, and therefore, at present it is sufficient to remark, that it is not performed until the sixth year, and the day of circumcision is celebrated by great fetes, and by presents from every member of the family. Dr. Oppenheim's account of the pomp and ceremony observed on such occasions in the families of the great, is very amusing. It may be well to mention, that the inner layer of the prepuce is not cut so short as the outer, and consequently it still affords a covering to part of the glans. In many, so small a piece of the fore skin is cut off, that it is not easy to say, when the person grows up, whether he has or has not been circumcised, an assertion illustrated by the fact, that Dr. Oppenheim was twice obliged to perform the operation for phymosis on Moslems.

Ophthalmia is very common in Egypt, but not in the provinces of Turkey. The native surgeons are of opinion that the cataract is produced by some foreign body, which falls from the head into the eye; they are very expert in performing the operation of depression with a needle, which they insert through the cornea. Dr. Oppenheim created great astonishment by the effects of an electrical machine, which he occasionally used in cases of amaurosis.

The blind are provided for to a considerable extent in Turkey, being the only persons allowed to ascend the minarets or towers of the mosques, for the purpose of proclaiming the hours of prayer, five times a day. As these towers command an extensive view of the tops of houses, where the women often air themselves and bathe, none but the blind are permitted to perform this office.

The dumb are favourites with the great, and are constantly employed as valets to wait on them, in the most confidential manner. This partiality is founded on the belief that they can tell no tales; but Dr. Oppenheim testifies that they do not always possess this good quality, for in the campaign against the Albanians, most important intelligence was received through the means of a dumb spy, who waited on one of the revolted chiefs.

EFFECTS OF INTOXICATION UPON GRAMINIVOROUS AND CARNIVOROUS ANIMALS.

In the first part of *Schweizerische Zeitschrift für Natur und Heilkunde,* published at Zurich in 1834, there is an exceedingly interesting paper by the editor, Dr. Pommer, upon the effects produced by spirituous liquors on animals. The experiments were conducted with the greatest care and perseverance, and the effects not merely of sudden but of long-continued, and repeated intoxication on dogs, rabbits, &c., were watched with indefatigable attention. Some idea of our author's industry may be formed from the recital of the third and fourth experiments, which lasted sixty-nine and seventy-four days respectively. In each a spaniel, three quarters of a year old and seven pounds weight, had brandy injected into his stomach; the quantity administered, twice a day, was at first only a drachm, but it was gradually increased to half an ounce, and as it appears that this dose did not produce any perceptible effect on the spaniels in question, we are justified in concluding that they had become accustomed to the stimulus of ardent spirits, or to use the toper's phrase, that their heads were made. But, alas, it is a melancholy fact, that even the best made head (I speak not phrenologically) is subject to those weaknesses, those imperfections of our nature, which have rendered the words intoxication and intemperance necessary in all human vocabularies; and accordingly our two canine friends exhibited undoubted symptoms of commencing inebriety, when the dose of brandy amounted to five drachms. It is curious enough, that in such animals, the effects of an over dose of spirituous liquor is first evident in the lower extremities. Before the animal appears the least stupid or sleepy, and while the power of the fore-legs remains unimpaired, that of the hind legs is greatly diminished; and consequently while the anterior half of the body is firmly obeyed by its still sober members, the posterior half is miserably tottering upon its weakened and uncertain supports. This fact is well worth noticing, and is the more interesting when we consider, that it is after all but an example of a general rule; for most poisons which exert an influence upon the nervous system, such as opium and other narcotics, strychnine, woorara, and many deadly substances, act in the first instance on the lower, or, speaking of quadrupeds, on the posterior extremities. This I myself have often observed, and it has been recorded by all experimenters, Orfila, Magendie, &c. Nothing, indeed, is more common than the remark, that "the animal moved about on the fore-legs, dragging the paralysed hind legs along the ground." Hence we are enabled to comprehend the deep knowledge of physiology, evinced by those votaries of Bacchus, who assert, and assert justly, that inability to walk is no proof that a person is intoxicated! The head may be clear, and the hand and arm possess their wonted muscular strength, and yet the individual, when he trusts himself to his legs, may be scarcely able to cross the room. It is evident, therefore, that these considerations and these experiments prove, that there are more causes for the staggering of a drunken man, than are generally imagined; he reels not merely because his head is giddy, but also because his disobedient and half-powerless legs are overloaded with their ordinary burden. Modern anatomists and physiologists take peculiar pleasure in pointing out every striking coincidence between their own conclusions and the immortal works of the ancient sculptors. Thus they bestow deserved encomiums on the accurate observation of nature, exhibited in the fighting gladiator and in the Laocoon, in which, the abdominal muscles being represented in general and violent action, the artist has not failed to extend that action to the cremasters, and consequently, in both these figures, the testicles have deserted the lower portion of the scrotum, and are spasmodically drawn upwards towards the ring! Does an equally profound knowledge of physiology appear in the figures of the drunken Centaurs and Lapithæ? Are the inebriated satyrs, so often introduced in festive processions, as the *"Bacchi prævia turba Dei,"* are these *"less than gods and more than men,"* represented in a state of physiological intoxication?* Be this as it may, and let the knowledge of the ancients on this important subject have been ever so accurate, it surely cannot surpass the depth of observation contained in the Irish saying, "that no man is drunk, unless he lies on the ground without holding!" It is pleasing to find the experience of a nation tending to identically the same result as the philosophical experiments of a sober German. There is one conclusion, however, arrived at by Pommer, which my own observations do not confirm. He asserts that his experiments prove man to be the only animal in whom drunkenness is preceded by great bodily and mental activity, in fact by a period of exhilaration. From his testimony it appears, that dogs, cats, rabbits, hares, horses, cows, *et hoc genus omne,* whether graminivorous or carnivorous, may be made dead drunk,† but not merry

* The definition of satyrs is thus quaintly, but seriously and tersely given by an old author.—*Dei capite cornuto, pedibus caprinis, toto corpore villoso, velocissimi.*

† In a Review of Andral's *Clinique Medicale,* lately published in that best of British medical periodicals, *Johnson's Medico-Chirurgical Review,* it is oddly enough observed, that the French expression *ivres morts,* which the Reviewer translates *drunk-dead, is not precisely the same as dead-drunk!* This is a repetition of Sir Montague Matthew's distinction between a horse-chesnut and a chesnut-horse.

with wine; in fact it appears if our author has observed accurately, that man is the only animal whom wine enlivens when taken in moderation. There is evidently a mistake here, for it is well-known that horses, when greatly fatigued by violent exertion, are suddenly revived by porter or even spirits, and we ourselves can testify, that on one occasion, a quantity of spirits having been mixed with the food of several pigs, they exhibited the first or exhilarating stage, quite as evidently as we ever observed in the most rational biped. Nay, I have even extended the experiments to flies, and grasshoppers, and if I am not strangely deceived, these animals are affected, at least so far as their motive powers are concerned, precisely like man; first they became sportively restless, then a staggering stage succeeds, and lastly they lie motionless; and what is still more singular, they will again recover from a state apparently inanimate, after it has continued many hours! in fact they seem to sleep off the effects of the debauch! I say *seem*, for as yet no one has investigated with the attention it deserves, the subject of the sleep of insects. Much might be done by observing the effects of narcotics on these animals. The subject is one of great physiological importance.

It is curious enough that Pommer was not able to detect the odour of alcohol in the brain, in any of the viscera, or the blood, in the animals he experimented on. In ten persons examined by Andral, and who died after enormous potations of brandy, he found neither in the ventricles or elsewhere, any odour of alcohol. Still I cannot subscribe to Pommer's conclusion, that the alcohol is never absorbed into the circulation, until it has undergone previous decomposition, for I remember having witnessed the dissection of a sweep, whose brain and its membranes exhaled a notable smell of spirits; and (as is cited by Andral), Dr. Cook, in his work on Nervous diseases, has recorded a case where there was found in the ventricles a clear fluid which had the taste and smell of alcohol, and which took fire on being brought near a burning body.* The following observations of Pommer, are of great physiological and pathological importance, and accordingly I give them without abbreviation:—

"Alcohol, injected into the blood-vessels, proves fatal in consequence of producing speedy and direct exhaustion of the cerebral and nervous energies, and occasions a destruction of the motive and sensitive functions, soon followed by a cessation of breathing. Animals poisoned by alcohol, exhibited indubitable symptoms of narcotism, and an apopletic state of the brain. The head was often rolled about convulsively, while the disordered motions of the whole muscular system, proved that the spinal marrow felt, in the first instance, the effects of the poison, and yet no marks of inflammation could be detected in the brain, spinal marrow, or nervous plexuses. It deserves likewise special notice, that when the injection of a moderate quantity of alcohol into the veins proved fatal, no marks of disorganization could be detected in the blood itself, which seemed to retain all its physical properties unimpaired; neither was life in such cases extinguished by reason of a sudden retardation of the blood's motion, nor of the cessation of the heart's action, for this organ continued to beat, as long as could be expected under the circumstances. On opening such animals, the heart exhibited the natural proportions between the quantity of blood, in its right and left chambers. The blood possessed all its usual qualities of colour, fluidity, coagulation, &c. Indeed, in some of the experiments, the last trace of sensibility in the heart did not cease until an hour after all marks of sensibility and motion had been destroyed, in the general system of motion, and in the respiratory muscles. It follows, therefore, that of the muscular organs, in animals killed by alcohol, the heart dies last; we must hence attribute their death, not to changes wrought

* I suspect some mistake here, for though alcohol may have passed from the stomach to the brain, yet it is scarcely credible that it would have done so without becoming considerably diluted, in which case it would not take fire.

directly in the blood, but on the nervous system, changes which are felt more suddenly, when the alcohol is injected into the blood, than when it is applied to the stomach, or any other part, merely because, in the former case, it is instantly conveyed through the medium of the circulation, so as to come into immediate contact, while unchanged, with the nervous extremities, and the nervous centres."

Our author, on the same grounds, thinks that the poison of serpents proves fatal in a similar manner, not by altering the blood physically, but by being conveyed through its medium, so as to come into contact with the nervous system generally. We must confess that many difficulties here present themselves, and after all it appears a dispute about words, for who can deny that the blood is physically different, when mixed with alcohol, or with viper's poison, from healthy blood. That it, to our feeble senses, appears to retain the same odour, colour, and consistency, is no proof of its not being altered; as well might we say that water holding tartar emetic in solution, is not physically different from common water, because we cannot distinguish it by the taste, sight, smell, or touch!

Our author concludes with a list of all the writers who have made experiments on the same subject; I subjoin it:—Major, Elsholz, Baglivi, Lonzone, Friend, Fontana, Siebold, Segalas.

BIRTHDAYS OF CELEBRATED LIVING AUTHORS.

A CHANGE in the fashion of almanacks indicates unequivocally a change in the spirit of the times, for the men of each generation, being wont to attach to particular days the memory either of occurrences they consider particularly important, or of personages they revere, we can detect in their calendars the most prominent characteristics of the "homme moyen," the average man of each epoch. It would form a curious subject of enquiry to compare the almanacks of the dark ages with those which followed the restoration of letters, and with those which have ushered in each succeeding year of the last half century; but I have neither time nor space for this comparison, and must consequently content myself with observing, that it may be hailed as a good sign of the times, to find the birthdays of philosophers and learned men, noted in some of the Continental calendars. Formerly these annuals exhibited no record of science, afforded no memorial of the greatest benefactors of mankind—the mighty dead who dedicated their lives to enlarging the boundaries of knowledge, and whose genius revealed the most precious secrets of nature; and, indeed, in British almanacks, even now, not one day out of the three hundred and sixty-five is so consecrated, not one is marked as having given birth to Newton, Harvey, Watt, Jenner, or Davy! It is not my intention to enter further on this subject, and I shall therefore proceed to present my readers with a list of the birthdays of living German authors, selected from amongst those most distinguished in the medical sciences, with an addition of a few who enjoy an European fame as naturalists or philosophers. The life of man is but three score and ten, and at the present moment its whole length when completed, lies equally divided between this century and the last, so that the years of the man of seventy fall as it were into two portions nearly equipoised and balanced on the year 1800 as a centre. At present the literary workers born in the *last* century are the most productive, but their numbers already exhibit a notable diminution, and in a few years they must retire to make way for more buoyant and youthful energies.

Blumenbach,	Göttingen,	May 11,	1752.
Tiedemann,	Heidelberg,	August 23,	1781.
Trommsdorf,	Erfurt,	April 2,	1770.
Liebig,	Giessen,	May 14,	1803.
Rose,	Berlin,	August 6,	1796.
Mitscherlich,	———	January 17,	1794.
Humboldt,	———	September 14,	1769.
Döbereiner,	Jena,	December 13,	1780.
Olbers,	Bremen,	October 11,	1758.
Oerstedt,	Copenhagen,	August 14,	1777.
Ehrenberg,	Berlin,	April 19,	1796.
Rust,	———	—— 5,	1775.
Schweigger,	Halle,	—— 8,	1799.
Callisen,	Copenhagen,	—— 8,	1786.
Seiler,	Dresden,	—— 11,	1778.
Himly,	Göttingen,	—— 30,	1762.
Gräfe,	Berlin,	March 8,	1787.
Carus,	Dresden,	June 3,	1789.
Burdach,	Königsberg,	—— 12,	1876.
Kunth,	Berlin,	—— 18,	1788.
Weber,	Leipzig,	—— 24,	1796.
Schultz.	Berlin,	July 8,	1796.
Valentin,	Breslau,	—— 8,	1810.

Nägele,	Heidelberg,	July 12,	1778.
Müller,	Berlin,	—— 14,	1801.
Hufeland,	———	August 12,	1762.
D'Alton	Halle,	July 17,	1803.
Barkow,	Breslau,	August 4,	1790.
Rathke,	Königsberg,	——— 25,	1793.
Horn,	Berlin,	——— 24,	1774.
Oppenheim,	Hamburg,	October 5,	1799.
Purkinje,	Breslau,	——— 17,	1790.
Brandes,	Salzuflen,	——— 18,	1795.
Ideler,	Berlin,	——— 25,	1787.
Clarus,	Leipzig,	November 5,	1774.
Langenbeck,	Göttingen,	December 8,	1776.
Schlemm,	Berlin,	———— 11,	1795.
Schönlein,	Vienna,	April 2,	1790.
Hecker,	Berlin,	January 5,	1795.
Froriep,	———	February 21,	1804.

ON PREVENTING EVAPORATION FROM WATER-TANKS IN HOT CLIMATES.

In certain regions of the earth nature has placed obstacles apparently insurmountable, to the free and comfortable enjoyment of existence; one of these has hitherto baffled all the efforts of art, and is caused by the prevalence of drought. In Australia, although rain falls at certain periods of the year in such great abundance, that the rivers overflow their banks, and large tracts of country are entirely inundated for a considerable length of time, yet, shortly after the close of the rainy season, the water subsides, and in the course of a few weeks, so great has been the evaporation, that where deep and rapidly-flowing rivers existed, nothing remains but stagnant pools, water-holes, and lake-like reaches of the rivers, occurring at intervals in their former beds. These natural reservoirs of water are of the most vital importance to the colonists and their extensive flocks. But there are many seasons, during which the air becomes so extremely hot and dry, that even these reservoirs are exhausted, and man and beast are forced to quit the then inhospitable district. A similar defect of climate exists in many other countries, such as Hindoostan, Scinde, and those kingdoms bordering on the banks of the Euphrates, which were the first settled and occupied by civilised peoples. Man has in all these places struggled, from the earliest periods, to secure for himself a sufficient and continuous supply of water—the life-blood of living beings, whether animal or vegetable. To promote an object of such paramount importance, we find that national works of the most expensive and magnificent description have been undertaken by the rulers of these countries; thus, in Hindoostan, each of the Mogul Emperors has emulated his predecessor in the construction, at an enormous expense, of tanks of immense magnitude, to preserve the necessary supplies of water during the dry season. The Kings of Ceylon even exceeded the Mogul Emperors in the size of their tanks, constructed for the same purpose, while in Mesopotamia and the countries watered by the Tigris and Euphrates, as likewise in Persia and Affghanistan, the inhabitants resorted to the expedient of constructing reservoirs under ground, and in some instances they even went so far as to conduct rivers league after league beneath the soil, in order to obviate the evil results of evaporation: each village having a well, by means of which the people were enabled to draw up the treasures of these subterraneous currents. In Constantinople the Greek Emperors built extensive arched reservoirs for holding water, from which a considerable portion of the city was supplied with this indispensable element.

To persons living in this moist climate it may appear of very little importance to guard against the effects arising from the evaporation of water; but to the philosopher, who, by experiments in his laboratory, has made himself familiar with its laws, or to the traveller, who, like Mr. Sturt, has seen, in Australia, evaporation carrying off daily from the reservoirs, the water upon which his own life, and that of his companions and cattle depended; and who has marked the appalling rapidity with which water disappears, when the air has become dry or parched; to such, I say, it must appear evident, that evaporation may become so rapid, as to render nugatory all efforts to preserve any large supply of water in open tanks or reservoirs, and thus act in preventing the colonisation of countries, in other respects most desirable for the purpose. Under the influence of the hot dry wind of Australia, Sir Thomas Mitchell observed the thermometer at 126° in the shade! How rapidly must evaporation proceed, when water is exposed to such a wind?

It is my object to show that this great amount of waste may be effectually prevented, and that, too, by very simple means; and that the surface of reservoirs, tanks, water-holes, and ponds in the hottest climates and in the warmest weather, can be for the most part preserved from the loss occasioned by evaporation.

The method which I propose for resisting the evaporation of water could not have been either thought of or applied before the present time, when a succession of discoveries has rendered us masters of many vegetable substances, such as India rubber and Gutta percha, which, after passing through certain simple processes, may be made available for rendering linen, cotton, woollen cloths, canvas, and other fabrics, even of the finest texture, impervious to either air or water. It is by the help of canvas so prepared that I propose to accomplish the object above-mentioned.

Those who are practically versed in this department of art, will readily suggest what species of impermeable water-proof canvas is best adapted in practice for the accomplishment of so desirable an end. It is sufficient to know that such a material can be manufactured at a cheap rate, of a light but strong texture, and in sufficient quantities to cover, as with a carpet, any extent of water that may be necessary. Where a surface of water is to be protected from evaporation, its water-proof carpet may be spread by the following simple means:—At suitable distances from each other on the canvas, and made of the same material, are to be inserted pouches or bags, which, when it is wished to float the canvas on the water, may be inflated with air in the usual manner; when not in use these bags need not, of course, be otherwise than in their collapsed condition. Let us suppose a piece of canvas nine feet in breadth, and one hundred and fifty in length, having these bags in rows, twelve or fifteen feet distant from each other; let us suppose such a piece of canvas placed on the water of a tank, it will then protect from evaporation a surface corresponding to its own extent. Similar pieces might be attached, by tying together their sides and ends, until the whole surface was similarly protected. All this could be done without much labour or trouble: the canvas could be carried in a boat, and dropped from the stern in the same manner as fishermen drop their nets, the men inflating each row of pouches or bags at the time it became necessary to cast them in. Ropes could be also fastened to the extremities of the sheet, so as to connect it with the bank or other boundary of the space of water, loops being attached for this purpose. This canvas could be easily spread out or hauled in, and would effectually prevent, while covering the water, any evaporation taking place, no matter how dry the atmosphere, or how intense the heat of the sun. Nor would this method have the inconvenience it is apparently liable to, of heating the water in the tank, for we know that water cannot be easily heated from above, inasmuch as that which is warmed at the surface becomes specifically lighter, and thus forms a superficial stratum, which prevents the propagation of the heat downwards. It is evident that by this method a considerable quantity of the covering, sufficient indeed to form a non-evaporating surface over large ponds, might be carried by a single horse. When an exploring party, so provided, arrives at a pond or water-hole, they can readily cover it, either by means of ropes brought round the sheet of water, or by one or two men swimming across, holding the ropes attached to the edge of the canvas; and thus preserve for months a supply, which, if left exposed to the influence of the atmosphere, would have vanished in the course of a few weeks.

The following extract from the work of Lieutenant-Colonel Sir Thomas Mitchell, Surveyor General of New

South Wales, proves that the preservation of water will hereafter form in Australia, the most essential feature in agriculture, and consequently every means adapted to facilitate this object will be of the greatest value in that extensive field for British colonization and enterprize. "With equal truth it may be observed that there is no region of the earth susceptible of so much improvement, solely by the labour and ingenuity of man. If there be no navigable rivers, there are no unwholesome savannahs; if there are rocky ranges, they afford at least the means of forming reservoirs of water, and although it is there uncertain when rain may fall, it is certain that an abundant supply does fall; and the hand of man alone is wanting to preserve the supply, and regulate its use. Where natural resources exist, but require art and industry for their development, the field is open for the combination of science and skill, the profitable investment of capital, and the useful employment of labour."

The preceding extract distinctly shows (what indeed is confirmed by other travellers) that civilised man will be unable to form permanent settlements in the extensive and fertile regions of the interior of Australia, unless he can call to his assistance means adequate to overcome the formidable difficulty presented by want of water during several months of the year. The method I have proposed, by which we can readily and cheaply cover even a large surface of water, will, no doubt, greatly facilitate the accomplishment of what would be otherwise in many localities unattainable. Instead of the expense of vaulting over reservoirs, or covering tanks, we can now make the water itself support its own roof—a roof it is true, thin and delicate of structure; but nevertheless, by reason of its impermeability, not less capable of preventing evaporation than if it consisted of the most solid masonry. This floating carpet or roof possesses the great additional advantage of rising or falling, according as the quantity of water in the reservoir increases or diminishes, so that all access of air to its surface, and consequently all evaporation is prevented. This covering being opaque, will keep the water perfectly in the shade, a circumstance which, combined with deficient ventilation, would in itself much retard evaporation, as is exemplified even here by the wetness of roads which are overshadowed by trees, and by the circumstance of the water of ditches, when covered by the *Lemna* or duck-weed, remaining so long after the summer heats have dried up all other places in the neighbourhood.

ON THE HOCK-JOINT OF THE HORSE.

Being engaged in the dissection of the horse, I found, on examining the hock-joint, that any effort to flex or bend the limb at that joint, was counteracted by a considerable resistance, which continued until the limb was bent to a certain extent; after which, suddenly and without the aid of any other force, it attained to its extreme degree of flexion. In attempting to restore the extended position of the limb, I found that a similar impediment existed to its extension, until the same point was passed, when the limb suddenly, as it were, snapped into its full degree of extension at this joint.

At first I conceived that this phenomenon depended on the tendons of the flexor and extensor muscles of the joint; but on removing all these muscles and their tendons, it was not diminished, and it therefore became clear that it depended on some peculiar mechanism within the joint itself.

Before I enter into the details of this mechanism, it is necessary to remark, *that it is evidently connected with the power this animal possesses of sleeping in the standing position,* for it serves the purpose of keeping the hock-joint extended so far as to counteract the oscillation of the body, without the aid of muscular exertion; and in this respect it resembles the provision made to effect a similar purpose in several birds, as the stork, and some others of the grallæ, which sleep standing on one foot. It will appear, also, in the sequel, that not only is the effect produced the same as in birds, but the mechanism is in many respects similar, if the account given by Cuvier, and also by Macartney, be correct.*

Sheep and cows are not provided with ankle-joints of a like structure, and it is well known that these animals do not sleep while standing. Another circumstance which adds additional interest to this peculiarity of structure, is, that it may possibly be connected with the disease termed *string-halt,* in which the limb is at each step suddenly flexed, to a degree far beyond that required in ordinary progression. Whether this is owing to a sudden and jerking flexion of the whole limb, or to flexion of the hock-joint alone, I have had no opportunity lately of determining. If the latter be the case, it is probably connected with the structure of the hock-joint, which I am about to describe. It may be right to observe, that not even a probable conjecture has been advanced, concerning the nature and cause of string-halt, a disease to which sheep and cows are not subject, and I have already observed, that in these animals the structure of this joint presents nothing remarkable.

The hock-joint is a good example of what is termed the hinge-like articulation, and is formed between the tibia and astragalus, which latter bone presents an articulating surface, with a nearly semicircular outline, and divided into two ridges, including between them a deep fossa. The tibia is furnished with depressions which ride upon the ridges of the astragalus, and has anterior and posterior projections, which, moving in the fossa, are received into corresponding depressions in the astragalus, at the moment the limb arrives at the greatest degree either of flexion or of extension.

The shape of the surfaces of the astragalus concerned in the articulation, is not that of a given circle throughout, for towards either extremity, the *descent is more rapid,* or, in

* See *Rees' Cyclopædia,* Art. Birds.

other words, answers to an arc of a smaller circle. Hence, when one of the projections of the tibia has arrived at its corresponding cavity in the astragalus, which happens when the limb is either completely flexed or completely extended, the rapid curve of the articulating surface presents a considerable obstruction to change of position. Thus, the form of the articulating surfaces, in itself, to a certain degree, explains the phenomenon, but its chief cause is to be found in the disposition and arrangement of the ligaments.

The external malleolus of the tibia is divided by a deep groove, for the passage of a tendon, into an anterior and posterior tubercle; from the latter of which and close to the edge of the articulating surface, arises a strong and broad ligament, that is inserted into the os calcis. Under this lies another ligament, which arising from the anterior tubercle, is also inserted into the os calcis. It is to be observed, that the origin of the latter is anterior to that of the former, but its insertion posterior, so that these lateral ligaments cross each other in the form of an x. The external articulating protuberance of the astragalus on which the tibia revolves, has, as I have already stated, a nearly circular outline, and the attachments of the ligaments just described, are at points on the outside of the os calcis, which would lie nearly in the circumference of that circle, where it is continued from the articulating surface; so that each of these ligaments has one of its extremities fixed in a certain point of the circumference, while its opposite extremity revolves during the motion of the joint, nearly in the circumference of the same circle. This observation applies likewise to the two lateral ligaments on the inner side of the joint, which have nearly the same relation to each other, and to the general contour of the joint, as that just described; hence it is obvious, that during the rotation of the joint, as the origins of these ligaments move along the same circumference in which their attachments are fixed, the ligaments will be most stretched when they correspond to diameters of that circle.

Now it is so arranged that this happens at the same time for all, and consequently the ligaments on each side correspond not merely as to direction, but as to the point of time when they become most stretched, which is nearly at the moment that the joint has no tendency to move either way, and at that moment, it is to be observed, that although the ligaments are most tense, and of course react on their points of attachment with greatest force, yet this produces no motion, as the force is exerted in a direction perpendicular to the circumference; but as soon as the tibia is moved beyond this point of inaction for the ligaments, the latter, no longer representing diameters, by their contractile force evidently tend to accelerate the motion, and as they all act in the same direction, and are assisted by the shape of the articulating surfaces, a sudden motion of flexion or extension is thus produced.

The preceding explanation supposes the ligaments of this joint to possess, contrary to the nature of ligaments in general, a certain degree of elasticity, which was evidently the case in all, but particularly in the most deep-seated of those on the inner side of the joint, which, therefore, appear most concerned in producing the sudden motion, whether of flexion or extension.

Note.—Since the preceding notice concerning the hock-joint of the horse, was submitted to the Academy, I have had an opportunity of examining two horses affected with string-halt, and am inclined to attribute the disease to a spasmodic affection of the flexors of the limb generally, rather than to any derangement in the structure of the hock-joint. It may be right to mention that the following authors on Comparative Anatomy, and the Anatomy of the Horse, have been searched, but they contain no notice of the peculiarity in the structure of the hock-joint, above described :—Macartney, Cuvier, Carus, Blumenbach, Meckel, Clater, Blaine, Stubbs, Percivall, Boardman, White, Lawrence, Osmer, Home, Bourgelat.

ON THE STRUCTURE OF THE VERTEBRÆ OF THE DELPHINUS DIODON.

In the autumn of 1829, two of the species of whale called Delphinus diodon, by Hunter; Hyperoodon, by Lacépède; and Cetodiodon, by Dr. Jacob; were captured near Dublin, one of which, measuring about sixteen feet in length, I procured for the purpose of preparing its skeleton.

After the spinal column had undergone maceration for a few days, I found that the intervertebral substance could be easily detached from the bodies of the vertebræ, and that it carried with it, firmly attached to each of its extremities, a flat circular bone, about a quarter of an inch in thickness, and exactly corresponding, in the extent and shape of its surface, to that of the body of the vertebra, from which it had been separated.

The separation was effected with facility, and took place spontaneously and completely when the maceration had been continued some time longer. The surface of the flat bone, where it had been adherent to the body of the vertebra, was of a spongy texture, afforded a passage to many blood-vessels, and was marked by numerous sharp projections, and deep furrows, diverging from its centre, and answering to similar projections and furrows on the denuded extremity of the vertebra. The surfaces of these flat bones, of course, varied in shape and size, with the extremities of the vertebræ to which they were attached, being from five to six inches in diameter at the dorsal, and not more than one inch at the last caudal vertebra. The material of these bones towards the intervertebral substance was of much harder and closer texture than that of the bodies of the vertebræ themselves, and where it was adherent to the intervertebral substance, it had a smooth surface, marked with a great number of concentric lines, answering to the arrangement of the fibres in the intervertebral tissue, which adhered to this face of the bone with great strength. This marking was deficient towards the centre, where the intervertebral substance is fluid.

The facility with which these bones are detached, is the reason why we never find them adhering to the vertebræ of those young whales which have been cast on our coast, and whose skeletons have been exposed to the action of the waves and the weather. Their flat shape, too, renders them liable to be covered by the sand, and hence they are rarely to be found, even when the vertebræ and other bones of this species of whale are scattered along the coast in great numbers; as happened at Dungarvan some years after several of these animals had been captured and dragged ashore by the fishermen.

The bones I have described must evidently be considered in the light of terminal epiphyses of the bodies of the vertebræ, and are deserving of notice on account of the facility with which they can be detached, even in very large, and, of course, not very young animals of this species, as I observed in the two skeletons preserved in the College of Surgeons, one of which measures thirty feet in length; so that when the skeleton has been artificially prepared, they resemble separate intervertebral bones rather than vertebral epiphyses. In the land-mammalia the consolidation takes place much more rapidly, and a few years are sufficient to efface all traces of former separation between the epiphysis and the body of the vertebra; the comparative slowness of this process in the whale, is probably referable to the longevity of the animal, and the greater length of time necessary to complete its growth. A knowledge of this fact puts us in possession of a new and useful mark of the animal's age independent of its size, and it is for this purpose I have brought it forward, for although not noticed by any author I have seen on the Anatomy of Whales, it must, nevertheless, have been known to several. If we find that the terminal epiphysis has become completely united to the body of the vertebra, we may be assured that the bone, whether large or small, belonged to an animal arrived at maturity; but if not, we may conclude that the latter had not yet attained to its greatest size. To facilitate this inquiry, I may remark that a very slight examination of a vertebra is sufficient to determine whether the epiphysis has, or has not, been detached; as, in the former case, the surface is marked by deep ridges and furrows diverging from the centre towards the circumference; whereas, in the latter, if the animal was of moderate size, the marking consists of concentric lines, answering to the attachments of the intervertebral substance. If the animal was very large, these concentric lines are found exaggerated into concentric furrows; and whether the attachments of the intervertebral substance be marked by concentric lines or by concentric furrows, *a considerable portion of the central part of the bone, where it had been in contact with the internal substance of the intervertebral ligaments, is quite destitute of this marking,* and presents a striking contrast to the rest of the surface.

I am not aware that the true cause of this notable difference between the markings on the extremities of the vertebræ of the cetacea has been before explained. It may not be uninteresting to add, that in the specimen of the Delphinus diodon in my possession, and in both of those in the Museum of the College of Surgeons, the want of symmetry between the right and the left sides of the cranium, which was first observed by Meckel in the skulls of the cetacea, is remarkably to be seen.

NOTE.—Flourens, in his work, *De la Longévité Humaine,* Paris, 1855, has dwelt on the condition of the epiphyses, as a means of determining the successive periods of life. The above essay of Graves, in which he seems to have anticipated the French author, appeared in the Transactions of the Royal Irish Academy for 1830.—ED.

ON SOME AFFECTIONS OF THE HAIR.

Physiologists are agreed that the hair consists of matter somewhat analogous to horn or nail, secreted by a vascular sac imbedded in the skin, and sometimes reaching as far as the subcutaneous tissue. There is reason to believe that this sac is abundantly supplied with nervous matter, and embraces within it the bulb-like root of the hair, which is now generally thought to be of a homogeneous texture, and not tubular or hollow in the centre. The colouring matter of the hair is said to be diffused through its substance; and most authors are of opinion that the hair, once formed, is then placed beyond the reach of any change connected with the organism. The phenomena of Plica polonica seem difficult to reconcile with this hypothesis, and my observation that hair, generally speaking, grows grey first at the tip,—the want of colour proceeding from the point towards the root, seems to establish the contrary supposition, and to prove that the hair, during its growth at least, is an organized body, endued with vitality, or otherwise it could not happen that colouring matter once deposited through its texture could disappear. And the probability of this opinion is strengthened by the rapidity with which the colour disappears, for even a long hair, when the greyness at its extremity has commenced, becomes entirely grey in the course of a few days, the change of colour proceeding rapidly to its root. Examples, too, have occurred of an evident sensibility existing in hair otherwise healthy.

Some physiologists have attributed the colouring matter of the hair to the sebaceous follicles, which, they say, secrete an oil, by the combination of which with certain principles contained in the hair the colour is developed; but, according to this opinion, the hair once dyed would not lose its colour in the manner I have described above. For practical purposes, then, we may consider the hair to resemble a plant imbedded in the surface of the body, and consequently its healthy or its diseased functions must be connected not only with changes occurring in the hair and its bulb, but with those which take place in structures more immediately in contact with the latter. Thus the hair may cease to grow, and baldness ensue, as in old age, from decay and absorption of the bulb itself; or the same result may in youth be produced by causes which injure the vitality of the bulb, or change the structure of the skin in which it is implanted.

INSTANCES IN WHICH GREY HAIR REGAINED ITS NATURAL COLOUR.

A field officer in a distinguished regiment had served for many years in tropical climates; had undergone the fatigues of the Burmese and other subsequent campaigns in the East Indies, during which he contracted dysentery and fever, and various maladies peculiar to hot countries; and finally, after many years' service, was obliged to return to these countries in the hope of regaining his health. When he consulted me he was worn and emaciated, and complained much of dyspeptic and nervous symptoms, with a constant tendency to bowel complaint. He was then forty-eight years of age, and his hair had, during a few years preceding, become quite white; while his forehead, parts of his cheeks, and the back of the neck and shoulders presented many large maculæ of a brown colour, nearly as deep as the areola around the nipple of a pregnant woman. In the course of four years he visited me again, having during the interval remained with the depôt of his regiment in England, and gradually regained his health under the influence of regimen and his native air. On his second visit I scarcely recognised my former patient. He had become robust and healthy-looking, and the maculæ had altogether disappeared, while his hair had regained its original brown colour: not a single grey hair remained. The hair is now soft and silky, and has continued of its natural colour during the last two years; but it is remarkable that the whiskers have remained white.

In the year 1837 I was called to see a gentleman, aged sixty-seven, labouring under the then prevalent influenza. He was a strong hirsute man, and his chest was covered with long white hair, which had been black in his youth. I blistered him on the chest, and when he recovered from the disease, the hair on the part that had been blistered grew again, but was now quite black, and has continued so since. I need scarcely add, that he is very proud of this unexpected symptom of returning youth, and readily exhibits to the curious this portion of his chest.

A lady, aged thirty-five, had a severe attack of fever, after recovery from which her hair turned quite grey, and began to fall out. The head was then shaved, and the shaving was repeated several times, after which there was an abundant growth of hair of the original auburn hue.

A friend has communicated to me the following fact relative to the hair, which forms a singular exception to what is usually observed in phthisis. A young lady, of fair complexion and dark hair, became consumptive, and her luxuriant hair rapidly fell and deteriorated, being replaced by a thin, woolly, coarse crop. The tubercular disease proceeded slowly, lasting fourteen months. About six weeks before her death, a new crop of hair appeared, if possible, more beautiful than that which she originally possessed, and grew with such unexampled rapidity, that at the period of her death she had a splendid head of hair. Physiologically it is deserving of remark, that though this young lady had considerably emaciated in the trunk and limbs, her face and features preserved the roundness and fulness of beauty; the scalp, therefore, was, in all probability, by no means deficient in nourishment. The unlooked for growth of hair excited vain hopes in the breast of the poor patient and her friends, who could not be persuaded that this new product of life was but the forerunner of death.

To many it may appear trifling and beneath the dignity of a practical physician to dwell so much on this topic; but in truth mankind have always attached great importance to this ornament of the human body; and grey hairs and baldness are to many quite as appalling as real disease, or even death. This feeling is not confined to the moderns, for we find that the poets and the moralists of antiquity abound in passages to the same effect. The physician who has witnessed the strange degradation of appearance which follows the shaving of the female head in fever, must acknowledge that the grief of the widow of old, who laid her tresses on the tomb of her deceased husband,* had at least a greater shew of poignancy than is exhibited by our modern ladies, who in their grief partially conceal, but never destroy, this cherished ornament. And they are probably right, for the operation of natural causes renders the growth of hair slower than the decrease of sorrow. I was not aware of the great degree of beauty which the hair imparts, until I examined, in the Royal Irish Academy, the skull of a Peruvian female mummy, in which the bones of the face and forehead were as usual exposed, but the desiccated scalp still bore its luxuriant crop of flowing ringlets, which imparted no small degree of beauty even to this death's head.† I may here men-

* So in the Helena of Euripides (v. 1087), the heroine exclaims when about to assume the widow' garb:

ἐγὼ δ' ἐς οἴκους βᾶσα βοστρύχους τεμῶ, &c.

"I will go in, cut off these crisped locks," &c.

† The mummy here referred to is now in the Museum of the Royal College of Surgeons.

tion, that I once attended a lady of upwards of eighty years of age, who exhibited all the usual appearances of withered senility, but who had a magnificent head of coal-black hair. Contrary to what might have been expected, she bitterly deplored the circumstance, for this emblem of youth was but ill assorted with every other external sign of old age. "Two years ago," said my patient, "my maid, in combing me, discovered a grey hair. I was overjoyed, and hoped that others would speedily follow, but none have appeared since." She was the only person who ever asked me for a receipt to turn the hair grey.

We are aware that the least highly organized tissues are capable of being reproduced after having been destroyed; now many facts have come under my notice which seem to authorize the conclusion, that when the original stock of bulbs has been destroyed in the scalp, a new stock is frequently developed by the powers of nature, and thus an entirely new crop of hair arises. It is well known that cases have occurred where supernumerary teeth have been produced; and, in the instance of the celebrated Countess of Desmond, it was asserted that when the adult set of teeth failed from old age, a rejuvenescence took place, and a third set appeared. I was always inclined to doubt the truth of this assertion until my friend, Dr. Curran, related to me the following particulars respecting his great-grandmother, Mrs. Waterworth. She had always been a remarkably healthy woman, was extremely active in her habits, and died, apparently of mere senility, aged ninety-five. When about eighty, her sight, which for fifteen years previously had been so weak as to prevent her reading, became so completely restored, that at the time of her death she could, without spectacles, thread the finest needle, and read, without fatigue or difficulty, the very smallest print: she about the same time got a completely new set of teeth. The exact number of teeth that grew at this unusual period I have not been able to ascertain; but of the fact, as stated above, there can be no doubt. This rejuvenescence was not consequent on any change of place or habits, but it was accompanied by a very considerable increase of strength, which continued to the last. Dr. Curran has a curious copy of Mr. Easton's valuable work on *Longevity*, in which the author has added in manuscript notes, many interesting particulars respecting Mary How, of Mapleton, Derbyshire, who at the age of 110 got several new teeth, whilst her hair resumed its former colour; Peter Bryan, of Tynan, county of Armagh, who cut several teeth at the age of 117; Lady Angelique Domengieux de Sempe, of Nouiliac, in France, who got teeth at 90, and lived thirteen years afterwards; Margaret Melville, of Kellie, Fifeshire, who lived to 117, and got teeth at 100; John Minniken, of Maryport, Cumberland, whose hair grew so abundantly in his old age, that twenty wigs were made of it between his 80th and 112th year; and many similar instances, of some of which Mr. Easton was himself cognizant. These cases are, perhaps, not more extraordinary than that of Old Parr, whose costal cartilages were found not ossified. Parr lived to 152, a fact for which we have the authority of a committee of the Royal Society (among whom was the great Harvey) appointed to make the *post-mortem* examination. As an example of a somewhat similar exception to general rules, Dr. Curran permits me to mention the case of his friend, Doctor Harrison, now a practising physician in the Isle of Man, who grew one inch in stature between his thirtieth and thirty-second year.

HAIR OF THE CARTHAGINIANS.

Much uncertainty prevailed as to what race of mankind the Carthaginians belonged to, until the publication of a learned work by Gesenius on *Phœnician Inscriptions*. This writer has proved, as Dr. Prichard testifies, that the Hebrew is identical, or nearly so, with the language of the Canaanitish, or Phœnician people on the coast of Syria, and with the Punic of Africa. The Carthaginians must consequently have been allied to the Jews, and were therefore a long-haired people.

This is shewn to have been actually the case by the following fact, recorded in the writings of Appian and Strabo, with reference to the last siege of Carthage, and thus recited by Rollin :—

"The command of the troops within the walls was given to another Asdrubal, grandson to Masinissa. They then applied themselves to the making arms with incredible expedition. The temples, the palaces, the open markets and squares, were all changed into so many arsenals, where men and women worked day and night. Every day were made 140 shields, 300 swords, 500 pikes or javelins, 1000 arrows, and a great number of engines to discharge them; and because they wanted materials to make ropes, the women cut off their hair, and abundantly supplied their wants on this occasion."

The Tyrians who founded Carthage became very numerous, and therefore probably did not, like many other Greek and Phœnician colonists, lose, in the progress of time, their native language. They found it, however, necessary to learn also the vernacular tongue of the Numidians, among whom they settled; and hence Mr. Hodgson's* explanation of the words in the *Æneid*, "Tyriosque bilingues." Modern researches go to prove that the Berbers of Northern Africa are the descendants of the ancient Numidians; and therefore that the latter could not have been Negroes, but were men with long hair and a tawny complexion. As the ancient Numidians occupied many, if not all the littoral provinces of Spain, where to this day evident traces of the Berber language are said to exist, we may understand how it came to pass that the Carthaginians experienced no difficulty as to language when they subjugated Spain, and marched towards the Alps and Italy. It is interesting to observe that though Africa has produced two of the most remarkable intellects of antiquity, yet that these were developed in individuals of different races, Hannibal

* *Transactions of the American Philosophical Society*, vol. iv, 1834.

belonging to the Caucasian, and Æsop to the Negro type.

* NOTE.—The following is the passage from Appian, quoted by Rollin. It will be seen that the Greek author gives the fact relating to the use of the hair of the women, in terms even stronger than those of Rollin, inasmuch as he states that they had recourse to this measure from the circumstance that all other supplies were exhausted :—

"*Εἰργάζοντό τε ὁμοῦ ἄνδρες τε καὶ γυναῖκες, ἡμέρας τε καὶ νυκτὸς μὴ ἀναπαυόμενοι καὶ σῖτον αἱρούμενοι παρὰ μέρος ἐπὶ ὅρῳ τακτῷ, θυρεοὺς ἑκατὸν ἡμέρας ἑκάστης καὶ ξίφη τριακόσια καὶ καταπελτικὰ βέλη χίλια, σαύνια δὲ καὶ λόγχας πεντακοσίας καὶ καταπέλτας ὅσους δυνηθεῖεν. ἐς δὲ τὰς ἐπιτάσεις αὐτῶν ἀπέκειραν τὰς γυναῖκας, τριχῶν ἑτέρων ἀπορίᾳ.*"—*Appianus*, viii., 93.

Men and women worked together day and night, without pause, having their food meted out to them according to a certain ratio, and they made a hundred shields each day, and a thousand missiles for catapults, five hundred spears and lances, and as many catapults as they could. *And to get strings for them, they cut the hair of the women, for want of any other hair.*

Strabo, xvii, 3, 15, says:—"*τρίχα δὲ τοῖς καταπέλταις αἱ θεράπαιναι παρεῖχον* :" *but the hair for the catapults was furnished by the female servants.*

ON SOME PECULIARITIES OF THE SKELETON IN HUNCHBACKS.

Although the observations of Dr. Stern, recorded in Müller's *Archiv*, cannot be said to throw any new light upon this subject, yet they have served to elicit some curious points of comparison as to the organisation of this deformed class of persons. Even the most inattentive observer must have remarked the sort of family likeness, both in mind and body, that runs through the individuals labouring under this deformity; a likeness arising not merely from the existence in all of a hump, but from a similarity in complexion, in the general form of the head, and in the care-worn, superannuated appearance of the face. Their limbs, too, are all similarly disproportionate, and seem evidently fashioned to serve a trunk of larger proportions. But though the growth of other parts, as, for example, the extremities, has not been suppressed equally with the growth of the trunk, yet neither has the development of these parts proceeded regularly, and it is to this curious phenomenon that the memoir of Stern is directed, for he proves that the different bones of the extremities in hunchbacks do not bear their due proportion to each other. Thus the *thigh bone* is somewhat shorter than it ought to be, even in proportion to the diminished stature of the individual, while the bones of the foot are very large, and suited to a much taller person. Of all the bones, the humerus is proportionally the longest, and to this is owing the great comparative length of the upper extremities in individuals thus deformed. The skulls of hunchbacks present a remarkable want of proportion between the cranium, properly so called, or brain case, and the skeleton of the face. In fact the former equals in size that of a well-grown adult, while the bones of the face remain undeveloped and small, as in childhood. This gives their physiognomy a very curious expression, for in their heads old age and wisdom seem associated with several of the elements of childhood and simplicity. In the form of the lower jaw, in the great size of the mouth, in the compressed flatness of the lips, and in the sharp elongated nose, we recognise a striking likeness between all humpbacks. It is curious thus to find that a disease of one, or of a few vertebræ, occurring *at an early period of life*, serves not merely as a foundation for a permanent deformity in the spine itself, but proves the means of modifying the size and shape of even distant organs, such as the bones of the face and of the extremities. An occurrence of this sort taking place before our eyes, and long after birth, teaches us what we may expect from injuries or diseases of any important organ during the growth of the fœtus; prepares us for expecting that certain malformations of the central organs necessarily give rise to secondary disturbances in the development of some given parts lying more in the circumference. It would be extremely interesting to determine what influence the situation of the hump has in disturbing distant development. Is the general formation of the face and limbs, when the hump arises low in the back, different from that which distinguishes those whose humps occupy a situation higher up? It is curious enough, and contrasts strongly with the effects on the facial development produced by a hump on the back, that some infants are born with the face fully formed, but wanting the brain and spinal marrow!

ON THE SUPPOSED WANT OF THE SAGITTAL SUTURE IN CERTAIN TRIBES OF NEGROES.

The following letter from Mr. Wallace, Surgeon in the Royal Navy, appears in the *London Medico-Chirurgical Review,* edited by the Drs. Johnson:—

"27, Surrey-street, Strand, 7th June, 1836.

"Gentlemen,—The following little piece of intelligence you may perhaps think worthy of being presented to your readers.

"In December, 1833, His Majesty's sloop 'Trinculo,' to which I was then attached, while cruising in the Bight of Biaffra, on the west coast of Africa, captured two small schooners, carrying (both) about 100 slaves, consisting of men, women, and children, the whole of whom we landed immediately after, at the island of Fernando Po. The Trinculo did not return to Fernando Po until October, 1835, at which time we naturally made inquiry after our old friends the liberated Africans, all of whom, with the exception of those who had died, we found domiciled on the island, having the character of being idle, disobedient, unkind to each other—in short, possessing a host of bad qualities, with scarcely a single good one to redeem them. But the remarkable circumstance to which I wish to call your attention is, that of those who had died, four had been examined on account of supposed disease in the head, and in all the sagittal suture was wanting. At the first examination the circumstance did not excite any very great degree of surprise, as it was merely supposed to be a *single* deviation from the ordinary process of nature, but when a second, a third, and even a fourth evinced the same thing, then it not only excited much attention, but produced the very natural conclusion, that in this race of blacks such is the usual cranial conformation. If such is really the case, to say the least of it, it is exceedingly remarkable; and for what purpose nature should so perform her work, is a question which, although interesting, it may not be very easy to determine.

"These blacks were principally from that part of the west coast of Africa lying between the rivers Gaston and Congo, and it has long been noticed that the slaves taken from that quarter are neither so powerfully made, nor in possession of the same degree of intelligence, as the tribes to the northward and westward; but, upon the whole, there is a fair development of skull, and, so far as I have noticed, the mechanism of the head, with the exception alluded to, is perfect.

"From Mr. Ballard, surgeon of the establishment at Fernando Po (the gentleman who kindly furnished me with the information now given), I received one of the skulls above-mentioned, which, since my arrival in England, I have deposited in the museum at Haslar.

"I am, Gentlemen, very respectfully yours,

"James Wallace, Surgeon, R.N."

I have thought it right to give the whole of Mr. Wallace's letter, for the purpose of annexing the following communication from Dr. Prichard to me on the subject, and of expressing my opinion that, in the skulls mentioned by Mr. Wallace, the obliteration of the sagittal suture must be considered as a mere accidental variety; and as it not unfrequently occurs in other races of mankind, it cannot of course be considered as characteristic of any particular tribe:—

"Bristol, July 20, 1836.

"You once asked me whether I had seen wormian or triquetral bones in negro skulls, to which my reply was, that they existed in several to which I had recourse to decide the question. I never till then heard of the doubt whether they exist or not, but since have seen Berthold's *Dissertation.* Neither Soemmering, Berthold, Blumenbach, Bory De St. Vincent, nor any writer known to me, mentions the want of sagittal suture; I do not believe it characteristic of any particular race. Many negro skulls, and some European, have the osseous structure so condensed by a more than ordinary deposition of earthy matter into the tissue which supports the bony fabric, as to be heavy like marble. In such heavy skulls *all the sutures* become evanescent. I have by me now four negro skulls. In one, the heaviest, a Creole, son of two slaves from the coast of Africa, the sutures are barely perceptible; the posterior half of the sagittal is quite obliterated: there are some wormian bones in the lambdoidal; nearly all the sutures in the face are quite imperceptible. In the other negroes, which are considerably less of weight, the sutures are all very strongly marked. In the skull of a Greek, a native of Corfu, the sagittal suture is obliterated in a considerable part of its tract. This Greek skull has a good deal of the white marble appearance seen in the cranium of the first negro. The heaviest and most marmoraceous skull I ever saw was one of a Mulatto, which weighed 2lb. 10oz. There are some curious remarks on this subject in Blumenbach, *De Generis Humani Varietate Nativâ,* and in Soemmering.

"J. C. Prichard."

INFLUENCE OF THE WATERS OF THE DEAD SEA AND OF THE GREAT SALT LAKE OF AMERICA ON ANIMAL LIFE.

The earth contains living beings so generally, that we feel surprise at finding portions of either land or water destitute of both animals and vegetables. When this exception occurs on a large scale, it naturally attracts more attention, and may even, as in the instance of the Dead Sea, obtain universal notoriety. Under these circumstances, the nature of the physical causes which have produced an effect so singular and unexpected becomes a subject of very interesting inquiry, in conducting which we will be evidently much assisted if we can discover, in some other country, a large body of water which displays, not only a similar absence of life, but likewise a combination of physical qualities closely resembling, if not absolutely identical with those of the Dead Sea.

This, the subject of our investigation, is a very deep and extensive lake, into which the Jordan—a considerable river, and several smaller streams, all abounding in the fishes and fluvial vegetables of Palestine, discharge their waters, and yet, as the name implies, it has been generally believed to harbour no living thing within its fatal boundaries. The surface of this lake is stated to be many hundred feet below the level of the Mediterranean.* It is about sixty miles in length, but varies considerably in breadth, and has of course, no rivers flowing from it.

Until the publication of the researches of Lieutenant Lynch, who was sent by the government of the United States, to conduct an expedition fitted out for the purpose of thoroughly examining the waters and shores of the Dead Sea, we absolutely knew nothing certain or definite respecting either. To our enterprising transatlantic brethren we are indebted for the first chart of a lake which lies, as it were, in the very cradle of civilization, and which, nevertheless, had (as far as I am aware) never before been surveyed or even navigated. My countryman, Costigan, it is true, succeeded in launching on it his frail skiff, but he very speedily fell a victim to excessive anxiety, fatigue, and the baneful effects of climate; and the observations subsequently made by Molyneux, Robinson, Kinglake, and Warburton, however interesting to the general reader, contain nothing sufficiently accurate to form the groundwork of scientific conclusions. The progress of geographical discovery has lately brought to light the existence of an inland sea still more extensive, and displaying within its boundaries an absence of life equally remarkable; viz., the Great Salt Lake of North America, first navigated, in 1847, by Fremont, commander of the exploring expedition fitted out by the government of the United States. This lake has many and striking points of resemblance with the Dead Sea, some of which it may be well to enumerate.

1st. Its water is equally salt, and, of course, has as high a specific gravity.

2ndly. Its banks and the neighbouring country abound equally in great deposits of salt, and in the various rocks usually associated with natural magazines of salt.

3rdly. In the neighbourhood of both, hot springs occur,

* According to several measurements, the surface of the Dead Sea is rather more than 1,300 feet below the level of the Mediterranean. Its depth is above 1,000 feet, and its breadth nine miles."—Ed. *Edin. Phil. Jour.* 1851.

several of which are sulphureous, and evidently owe their existence to volcanic action, as is proved by the co-existence of tufa, lava, basalt, and other formations obviously of igneous origin.

4thly. In both of these lakes the surrounding country at considerable distances exhibits a repetition, on a small scale, of similar phenomena. Thus, in Palestine we have, according to the observations of Lynch, hot sulphureous springs, and very productive bitumen pits, at the higher source of the Jordan, many miles distant from the Sea of Galilee. Accordingly, we must acknowledge the operation of an agency in the production of salt and sulphureous waters, together with bitumen, in many remote parts of Palestine, an agency similar in all respects to that which has produced like effects at the Dead Sea and its immediate vicinity. The same observation applies to the Great Salt Lake of America, for all its concomitant and remarkable peculiarities appear in localities far removed from the lake itself.

5thly. A very singular coincidence is, that each of these reservoirs of salt water receives a river derived from a neighbouring fresh-water lake. Thus, the Jordan discharges the superabundant waters of the Sea of Galilee into the Dead Sea, while, in like manner, the Great Salt Lake receives a considerable supply of fresh water from the Utah Lake.

6thly. Though the Dead Sea receives copious supplies of fresh water from the Jordan, and various other considerable streams and rivulets, yet the freshening effect is only felt at the mouths of those rivers, and their immediate neighbourhood, so far as the shallow water (due to the accumulation of detritus carried down by their currents) extends. While shallow, the water at first fresh, becomes brackish, and all traces of freshness disappear when the deep parts of the lake are reached. The same remark applies to the Great Salt Lake, which is upwards of seventy miles long, and of great depth. The Bear River and the Weber empty themselves into it, and though both are large rivers, they scarcely produce any freshening effect except at the point of entrance into the lake. It is of great importance to our inquiry to remark, that in the case of the Dead Sea, and of the Great Salt Lake, all the affluents contain the usual proportions of fishes and other animals, as well as of vegetables peculiar to their respective countries. Nay, more, in each case where the affluent has formed an extensive delta, there, in proportion to the average degree of freshness of the water, we find various plants growing in abundance; neither are the banks or borders of these lakes invariably destitute of trees, shrubs, or grass. On the contrary, wherever the nature of the surrounding rocks affords materials for a fertile soil, and rivers or springs supply the necessary moisture, there vegetation, occasionally luxuriant, is to be found. Thus it is necessary for us to bear in mind that life is not banished from every part of either the Dead Sea or the Great Salt Lake, or their respective shores, but encroaches upon both when favourable physical circumstances exist to encourage the growth and maintenance of either animals or plants. It is true that the rugged rocks, which in most parts surround the Dead Sea, are, from their nature, and the absence of supplies of fresh water, more destitute of vegetation than those around the Great Salt Lake. This admits a ready explanation by the much greater humidity of the air, and frequency of rain, in the Western parts of America than in Palestine.

It must not be forgotten, likewise, that certain rocks disintegrate very slowly under exposure to atmospheric influences, and others seem altogether incapable of supporting vegetation. Thus I have examined several extinct volcanic craters in Auvergne, and, after the most minute search, could not discover the existence of even a lichen on their surface: and I was the more surprised at this fact, because other parts of that district exhibited the richest soil, spreading over fields of lava, and extending far up mountains composed of that material.

Having made these preliminary observations, we must next examine more accurately the nature and proportions of the saline contents, to which we have attributed the absence of fishes, and the usual inhabitants of deep water, from the inland seas in question.

Mr. Monk, author of the *Golden Horn, or Sketches in Asia Minor*, gives a very interesting description of his tour round certain portions of the Dead Sea; and we are indebted to his exertions for an analysis of its water, a specimen of which he brought to Mr. Herapath, who found in it rather more than 24 per cent. of saline matter, consisting of chlorides of potassium, sodium, calcium, magnesium, iron, and manganese, with bromide of magnesium.* This high saline impregnation alone is quite sufficient to account for the absence of both vegetable and animal life, even on the supposition that none of the salts are actually poisonous to either, except when present in very large proportions, a supposition, which, however, is not warranted, as one of them, the bromide of magnesium, is detrimental to animal life.†

* *Vide* Herapath and Thornton, in No. viii. of *The Quarterly Journal of the Chemical Society of London,* for January, 1850; also *Edinburgh New Philosophical Journal,* vol. xlviii. p. 313.

† The water of the Dead Sea has been analysed by Dr. Apjohn, and also by Gmelin. The specimen examined by Dr. Apjohn was brought to this country by George James Knox, Esq., and was collected about half a mile from the embouchure of the Jordan, and towards the close of the rainy season. The following are Dr. Apjohn's results, as stated by him in the *Proceedings of the Royal Irish Academy*, vol. i., 1841, p. 290:—

Chloride of Calcium	2·438	18·78
Chloride of Magnesium	7·370	
Bromide of Magnesium	0·201	
Chloride of Potassium	0·852	
Chloride of Sodium	7·839	
Chloride of Manganese	0·005	
Sulphate of Lime	0·075	
Water	81·220	
	100·000	

The specific gravity of the water was 1·153, and its boiling point 221 deg. F.

The specimen examined by Gmelin was of greater density, its specific gravity being 1·212, and even the ratio of the salts was not the same as that found by Dr. Apjohn. Gmelin found chloride of ammonium and chloride of

We owe to Fremont the only analysis of the water of the Great Salt Lake I have been able to obtain, and which, although rough, is quite sufficient for our purposes. He obtained from 40 pints of the water 14 pints of solid saline residuum, *i.e.*, more than a third by weight of salts! Fremont says, that a subsequent and more accurate analysis detected in this residuum chlorides of sodium, calcium, and magnesium, together with sulphate of soda and lime. Now, as the Great Salt Lake contains no fishes or other animals, and in this respect agrees with the Dead Sea, may we not, or rather must we not, attribute so striking a coincidence to the saline properties of their waters?

It is plain that fishes of the ordinary specific gravity could not swim at any depth in such a medium, for its great density would tend powerfully to bring them to the surface. This quality of the water would of itself render it unfavourable to such animals, but it is probable that the chief obstacle to their living in it is to be found in the immense proportion of salts present, by which it is rendered unfit for the purposes of respiration and nutrition.

It is true that some crustaceous and other animals of a still lower grade, have been found in the strong brines of salt mines; and it is by no means proved that such do not exist even in the highly saline waters of these lakes, for no investigations have been made sufficiently numerous or accurate to determine this curious question. Indeed, Fremont (p. 153), discovered numerous larvæ of insects, *or skins of worms,* as he calls them, on the shore of an island in the Great Salt Lake, but he had no means of determining either the species or the *habitat,* but those he observed were dead, and evidently thrown up by the waves. The specimens were not larger than a grain of oats. Future observers should seek for them, or something similar, on the shores of the

aluminum, of neither of which could Dr. Apjohn detect the slightest trace. These discrepancies are probably due to a varying constitution of the water, depending on the season, and on the localities from whence the specimens for analysis were taken.—Ed.

Dead Sea.* A very interesting subject of inquiry here suggests itself. It has been observed that the rivers which flow into the Dead Sea and the Great Salt Lake abound in fishes. Do these fishes belong to species peculiar to these rivers, or do they occur in other rivers of Palestine and North America? The researches of my friend Agassiz, published in the *Edinburgh New Philosophical Journal,* induce me to favour the former supposition.

With respect to plants, it has been ascertained that salt in any considerable quantity proves destructive to all ordinary species. See the experiments of Voelcker, detailed in the Report of the 20th Meeting of the British Association, p. 115. He found that most plants were injured seriously when watered for a month with a solution of 100 grains of common salt in a pint of water, *i. e.,* containing about $\frac{1}{12}$ part of salt. If we now consider the waters of the Great Salt Lake, or of the Dead Sea, in which the saline ingredients are so much more abundant, we at once perceive how impossible it would be for any plant to live in a medium so intensely saline. Voelcker found that the grasses are affected more injuriously by salt than any other family of plants; a fact which explains the total absence of pasturage over the extensive districts called the Salt Deserts, south of the Great Salt Lake, and which present the most appalling spectacles of great tracts of country totally destitute of life that the world affords. They truly deserve the name of the Dead Deserts.

* Since writing the above, I find that my anticipations have been confirmed, for Baron A. von Humboldt (*Views of Nature,* edit. Bohn, London, 1850, p. 260) states, "in opposition to the generally adopted opinion respecting the *absence* of all organisms, and living creatures in the Dead Sea, it is worthy of notice, that my friend and fellow-labourer, M. Valenciennes, has received beautiful specimens of *Porites elongata* (Lamarck), from the Dead Sea, which is supersaturated with salt."

Humboldt does not mention whether these specimens were found where the water is really saturated, or only in the estuaries of rivers, where it is brackish. From the occurrence of this species in the Red Sea, it appears to me very improbable that it could exist also in water so much more impregnated with salt than that of the ocean, as we know the undiluted water of the Dead Sea to be.

Mr. Bryant* draws the following picture of this region, to which I am particularly anxious to direct the reader's attention, as it represents scenes quite as desolate as those which, in the neighbourhood of the Dead Sea, have been pourtrayed in the works of Mr. Warburton, and of the author of *Eothen* :—

"Descending† into the plain or valley before us, we took a north-west course across it, striking Captain Fremont's trail of last year, after we had commenced the ascent of the slope on the western side. The breadth of this valley at this point, from the base of one range of mountains to the other, is about twenty miles. Large portions of it are covered with a saline efflorescence of a snowy whiteness. The only vegetation is the wild sage; and this is parched and shrivelled by the extreme drought. Not a solitary flower or green plant has exhibited itself. In our march, we crossed and passed several deep ravines and chasms, ploughed by the waters from the mountains during the melting of the snows, or hollowed out by the action of the winds. Not a living object has been seen during our day's march.

"We encamped about two o'clock, P.M. There were a few dwarf cedars in our vicinity, and scattered branches of dead grass. In a ravine near us the sand is moist, and by making an excavation, we obtained a scant supply of water, impregnated with salt and sulphur. A dense smoky vapour fills the valley, and conceals the summits of the distant mountains. The sun shining through this dispenses a lurid light, colouring the bare and barren desert with a more dismal and gloomy hue.

* * * * *

"We passed over this ridge through a narrow gap‡, the walls of which are perpendicular, and composed of the same dark scoriaceous materials as the débris strewed around. From the western terminus of this ominous-looking passage,

* *What I saw in California,* being the Journal of a Tour in 1846 and 1847, by Edwin Bryant, Esq.

† Page 145. ‡ Page 149.

we had a view of the dark desert-plain before us, which, as far as the eye could penetrate, was of a snowy whiteness, and resembled a scene of wintry frosts and icy desolation. Not a shrub or object of any kind rose above the surface for the eye to rest upon. The hiatus in the animal and vegetable kingdoms was perfect. It was a scene which excited mingled emotions of apprehension and admiration.

"About eleven o'clock* we struck a vast white plain, uniformly level, and utterly destitute of vegetation, or any sign that shrub or plant had ever existed above its snow-like surface. Pausing a few moments to rest our mules, and moisten our mouths and throats, from the scant supply of beverage in our powder-keg, we entered upon this appalling field of sullen and hoary desolation. It was a scene so entirely new to us, so frightfully forbidding and unearthly in its aspects, that all of us, I believe, though impressed with its sublimity, felt a slight shudder of apprehension.

"Ascending to the summit of the mountain, just as the sun was setting, I had a more extended view of the Great Salt Plain than at any time previously. Far to the south-east, apparently from 100 to 150 miles, a solitary mountain of immense height rises from the white surface of the desert, and lifts its hoary summit, so as almost to pierce the blue ceiling of the skies, reflecting back from its frozen pinnacle, and making frigid to the eye, the warm and mellow rays of the evening sun. No words can describe the awfulness and grandeur of this sublime desolation. The only living object I saw to-day, and the only sign of animal existence, separate from our party, was a small lizard."

The preceding extracts from Mr. Bryant's interesting work, afford a proof that similar physical circumstances everywhere produce similar effects; for in America, as well as in Palestine, the superabundance of saline ingredients is equally destructive to life.

Mr. Warburton, the American traveller the Rev. Dr. Robinson, and Mr. Kinglake, the author of *Eothen*, have all

* Bryant, p. 151.

dwelt so much on the horrors of the Dead Sea, that I think it right to trespass still further on the reader's attention, by submitting to his consideration the following passages also extracted from Bryant's work, which, if I mistake not, will prove that the Great Salt Lake of America exhibits, in every respect, features not less repulsive than those so vividly described by authors as *unique*, and as peculiar to the Dead Sea.

"Resuming our march,* we took a south course over the low hills bordering the valley in which we have been encamped; thence along the base of a range of elevated mountains, which slope down to the marshy plain of the lake. This plain varies in width, from fifteen to two miles, becoming narrower as we approach what is called the 'Utah Outlet,' the channel through which the Utah Lake empties its waters into the Salt Lake.

"The Great Salt Lake has never been accurately surveyed. It is situated between 40° and 42° of north latitude, and between 35° and 36° of longitude west from Washington. Its length is variously stated by the hunters and trappers who have travelled along its shores, at from 150 to 180 miles; but in this estimate, the numerous large bays and other irregularities are included. Its extreme length in a straight line is probably 100 miles, and its extreme breadth between forty and sixty miles. At this season the shore, as we pass along it, is white, with a crust of the muriate and carbonate of soda combined. The muriate of soda predominates, but the alkali comprised with it is sufficient to render the salt bitter, and unfit for use in its natural state. When the wind blows from the lake, the stench arising from the stagnant water next to the shore is highly offensive to the smell. The surface of the lake does not present that rippling and sparkling appearance when the sudden breeze passes over it, so frequently seen on fresh-water lakes, and on the ocean. The waters undoubtedly are thoroughly saturated with saline matter, and hence, from their weight, when they move at all, it is with a lazy and sluggish undulatory motion.

* Page 135.

* * * *

"The sunset scene this evening was splendid. The surface of the lake appeared like a sheet of fire, varying in tint from a crimson to a pale scarlet. This flame-like ocean was bordered, as far as we could see to the north and south of us, with a field of salt, presenting all the appearance of freshly-fallen snow."

"Proceeding about two miles, and turning the point of the mountain, we came to seven warm springs, so strongly impregnated with sulphur, as to have left a deposit of this mineral in some places several feet in depth. These springs gush out near the foot of a high precipice composed of conglomerate rock and a bluish sandstone. The precipice seems to have been uplifted by some subterraneous convulsion. The temperature of the water in the basins was about 90°. The water of most of them was bitter and nauseous."

The attentive reader cannot fail to discover, in this account of the Great Salt Lake, many points in which it entirely agrees with the Dead Sea; indeed, several passages of Mr. Bryant's description might be substituted for those of Mr. Warburton or Mr. Kinglake, without in the least altering the meaning of these authors, when detailing what they conceived to be the most striking peculiarities of the Dead Sea.

The Rev. Dr. Robinson and Mr. Warburton dwell emphatically on the non-volcanic nature of any portion of the shores of the Dead Sea, and the former quotes von Buch, the celebrated geologist, in support of this opinion, which must, however, have been founded on insufficient data, for Lynch's narrative contains numerous proofs directly contradicting it. Thus, at p. 280, he says:—"The distance in a direct line to the Arabian shore measured seven nautical miles. Mr. Aulick found on the latter a volcanic formation, and brought specimens of lava."

Again, at p. 371, Lynch says:—"Stopped to examine some huge black boulders upon the shore, which proved to be trap interspersed with tufa. The whole mountain, from base to summit, appeared to be one black mass of scoriæ and lava, the superposition of the layers giving them a singular appearance. In the rocky hollows of the shore were incrustations of salt, of which, as well as the lava, we obtained specimens."

And at page 275—"But the scene was one of unmixed desolation. The air, tainted with the sulphuretted hydrogen of the stream, gave a tawny hue even to the foliage of the cane, which is elsewhere of so light a green. Except the cane-brakes clustering along the marshy stream, which disfigured while it sustained them, there was no vegetation whatever; barren mountains, fragments of rocks blackened by sulphureous deposit, and an unnatural sea, with low, dead trees upon its margin, all within the scope of vision, bore a sad and sombre aspect."

The preceding quotations seem to prove that von Buch was in error in stating* that "this sea has no appearance of volcanic origin. It merely occupies part of the great valley or *crevasse* that runs from the Lebanon almost to the Gulf of Akabah."

Mr. Warburton, misled by the authority of von Buch, observes upon this point:—"The absence of volcanic agency renders still more remarkable the appearance of some fierce fiery ordeal, through which it must have passed."

Having, in common with the numerous readers of the *Crescent and the Cross*, derived much pleasure and instruction from Mr. Warburton's learning and accurate observation, I cannot but regret that he has, with reference to the Dead Sea, deviated from his usual practice, and allowed his imagination to get the better of his judgment. "The sea itself," he observes, "is a vast cauldron, in which the damned cities of the plain lie ever seething in salt brine, to whose simmering surface masses of bitumen ever and anon rise bubbling."

No one, from this passage, could possibly have anticipated that the water of this sea is beautifully clear and cool, and, as appears from Lynch's narrative, in its length and breadth,

* Von Buch's Letter to Dr. Robinson.

quite free from all unpleasant odour or unwholesome miasma. Indeed, it appears that the navigators of the Dead Sea experienced no inconvenience whatsoever from any exhalation, while at a distance from the shore, or even sailing near the land, when the latter was bold and the water deep.

The great body of the sea consists of extremely salt but otherwise very pure water; and as the salts it contains are not volatile but fixed, the superincumbent air is in no way polluted. The water, too, resembling in colour that of the ocean, presents nothing of a forbidding or disgusting nature. The water of the *Great Salt Lake,* as described by *Fremont,* is precisely similar; and it is when we approach the shores of either of these seas that the purity of their waters or air is lessened, and that only in the comparatively few localities where the shores are low, marshy, and moistened with streamlets flowing from sulphureous springs. In all these respects there is a remarkable coincidence between these two inland lakes of salt water, that of America appearing to be in every particular a repetition of the Dead Sea, but on a much larger scale.

It is necessary to remark, that there is not the least doubt as to the source from which either of these seas derives its saline impregnation. The mountain of rock salt at *Usdum* contains an inexhaustible supply for the Dead Sea, and the Great Salt Lake of America is likewise indebted for its saline ingredients to cliffs of rock salt.

The belief that nothing living can exist within the boundaries of the Dead Sea, is so generally spread, and has been countenanced by so many authors of reputation, that it becomes necessary to show that recently ascertained facts are quite opposed to the truth of this opinion.

Recent writers and travellers have not failed to fall in with and confirm the popular prejudice on this subject—thus, Mr. Warburton calls the Dead Sea a *corpse,* and says with much emphasis, "There was no shell, or fly, or any sign of life along the curving strand, which rose steeply to the water's edge, and consisted of very small and angular pebbles." Dr. Robinson, and the author of *Eothen*, both indulge in reflections respecting the absence of life, not only from the waters of the Dead Sea, but from the air above; and the shores surrounding it. We find also Lynch bearing similar testimony: thus, at page 311, he states, "No bird fanned with its wing the attenuated air, through which the sun poured its scorching rays upon the mysterious element on which we floated, and which alone of all the works of its maker, contains no living thing within it."

This passage, I must confess, strikes me as being more poetical than philosophical, for, in the first place, no fact recorded by either Lynch or others justifies the epithet *attenuated* being applied to the air; and, in the second place, Lynch seems to forget that he himself several times met with birds both resting on the waters of the Dead Sea, and flying over it. Thus in one part of his Journal we find the following entry, page 287:—"One of the party shot at a duck, a short distance from the shore—dark-grey body, and black head and wings. This was fully twelve miles from the Jordan. The bird, when fired at, flew but a short distance out to sea, where it alighted, and again directed its course towards the shore. We therefore inferred that its haunt was among the sedges of the little fountain."

I have no doubt that the reader will partake somewhat of the astonishment which I felt on discovering that the facts recorded by Lynch (for the observation of which he deserves so much credit) are quite at variance with his general conclusion, as to the absence of birds from the Dead Sea and its shores. Thus at pages 274 and 279 the following occurrences are detailed:—

"Started two partridges of a beautiful stone colour, so much like the rocks that they could only be distinguished when in motion. Heard the notes of a solitary bird in the cane-brake which we could not identify. The statement that nothing can live upon the shores of the sea is therefore disproved. The home and the usual haunt of the partridge may be among the cliffs above, but the smaller bird we heard must have its nest in the thicket. A short distance from the camp saw a large brown or stone-coloured hare, and started a partridge. Heard another in the cliffs above, and a small bird twittering in the cane-brake beneath me. We discovered that these shores can furnish food for beasts of prey. Found some of the sea-side brachi, supposed to be alluded to in Job, and translated mallows in the English version; also the Sida Asiatica.

"At 5 P.M., temperature 80° as the sun declined, the wind sprang up and blew freshly from the north, and I began to feel apprehensive for the boats. Towards sunset walked along the base of the mountains to the southward to look for, but could see nothing of them. Started a snipe, and saw, but could not catch, a beautiful butterfly, chequered white and brown."

The preceding quotations announce then, contrary to all our preconceived ideas, that on the shore of the Dead Sea the sportsman may look for a goodly assortment of game, viz., ducks, snipe, partridge, hares, while the ornithologist may expect to add specimens of singing birds to his collection, and the entomologist may perhaps succeed in capturing "*the beautiful butterfly, chequered white and brown,*" which eluded the pursuit of Lynch.

Having, by the aid of this explorer so fully established the existence of animals on the shores of the Dead Sea, it would be unnecessary to quote the following passage (p. 286) relating to vegetable life, were it not that Lynch shows that his prejudices did not prevent him getting a glimpse of the truth, that like physical causes will produce like effects, whether in Palestine or America.

"The plants we found here, besides the lily, were the yellow henbane, with narcotic properties; the nightshade or wolf-grape, supposed by Hasselquist to be the wild-grape alluded to by Isaiah; the plant used in the manufacture of barilla; and a species of kale (Salicornia Europæa). This plant is found wherever salt water or saline formations occur.

It was here upon the shore of the Dead Sea, and Fremont saw it on the borders of the Great Salt Lake, west of the Mississippi. Besides the single pistachia tree, there were a great many tamarisks now also in blossom ; the flowers small and of a dull white colour; the wood of the tree makes excellent charcoal, and, in the season the branches bear galls almost as acid as the oak."

Notwithstanding the descriptions given by Mr. Warburton of the Dead Sea and its shores, the following account of his feelings on first seeing and on taking leave of them, deserves special notice, not only because it appears true to nature, but because it suggests to the mind the suspicion that other travellers, who have described the same scenes, have been influenced by preconceived opinions, to see every thing in a gloomy point of view :—

P. 229. "In about three hours, we reached the mountain brow looking down upon the valley of the Jordan; and delightfully that beautiful strange scenery burst upon our weary and dazzled eyes.

"Far from looking gloomy or curse-stricken, it was the most *riante* scene I had yet beheld in Palestine. The Dead Lake itself was as brightly blue as those of Italy; the mountains of Moab and the Ammonites lifted their lofty line against the early sun, and wore a purple hue over their multiplied cliffs and promontories."

P. 240. "Then came sunrise, first flushing the light clouds above, then flashing over the Arabian mountains, and pouring down into the rich valley of the Jordan. The Dead Sea itself seemed to come to life under that blessed spell, and shone like molten gold among its purple hills.

"I lingered long upon that mountain's brow, and thought that, so far from deserving all the dismal epithets that have been bestowed upon it, I had not seen so cheerful or attractive a scene in Palestine. That luxuriant valley was beautiful as one great pleasure ground; its bosks and groves of aromatic shrubs, intermingled with sloping glades and verdant valleys: the City of Palms might still be hidden under that forest, whence the old castle just shows its battlements. The plains of Gilgal might still be full of prosperous people, with cottages concealed under that abundant shade; and the dread sea itself shines and sparkles as if its waters rolled in pure and refreshing waves 'o'er coral rocks and amber beds alone.'

"The road from hence to Jerusalem is drear and barren, and nothing but Bethany occurred to divert my thoughts from dwelling on the beautiful Dead Sea."

ON THE PROGRESS AND CONTAGION OF ASIATIC CHOLERA.

In the sixteenth volume of the first series of the *Dublin Medical Journal* I published a sketch of the origin and progress of Asiatic cholera, and brought forward evidence which appeared to warrant the conclusion that it is propagated chiefly by means of contagion. The collection of materials for that paper occupied much time, and their arrangement cost me considerable labour; nor did I arrive at the result there sought to be established without the most assiduous reflection, and a conscientious interpretation of recorded facts.

The recent progress of the disease, as it bears upon this subject, is treated in the second edition of my *Clinical Medicine,* just published, and I must refer the reader, for additional arguments, to the Lectures on Cholera, contained in the first volume of that work. Still, as Lord Morpeth in the House of Commons, and the Sanitary Commissioners appointed by Government, have expressed an opinion contrary to what I have set forth, I am bound, in justice to myself, to bring forward additional evidence in favour of the conclusion I before advocated. But other and still more powerful reasons induce me to resume the subject at the present moment; for I find that the non-contagious nature of cholera is so authoritatively maintained, that everywhere throughout the country, physicians, when consulted, have advised that the sheds built for the reception of fever patients should not be retained for the purpose of accommodating persons attacked with cholera; and, swayed by their opinion, the Poor Law Guardians have already ordered several of these temporary hospitals to be pulled down.

The manner in which, in the former and in the present epidemic, cholera has diffused itself,—travelling, year after year, by the main routes of communication, until it has visited almost every civilised country on the surface of the globe,—presents what at first appears an unparalleled example of the extension of disease; but it is so only in appearance, because other diseases have also spread similarly, although, their diffusion having happened at a time when the communication between countries was more difficult, and intelligence was not obtainable concerning the history of their propagation, their progress was not noted with the same accuracy, and the date of their arrival at each place was unrecorded. There can be no doubt that the spread of syphilis offered something analogous; and that small-pox, measles, and scarlatina,—of the date and locality of whose first appearance we are ignorant,—extended themselves in a similar manner, and were found in every country holding intercourse either by land or sea with those where they originated; and, consequently, while these diseases were long-established scourges all over the three continents comprised within the limits of the old world, Australia and the Americas, together with the isles of the Pacific, were spared, until the discoveries of modern navigators had opened a path to those extensive regions also. Thus it is that in everything human we find a mixture of good and evil; even the most splendid discoveries, no matter how pure their conception, lead to results not always free from alloy. The rapid communication that now binds the most distant parts of the world together, and which causes the journals of London to be daily encyclopædias of what is simultaneously transmitted from the most remote countries, might be supposed to be capable of producing nothing but unmixed good. But it has been evidently the cause of a serious change in the moral, intellectual, and social state of the world, the consequences of which can as yet be scarcely appreciated. Nations are now no longer insulated collections of individuals, so separated that the events occurring in any one are scarcely felt even by its neighbours. The passions, the emotions, the constitutional struggles of a people, soon overflow the boundaries of their country, and roll on like a tidal ocean-wave, which breaks successively on every shore; while, as is proved by events quite recent, governments are powerless in their attempts to construct artificial ramparts to stem its progress. Whether this may ultimately be productive of moral benefit to the human race, is a question that can be solved only by futurity. But it can admit of no doubt that the intercommunication between distant countries not only renders us acquainted with the wants of each individual member of the general society of nations, but stimulates us, from interested motives, to relieve them; and, consequently, the physical condition of man must, by this means, be in many respects improved. As an instance of the important benefits which arise from this daily contact between nations, we may adduce the impossibility of the recurrence of such famines as frequently half destroyed the populations of Europe and Asia in the dark ages.

Had a calamity such as threw its dark shadow over Ireland in 1846, occurred a thousand years ago, what succour, what aid could have been expected? A whole nation might have perished, and the knowledge of its fate would have extended scarcely beyond the nearest ports of the now sister island; but Providence timed it otherwise, and the intelligence of the disaster, everywhere conveyed, everywhere excited sympathy; and so active were the efforts to relieve, that, long before the year of trial had expired, contributions had reached us from Australia, New Zealand, Ceylon, the farthest parts of India, the most remote districts of Africa, and from our American kinsmen: contributions which, added to the gifts presented by European, and, above all, by English benevolence, brought to our shores such a supply of food, that this people survives, a monument of the combined love and charity of the whole family of mankind.

But this evident and paramount advantage is, as we have seen, to a certain extent counterbalanced by the fact, that the caravans and ships which transport the comforts, ornaments, and means of life, which convey merchandise and food, may arrive likewise freighted with the seeds of death, with plague, fever, or cholera.

It becomes, therefore, a state question of great importance, in a country like England, in whose ports vessels arrive every hour from various quarters of the world, how far it is possible, under such circumstances, to prevent the importation of disease. Where the contagious malady, such as the plague, is usually confined within certain limits, and can obtain an exit only from the territory it infests through a small number of given outlets, then other states may guard against its importation by imposing quarantine upon vessels coming from the infected ports. But it is far otherwise with regard to the cholera. Advancing from the east, it has travelled slowly and steadily during the last few years through Russia, and at the present moment forms a semi-circle, stretching from Egypt through Turkey, Hungary, Poland, and Finland, and is travelling along the radii of communication towards the central parts of Europe from so many points, that the idea of protecting ourselves by quarantine from its importation must be abandoned. We must bear in mind, too, that Great Britain chiefly depends on trade for the support of millions of her population, and that any quarantine laws which had the effect of closing all the channels of her commerce (and, to be efficacious, they should close them all), would speedily produce such distress in the manufacturing districts as would occasion starvation so intense and extensive, that more deaths would arise from the operation of this cause alone, than could possibly be caused by the introduction of any disease, however infectious. Connected as we are, therefore, by our commercial intercourse, with every country and every climate, we must submit to the dangers which may arise from this new consequence of commerce—*free trade in diseases.* But, although the question respecting the infectious nature of cholera does not concern the quarantine laws, and can lead to no curtailment of the activity of our merchants, and though the knowledge of its being infectious may not serve to guard us against its incursions, it may, nevertheless, materially aid us in diminishing the extent of its ravages. If the disease be not contagious there is no danger in placing cholera patients in general hospitals; there is no use, so far as guarding against the extension of the disease, in removing the sick from private dwellings; and such indeed is the view of the case taken by the Dublin Sanitary Association, as appears in the following extracts from their circular:—

"1st. As the Sanitary Commissioners of London, after long and careful investigation, have come to the conclusion that the disease is epidemic, and not contagious; and as the fear of contagion, in the last epidemic of cholera, caused a great panic in those who were unaffected, and led to a neglect of the sick at a period of the disease when assistance was most valuable, the sub-committee recommend that on the first appearance of cholera, a placard embodying this opinion should be extensively circulated among the poor, for the purpose of removing their apprehensions."

"4th. The London Sanitary Commissioners having given their opinion against the establishment of large cholera hospitals, and in favour of providing cholera wards in existing hospitals for the very destitute, and having come to the conclusion that all but the very destitute would have a better chance of recovering by staying at home, your sub-committee, coinciding in these opinions, recommend that depôts of clothing, blankets, flannel, &c., be established, in addition to the ordinary medicines, in order to meet the necessities of those patients who may not avail themselves of the hospitals.

"5th. And further, that, for the purpose of securing attendance upon this class of patients, a corps of nurse-tenders be formed, whose names shall be registered at each parochial dispensary, and who shall be placed at the disposal of the cholera physician, under regulations to be hereafter drawn up."

I am glad, however, to find that at a meeting of the Dublin Sanitary Association, held on Wednesday the 24th of August, 1848, the following valuable observations emanated from the Chairman, Sir Edward Borough, Bart., whose exertions have been so eminently useful to the citizens of Dublin, with reference to the measures of the poor-law guardians of the South Union:

"The Chairman stated that the bill brought in by Sir William Somerville, on the 10th of August, continues the Acts 10 Vict. c. 6, and 10 Vict. c. 22, re-enacting the same system of appointment of relief or hospital committees, but repealing such portions of both as enact the payment of expenses out of the funds at the disposal of relief commissioners. Clause 5 enacts that, provided three members of relief committee certify expenses, &c., the board of guardians shall pay the same out of the rates. The Chairman continued to say that, from a conversation which he had recently held with some medical men of great eminence, and much experience in the city, he was induced to submit the following suggestions emanating from them to the committee of the Sanitary Association. It is very strongly recommended that the City of Dublin should be divided without loss of time into districts, and that sanitary committees should be formed in these districts, so as to be prepared with the machinery for working the bill introduced into the House of Commons on the 10th of this month, in the event of the visitation of cholera, fever, or other disease, whether epidemic or contagious. There ought to be four cholera hospitals for Dublin, *i. e.* two in addition to the late temporary fever hospitals. To each should be attached a superintendent and a medical assistant for every twenty-five patients; all to reside within the hospital, and to be provided with breakfast, dinner, and beds in the building. There should be prepared a list of thirty such assistants (say medical students, if licentiates cannot be procured), from which the staff of each hospital, as it is wanted, can be completed; and suitable arrangements should be made for the transport of patients from their own dwellings, it being manifest that patients among the poorer classes, such as room-keepers, can scarcely be treated in their own dwellings, and that they ought to be removed to hospital. Simple forms of treatment on the first appearance of premonitory symptoms, and general directions, clearly and intelligibly drawn up, should be prepared and got ready for circulation, as has been done in Russia. All these arrangements may be made quietly, so as not to alarm the public; but, coming as these recommendations do from a most experienced quarter, the Chairman considered them to merit serious consideration. The Chairman, in continuation, drew the attention of the Committee to the resolutions of the Medical Committee of the Manchester Royal Infirmary, in which the erection of special cholera hospitals had been advocated."

Nothing appears to me to be more consistent with previous experience and the dictates of common sense, than the arrangements here proposed by Sir Edward Borough.

In the years 1832 and 1834, four large hospitals were provided by Government for the reception of cholera patients, and ample means for carrying the sick to the public institutions were everywhere at hand. The working of this system was most satisfactory; and the smallness of the number attacked, compared with the population of the city, may, I am persuaded, be accounted for by the sick being so quickly taken from amidst the healthy, and thus a focus of contagion in each case being avoided.

Advocating as I do the establishment of hospitals for the reception of cholera patients, I am by no means prepared to deny that in many instances the removal of the sick might be attended with fatal results, and that consequently it would be wiser, in certain cases, to have them treated at home; and

I am glad that my opinion receives the support of Dr. Cane, who has expressed himself strongly on this subject.*

I have been induced again to take up the subject of cholera, not merely for the purpose of bringing forward matter that I think may be useful to society, by suggesting to our rulers the best measures of medical police to be adopted when the disease arrives in Ireland, but also for the purpose of cursorily pointing out some of the many absurdities that have been broached, both in medical works and in the newspapers of the day, concerning the origin, nature, and diffusion of this disease. Thus we find in a London paper of the first authority, that when the fact was noticed of the cholera having travelled from Moscow to Petersburgh, its route on this occasion was declared to be a new proof of its *fluviatile origin*,—an expression, by the bye, of which writers seem much enamoured. I would humbly offer, as a slight objection to the accuracy of this expression, that no river flows, or possibly could flow, from Moscow to Petersburgh, as, if water attempted to accomplish the alleged journey, it would have on the way much up-hill work.

In opposition to this fluviatile theory, it is deserving of notice that the boatmen on the Danube, employed in the navigation of boats on that river, have been but rarely affected by the disease; and simply for this reason, that they hold very little communication with the inhabitants on either bank, having provisions on board to enable them to complete their voyage.

Rivers, as constituting in many countries the chief routes of communication, must, for that reason, be the channels by which infectious diseases are conveyed; but that rivers, marshes, or humid localities, are not in themselves capable of generating cholera, is evident from the fact, that in every quarter of the world places of this description, when out of the line of march of the cholera, and containing inhabitants who lead a secluded life, have escaped.

* *Dublin Medical Press*, August 16, 1848, pp. 98, 99.

In the Hamburgh *Nachrichten*, 26th of July, 1848, I find the following astounding piece of philosophical intelligence, imparted in a letter from Petersburgh of the 12th of July:—"The cholera is now considerably on the decrease. That the state of the atmosphere underwent considerable changes upon the approach and setting-in of this disease, has been placed beyond a doubt by the experiments of men of science, who have found that as soon as cholera had set-in there was an almost total failure of the necessary electricity in the air; and that this was accompanied by a notable weakening of the force of the magnet; so that, when the disease was at its acme, a magnet, which in the usual state of the atmosphere was capable of sustaining forty pounds, could not lift more than four or five. During the last week its power has increased to sixteen pounds, and the disease is now on the decline." Intelligence so cheering must have been very satisfactory to the citizens of Petersburgh; an announcement so scientific must have proved most encouraging. This specimen of philosophy has, I believe, found its way into every newspaper in Europe; after which who will exclaim, "*Magna est veritas et prævalebit*,"—for, surely, in these latter days, it is error that is winged, while truth, unfledged, creeps slowly behind.

If we were to believe all we hear of the cholera, and to attach implicit credence to the various facts recorded concerning its progress, we must give up everything like an attempt to account for its propagation, and abandon ourselves to the hypothesis that the usual laws of nature have been suspended for the benefit of this scourge of mankind.

Thus in the *Morning Chronicle* of August 17, 1848, it is gravely stated, that "the cholera jumps over enormous spaces, and then retraces its steps, as if to repair the omission. It runs down one bank of a river for several hundred miles, and never touches the other bank. It has dealt the same with streets. In Paris it has happened that all the inmates in the upper and lower stories of a house lay dying, whilst not a single person in the middle stories felt ill. We have on record an instance of one side of a ship in the Madras Roads being struck by cholera, while the other side was untouched; nor did the men on the side not attacked by it afterwards suffer, although they attended upon their afflicted companions, and buried them; that is, threw them into the sea as they successively died." In proof of the authenticity of this fact, the writer quotes Mr. Chalice's pamphlet, who adopted the narrative from Colonel Rolls.

"*Quod nimium probat, nil probat*," is a most salutary rule respecting evidence, and the application of it to that now before us, insures its rejection. What an accurate sanitary inquisition, and what laborious and expensive investigations, were necessary to ascertain the strange manner in which cholera was limited by the above river. Whether both banks were equally inhabited—whether one was populous and the other a desert—whether the river was straight in its course or serpentine, are matters of too little importance to be mentioned; but the one needful fact is asserted with all due solemnity—that the cholera for several hundred miles was always opposite to, but *never touched the other bank*. Observe here the peculiar force and unhesitating exactness of *never*; it is equalled only by *all* the inmates of two stories dying, and *not one* of the intermediate story being attacked! It is exceeded only *by the one side* of the Madras ship!

Mr. Chalice has thought fit to add, by way of illustration, that the cholera is considered by the native Indian doctors to arise from animal miasmata, produced by migratory insects, analogous to those known as blights. "But this theory," the writer continues, "has found no favour with the medical men of Europe, who, however, we rejoice to say, have at length decided, by an overwhelming weight of experience and authority, that the disease is not contagious. Science has its heroes as well as war, and its martyrs as well as religion." So far the writer in the *Chronicle*. Let us now see how he proves his latter assertion. What hero does he bring forward, what martyr does he exhibit for our admiration? His following sentence answers this question:—

"More than one French physician placed himself in direct contact with a patient in the worst stage of cholera, in order to bring the contagion question to proof." We may here discover something of the hero, but as the gentlemen in question escaped unscathed, we cannot detect anything of the martyr. When such assertions as these, brought forward by the *Chronicle*, are gravely recorded in a leading article upon a subject of vital importance to the nation, we are almost tempted to hope that the writer was not an Irishman. But this writer, after all, to whatever nation he belongs, concludes the article in question with some more sensible remarks: "Mr. Chalice," he says, "the author of the pamphlet entitled *Should the Cholera come, what ought to be done?* gives the following advice on diet: 'Good wholesome fresh beef and mutton, with the best wheaten-bread, and a glass or two of good old port to those who have it or can get it, is what we recommend: at the same time we do not object to the occasional substitution of a roasted fowl or partridge." So far Mr. Chalice, as quoted by the writer in the *Chronicle*, who adds: "We see no objection to this advice, except that alleged, against advice of the same sort, by M. Louis Blanc—'That it was a farce and a mockery as regards the lower classes.'" I may remark that the metropolitan papers, one and all, gave a very prominent place to somewhat similar advice which emanated from a still greater authority, viz., Mr. Wakley, the member for Finsbury, and coroner for London, who, on the occasion of an inquest held on the body of a person who died of English cholera, warned the public not to allow the Asiatic cholera to surprise any individual with an empty stomach, as each unhappy wight in such unwholesome predicament would become its instant prey. "A full stomach," says Mr. Wakley, "and plenty of capsicum, are the best defences against cholera." So that John Bull, evidently, no matter whether he has to fight a human, intelligible foe, or has to contend against an unseen and mysterious enemy, still relies on the national advantage of a full stomach. I have no objection to this mode of self-defence, although I foresee some difficulty in maintaining the stomach in the constant necessary state of repletion; but I must protest against the capsicum, which, being a powerful stimulant, will, if it be used to excess (as Mr. Wakley's recommendation is very likely to induce ignorant persons to do), inevitably produce a congestion of the mucous membrane of the alimentary canal, that may facilitate the inroad of the very disease it is intended to prevent.

It is scarcely necessary to record the strange phenomena witnessed by some of the British consuls, as alluded to by Lord Morpeth in his speech in the House of Commons; nor is it requisite to refute the connexion which one of these officials supposes to exist between the appearance of hosts of caterpillars and the advent of the disease. Another of them dwelt upon the unusual heat of the weather; but this gentleman was evidently unaware that the disease had deliberately marched over the highest passes of the mountains in Hindoostan, attacking travellers amidst the snows, and devastating villages at the greatest altitude, perhaps, that man inhabits, in the Bamian pass, between Cabul and Bokhara. Some, too, have chronicled most portentous and nauseous-smelling fogs, which have wrapped up the whole surface of the fated country as in a winding-sheet. But enough of these absurdities. Mankind, when alarmed, become credulous, and times of danger are always times of superstition. Reason ceases to reign when the fears or passions of men are excited. In connexion with the influence which poverty and the condensation of wretchedness have in producing disease, I may remark, that, however effectual such causes may be in giving rise to certain classes of fever, gangrene, erysipelas, or dysentery, yet they can never originate specific diseases. No matter how crowded people may be together,—no matter how wretched their condition,—no matter how bad the ventilation, even though it should approach to that of the Black Hole of Calcutta,—still the combination of all these malign influences is incapable of giving rise to either measles, scarlatina, small-pox, hooping-cough, or, I will add, cholera. Had they been capable of producing cholera it would not have been of such recent date among us.

I cannot give my assent to the benefits that are supposed to accrue from opening the sewers and white-washing the houses in the poorer parts of cities. It is true that obstructed sewers give rise to disgusting nuisances, and soiled exteriors are offensive to the eye. But the causes of epidemic disease escape the scrutiny of both nostrils and vision, as is proved by the fact that the worst parts of most capitals of Europe, however abounding in all sorts of abominations, do not give rise to either typhus fever, plague, or cholera. Filth is the outward and visible sign of poverty, and, like poverty, is itself an evil; it oftener accompanies than causes disease; otherwise, as I have said, every capital in Europe would contain within its precincts many self-supporting manufactories of pestilence. I have always been of opinion that poverty is more injurious to health than dirt; that its prevalence entails disease—sporadic disease—from many obvious causes, and increases the spread of contagious maladies on account of the *entassement* or crowded state in which the poor necessarily live. If humanity strives, therefore, in its visits to the haunts of misery to prevent the spread of contagion, it must pluck the inmates from within those bounds, disseminate them over a large space, where the same number that now inhabit rooms may occupy large houses, and may have the use of nutritious food. But, alas! this, the only true method of relief, will require something more expensive than the broom and the brush; and those who are so loud in recommending open sewers and white-washing as sovereign prophylactics, will, perhaps, shrink from contributing their share of that poor-rate, or money for relief, which alone can snatch the pauper population from the hands of the destroyer.

The present is a particularly dangerous time to overlook the contagious nature of cholera; for the unfortunate likelihood of a dearth of food will render it necessary to provide means to assist in feeding the people, and if the same methods are employed as in the years 1846 and 1847, great numbers of the indigent and starving poor will be daily brought together for the purpose of being fed, and thus people in multitudes will be assembled, and to a certainty the contagion of the cholera will be disseminated far and near. In fact the same reasons that caused typhus fever to spread, and commit such dreadful ravages in 1846 and 1847, will produce a like effect with regard to cholera. In the above-mentioned years of public calamity, fever so fast followed on the footsteps of famine, that some persons thought the former was the natural consequence of the latter; whereas the unusual prevalence of fever in those years arose, not directly from the want of food, but indirectly from the opportunity the contagion had of affecting persons brought together to partake of the measures of relief; and it is much to be apprehended that the same connexion will be observed soon between famine and cholera, as then existed between famine and fever. In truth, wherever large numbers of starving persons are collected to receive food, it is a mere matter of accident what contagious disease may become prevalent amongst them. It may be fever,—it may be plague,—it may be cholera,—or it may be small-pox, if the nation consists chiefly of persons unprotected by vaccination, as occurred in the lamentable famine at Gujerat in 1812, when the small-pox broke out in the midst of the multitudes assembled for the purpose of receiving rice, and in a few months very nearly depopulated the country.

It is strange what a general disinclination has existed for some time in Great Britain to allow that diseases are contagious. The influence of capital has, for obvious reasons, been brought to play, and every expedient has been resorted to,—no matter at what danger to the public health,—to try to diminish the stringency of the quarantine laws, and thus to remove the obstacles to trade. In furtherance of this object, advocates have been found who did not scruple to advance opinions quite opposed to those hitherto received, and many treatises and books have been published to disprove the existence of contagion even in the case of plague. As to typhus fever, its non-contagious nature was by such persons supposed to be demonstrated, and the great majority of the physicians of England were non-contagionists. The Irish physicians, however, never supported this view of the subject, for, unfortunately, they had before their eyes daily proofs of the contagious nature of typhus. The events of last year have shown that the opinions of my Irish brethren were correct, and no one is now found who denies the contagion of typhus, for all have been taught by its transmission to America and Canada, that it is a portable disease, capable of being propagated by infection. Yellow fever affords another example in which the opinions of our predecessors were supposed to have been overturned by the investigations of modern observers; and almost all European and American physicians were united in believing that it was not a contagious disease, although the contrary had been maintained by the most eminent men of the last century. I had an ample opportunity of observing a variety of typhus in the Irish epidemic of 1826, which, in its symptoms and pathology, so manifestly agreed with yellow fever, that I could not entertain any doubts as to their identity. I was convinced, also, that the opinion of those who maintain that yellow fever is never contagious must be incorrect.

The circumstances which attended the breaking out of fever in the "Eclair," and its importation by means of that vessel, into the island of Boà Vista, were so strongly indicative of its infectious character, that the latter is now generally allowed; and thus yellow fever is by this single instance taken out of the category of non-contagious diseases. I must refer the reader for an excellent article on this subject to the number of the *British and Foreign Medico-Chirurgical Review* for July, 1848, where he will find an admirable analysis of all the facts that are detailed in the Reports of Dr. King and Dr. M'William on the circumstances attending the appearance of the fever at Boà Vista.

The article in question is extremely able, and at its commencement the reviewer states that Dr. King's opinions respecting the contagion of yellow fever seemed to have been fully formed before he landed at Boà Vista. He was, and is, a decided non-contagionist, and believes that he has succeeded in throwing doubts on the fact of the importation of yellow fever into Boà Vista, by the crew of the "Eclair;" and yet the reviewer, relying altogether on the testimony of Dr. King, a non-contagionist, succeeds in proving incontrovertibly from Dr. King's facts, that the disease was imported by the crew of the "Eclair." I look on it as of great importance that such a result has been arrived at in this review, because in the previous part of the same number it has given an able article "on the causes and diffusion of cholera," and has supported the conclusion that cholera is not contagious. I take the liberty of submitting the following facts to the consideration of the reviewer, and only entreat him to use the same tests and the same method of reasoning that he has so successfully applied in the analysis of Dr. King's book, and I have no doubt he will see reason to change his opinion, for the example of the contagiousness of cholera I am now about to bring forward, is very similar in the circumstances which attended it, to those that followed the arrival of the "Eclair" at Boà Vista. In truth, the coincidences between the two cases is very remarkable. There is this difference, however, that the evidence of the importation of cholera is, if possible, much stronger than that of the importation of yellow fever. The particulars of this case are given in the thirteenth volume of the *American Journal of the Medical Sciences*, p. 359, "On the Communicability of Cholera, by Professor S. Henry Dickson, M.D."

"On the 31st of October, 1832, the brig "Amelia," bound to New Orleans, after a tedious and stormy passage from New York, having sailed on the 19th of the same month, was wrecked on the beach of a low and sandy island, about twenty miles from Charleston, far out to seaward, and offering a very scanty vegetation. It is regarded by its owner, Mr. Milne, as quite a healthy spot, and is resorted to by him as an agreeable summer retreat, four of his negroes being left upon it as permanent occupiers. The brig had on board, beside her ordinary crew, 105 passengers, 102 *of whom were crowded into the steerage. During the voyage, which was wet and tempestuous, they were much confined below,* and when six days out became sickly. Twenty-four died of cholera on the way, and several were ill when the vessel was stranded. The survivors were treated with the greatest humanity by the owner of the island, and took refuge in his buildings. The captain and one of the passengers came up to Charleston with Mr. Milne, and reported the affair to the municipal authorities, who promptly entered upon the measures dictated by a correct and liberal policy. The deputy port-physician, Dr. Elfe, visited the island, and announced the nature of the disease existing there. A boat's crew of wreckers, who had gone down to the spot* to pursue their usual avocation of saving the vessel and cargo, having returned to the city, one of them was seized with cholera, and died in Elliot-street, under the care of Dr. Schmidt. His was the only case which I myself had an opportunity of seeing, and it appeared to me well marked, and clearly identical with descriptions now familiar to every one. The rest of the crew were ordered to the island to perform quarantine, and having embarked, two fell sick, and one died of cholera on the passage down.

"Two physicians, Drs. Jewey and Pritchard, were, in the meanwhile, sent thither to afford the requisite medical attendance upon the sick; everything necessary for their support and comfort being forthwith furnished as far as was in the power of our intendant and council, to whom all praise is due for their conduct on this occasion. As neither the brig's crew and passengers, nor the wreckers, an additional number of whom had now gathered about the wreck under permission of the authorities, were willing to remain on the

* The avocation of an American, is evidently *antipodal* to that of an English *wrecker*.

island under quarantine restrictions, eighteen men from the city guard under the command of a lieutenant, were detained to perform the duty of a *cordon sanitaire* in confining them there. These men were stationed between 100 and 200 yards from the sick, but in going to and from the landing they were forced to pass much nearer the building of one of the kitchens, which was used as an hospital; nor was it possible to prevent them from communicating with the passengers who were dispersed over the island. After the lapse of a week, Dr. Hunt went down to relieve Drs. Pritchard and Jewey, who were worn out with continual and severe exertions. A reverend clergyman of the Catholic church, Mr. Byrne, with the zeal and devotion of his sacred calling, also visited the island, and remained to dispense the consolations of religion to the sick and dying.

"Now, let us see what was the result of this intercourse of a number of sound and healthy individuals with this infected vessel, and her diseased passengers and crew. Out of about 150 persons collected on the island, twenty-three died, of whom twelve were passengers landed from the brig. Of the *wreckers,* who were the first to visit the vessel, and the most continually employed about her, some were almost immediately taken ill after their exposure; one died in town, one on the way to quarantine, and in all *eight* died. Of the *four* negroes on the island, *three* died, one child and two adults. Of the guard employed on duty there, every man was affected more or less with the symptoms of cholera, with the exception of the commanding officer; nine were reported as attacked seriously, and *one* died; who, as Lieutenant Knights assures me, had never boarded the brig. Of the three physicians employed, Drs. Jewey and Pritchard escaped all suffering but that of extreme fatigue. Dr. Hunt reports himself on the 17th November, as attacked by cholera, but he quickly recovered. I cannot help expressing here my sense of the merits of these medical gentlemen, whose humanity and ardour led them to renounce the comforts and enjoyments of home, for an imprisonment on a dismal sandbank, exposed to much privation, and to special hazard of sickness. Their conduct does honour to their profession, and to human nature. Lastly, the male nurse who accompanied Dr. Hunt, was taken ill and died. This man had been employed a week previously by Dr. Schmidt, as a nurse to the only person who had the disease in the city. He had been assiduous in his attendance, and almost constantly engaged in the application of frictions until the patient died. Thus, there were *thirteen* deaths among the few who visited the island and the wreck. Such as I have above stated are the simple facts; what are the reasonings and inferences fairly to be founded on them? I pass by all discussion of the *negative* circumstances of this remarkable case, as irrelevant to the question before us. The city of Charleston escaped without suffering the invasion of cholera, although the captain of the brig and a passenger came up to town and communicated with the authorities; although the deputy port-physician returned home, after visiting, examining, and prescribing for the patients; although the crew of a wrecking boat violated the laws, and returned also for a short time to their homes, after boarding the stranded brig; although one of their number died in a very thickly-built part of the town; and although two or three of the individuals quarantined on Folly Island, escaped to the mainland. I have no wish to subtract from the real weight and value of these circumstances. I rejoice to be led to the conclusion at which they clearly point, that like all other communicable diseases, cholera requires the concurrence of certain contingencies in order to give efficiency to its generating or exciting cause.

"Nothing is better understood than that some undefined condition is requisite to the transmission of every malady, whether regarded as contagious or infectious. The most universal of all epidemics, even influenza itself, does not affect every individual within the sphere of its prevalence. Small-pox is not always taken by the exposed subject; nay, inoculation often fails, however carefully performed, and with the most virulent matter; and I appeal to every physician of reading and experience, if numerous instances of a similar nature have not come under his immediate cognizance. Thus, the man who died in Elliot-street, though visited by numbers during his short illness of a few hours, was happily a cause of disease to no one; nor did those who evaded the imprisonment of quarantine spread it in any direction. We are entirely ignorant of the concurrent conditions essential to the transmission of cholera, if it be transmissible; we know that they are not fulfilled in the above cases. The positive facts, however, I repeat, are worthy of the most serious consideration on the part of all who are anxious to arrive at the truth. Cholera was unknown on our shores until the date of the unfortunate wreck of the brig 'Amelia,' on the beach of Folly Island. No local cause capable of originating such a disease is imagined to have existed on that island. Cholera prevailed at New York when the brig sailed from that port; the week before her departure fourteen deaths are recorded in the bill of mortality. Twenty-four of the passengers died of it on the voyage, and several were landed labouring under it. The first boat's crew of wreckers who boarded her were some of them attacked with the same pestilence which had prevailed at New York when she sailed, and of which her passengers had been ill and died. None of the other inhabitants of Charleston were seized in the same way, either at that time or afterwards: the conclusion is therefore irresistible, they received the infection on board the brig. The doctrine is now established beyond a reasonable doubt, that cholera is importable."

Professor Dickson's account of the wreck of the "Amelia" exhibits the strongest evidence of truthfulness and candour, and its authenticity and correctness have been testified by various witnesses. The Professor deserves much credit for not hesitating to state some facts which apparently militate against his conclusion. Nothing that I can say is capable of adding weight to the arguments of Professor Dickson, except to inform the reader that in 1832, the date of the transaction, the city of New York contained 220,000 inhabitants, and the deaths from cholera during the week previous to the sailing of the "Amelia," amounted to fourteen. Let the reader apply the doctrine of chances (as explained by Professor Alison in a quotation from a treatise of Dr. Simpson's), in the preceding part of this sketch,* to this mortality, compared with that which occurred on board the ill-fated brig during the six days preceding her wreck, and which amounted to twenty-four deaths out of 102 passengers crowded together, and placed under circumstances most favourable to the propagation of disease by means of infection. Let this calculation be fairly made, and the result will amount to a demonstration that cholera is contagious. Let the voyage of the "Amelia" be likewise compared with the sad registers of the mortality which fever caused in emigrant vessels from Ireland last summer, and in which typhus broke out among the passengers some days after they had sailed, and the similarity of the attending circumstances will be found so striking, that we cannot refuse to allow an identity of causes when all the effects are the same. With respect to the Irish ships, that cause is now universally admitted to have been contagion; and that same cause it was which produced the disastrous spread of cholera in the American brig.

Since the publication of my last article on this subject, cholera has reached England, and its arrival has been attended by circumstances which make me quite sure that the opinion, so positively announced here by the Board of Health, and in London by the College of Physicians, rests on a very doubtful foundation. Before I proceed, however, to arraign this opinion, it may be well to recapitulate it. The Board of Health in Dublin have published a circular, in which we find this passage: "The Commissioners of Health are anxious to impress upon all persons the import-

* *Dublin Medical Journal*, 1st series, vol. xvi. p. 379. This method of argument was originally applied by the late Dr. Whitley Stokes, to prove the contagiousness of typhus fever.

ant difference that exists between cholera and fever, with respect to the mode of propagation of these epidemic diseases. Fever, it is well known, is highly contagious, or easily propagated from one individual to another; while all experience shows that cholera is rarely, if ever, contagious, consequently, the separation of the sick from the healthy,—a measure so essential in checking the spread of fever,—is not required in cholera; and the friends and relatives of persons attacked with cholera may be under no apprehension of catching the disease, and need not be deterred from affording to the sick, in their own dwellings, every needful assistance and attention. The Commissioners of Health, after mature consideration, do not advise that cholera should be met by an extended system of hospital accommodation, such as is needful in epidemics of fever; but recommend, in preference, a general system of prompt and efficient dispensary relief. The non-contagious character of cholera fortunately removes all objection to the receiving of persons suffering under the disease into the ordinary hospitals of the country, whether infirmaries or fever hospitals,—all of which the Commissioners of Health advise should be open and in readiness to receive destitute persons in cholera."

In the circular issued by the Royal College of Physicians of London, the following paragraph occurs:—"Cholera appears to have been very rarely communicated by personal intercourse, and all attempts to stay its progress by cordons or quarantine have failed. From these circumstances the committee, without expressing any positive opinion with respect to its contagious or non-contagious nature, agree in drawing this practical conclusion: that in a district where cholera prevails, no appreciable increase of danger is incurred by ministering to persons affected with it, and no safety afforded to the community by the isolation of the sick."

I may here remark that the Committee of the Royal College of Physicians of London have left themselves open to the charge of inconsistency; for, while they do not express any positive opinion with respect to the contagious or non-contagious nature of cholera, they recommend measures which can be justified only by *a very positive opinion indeed, that the disease is not contagious.* It was unwise to preface the practical adoption of an opinion by an expressed doubt of its soundness.

Thus I find arrayed against my views two bodies, to whose authority the public must attach great importance. But, being persuaded that I am upholding the cause of truth against error, I am by no means discouraged, and feel myself urged by a sense of duty to persevere. Neither have I been, since the publication of my article in the *Dublin Quarterly Journal* for November, 1848, entirely unsupported, for I have received communications from many eminent physicians, both in Ireland and England, approving of the course I have taken; and some periodicals, both medical and literary, have expressed a similar opinion. Thus in the *Medical Gazette,* of the 4th of November, 1848, the reviewer of my work on "Clinical Medicine" thus expresses himself:—"Dr. Graves believes, in common with most professional men, that cholera is an imported disease. His description of its origin and progress is one of the best summaries of the history of this pestilence which we have seen: and the facts which he has adduced of its obviously contagious character are only confirmatory of what has been already published by Copland, Watson, and other eminent observers." The reviewer then proceeds to enumerate the chief arguments I have used, and concludes by declaring that the *Medical Gazette* had long advocated the opinion that cholera is contagious. On one point only I wish to set the reviewer right; the passages he quotes from the chapter on cholera in the second edition of my book, are all taken from a paper printed in the *Dublin Medical Journal,* in the year 1840, and consequently long before either Dr. Copland or Dr. Watson had written on this question. The London *Literary Gazette* of the 28th of October, writing upon the same subject, remarks:—"But still, as cholera does exist, and becomes more pestilent, it is good to hear what Dr. Graves states about it. Well, he seems to confirm a suspicion we ventured to intimate in our last *Gazette* (in spite of all the non-contagionist theories about it), that the disease might be contagious; and we instanced its propagation into the town of Hull by a vessel from Hamburgh in support of this probability."

In a series of papers signed "Medicus Galvinensis," an able writer in the Dublin *Medical Press* has strenuously insisted upon the contagiousness of cholera, and has brought many important facts to bear upon the subject. As, however, the general expression of the metropolitan newspapers is adverse, and as the public mind must be much influenced by the specious arguments which their talented writers artfully decorate with eloquence, I am impelled by the danger which must arise from the propagation of error, again to raise my voice, and to call upon the Government, before it is too late, to make the necessary preparations for encountering this disease, when the epidemic reaches our shores. In a conversation which I had with a friend in the beginning of last September, I announced to him that this *vexata quæstio* was approaching a rapid solution, for cholera being then established at Hamburgh, the mode of its propagation would soon become evident. I reasoned that, if the disease extends itself by means of an atmospheric influence, it would arrive on every part of the east coasts of England simultaneously, or nearly so, and that consequently I should expect that, in the course of a few weeks from that date, the cholera would appear nearly at the same time in all the ports of England equally distant from Hamburgh: but that if the propagation of the disease depends on contagion, we might look for its appearance only in those ports which had a direct communication with Hamburgh. The subsequent progress of events has afforded a most startling verification of this position, for, as I observed in a short letter in the *Dublin Quarterly Journal* for November, 1848, the disease has broken out in Leith, Sunderland, Hull, and London, all seaports communicating constantly with Hamburgh, while none of the intermediate towns between Leith and London have been visited, and for the simple reason that there is no direct intercourse between them and Hamburg. Facts such as these have made a serious impression on my mind, and have corroborated the opinion I formerly ventured to express, that the official authorities have, to say the least, acted unwisely in advising that cholera patients should be admitted into general hospitals, in place of preparing (as was done during the former cholera epidemic) special hospitals for the treatment of cholera. I asserted (and further reflection has induced me to repeat the assertion) that the mode of proceeding proposed by the Board of Health, namely, that of admitting cholera patients into general hospitals, is likely to produce much injury, not only by endangering the lives of the poor patients labouring under ordinary diseases, but by alarming society at large, by collecting cholera patients into so many and different hospitals. During the former epidemic, the moment a poor patient was attacked with cholera, notice was sent to the proper quarter, and immediately a fitting convenience was provided, and the sick person was brought to a cholera hospital without delay. Thus, not only was a focus of contagion removed from the family where the sickness occurred, but the patient had the advantages of all those appliances which skill, combined with a liberal expenditure, could supply; and to the activity with which this system was pursued we must attribute the comparatively small mortality from cholera that occurred in this metropolis. In the name, therefore, of humanity, I implore the Government to pause before it puts into operation a course of proceeding which may be most pernicious in its results; and I call on the authorities to be guided by truth rather than by the false maxim, that it will be conducive to the tranquillity of the public mind to proceed on the principle that the disease is not contagious. But, alas! unconsciously I find myself falling into a serious error. I have recommended *truth*, and by my reasoning have endeavoured to uphold it; but what chance can there be of truth prevailing or of error being dissipated, when the great luminary which enlightens the mind of England, and serves as a beacon to warn us of coming danger, so far presumes upon the ignorance and credulity of its readers as to dare to print the following puerilities?* The *Times* of October 17th, in its leading article, thus proceeds:—"The disorder has chiefly appeared at Woolwich, but not in Woolwich generally; nor in the river generally; nor in the convict ships generally, though they all lie so close together; nor in the "Justitia" convict ship generally; nor in its lower deck generally; but on the starboard side and stern thereof, particularly and exclusively that part exactly opposite the mouth of a sewer which empties itself into the Thames."

I must confess that it rather puzzles me to make out how the "*starboard side and the stern thereof*" can be called "*that part*," seeing that they form two very different parts of a ship; neither can I understand how these two different parts, one of which is at right angles with the other, can be *exactly* opposite the mouth of a sewer; but waiving this inaccuracy of language on the plea that the Thunderer, as when erst enamoured of *Europa*, still seeks gratification by making himself a—Bull,—it appears, according to this new philosophy, that a malign atmospheric influence arrived in the Thames, but of so thin, curved, and laminated a nature, that it touched not any of the numerous ships that lie *so close together*, but, winding itself amongst them and leaving them unscathed, it poured itself into this unfortunate sewer, from which it issued again forthwith, directed against the starboard side and the stern of the fated vessel. In ordinary cases, when a malarious wind reaches an opposing obstacle, such as the side of a ship, and enters through windows or port-holes, those who have berths at that side are evidently more protected from the direct influence of the vapour, than those who sleep at the opposite side; and therefore, even supposing that the air was poured into the ship like a fluid,

* The greater part of the following observations on the "Justitia" and the theory of the *Times*, were published in the *Freeman's Journal* of the 29th October, and consequently a week before some judicious remarks on the same subject appeared in the London *Medical Gazette*.

and capable of reaching only those who were in its direct course, it is quite evident that the persons occupying berths on the larboard side should have been chiefly affected, and not those on the starboard. But the atmosphere (and it is the only medium by which the deleterious influence could be conveyed from the sewer) is unfortunately elastic, and whether it enters the hold of the ship by the starboard windows, or by the larboard, or by the poop, it immediately diffuses itself equally through the whole internal space; and besides I beg leave to remind the writer in the *Times*, that the inmates of the ship, convicts though they be, do not remain like statues in a gallery, fixedly arranged at different sides and opposite to each other.

But in fact the subsequent course of events has completely overthrown the hypothesis of the *Times*, and has altogether exculpated the accused sewer from the guilt of having generated spasmodic cholera; for the hulk "Justitia" having been removed from the suspected locality, it was at last found necessary, on account of the continued spread of the disease, to remove the convicts, but not until twelve had died, and thirty-seven sickened: and then we find suspicion transferred to the hulk itself, and forthwith it was ordered to be broken up! I have no returns which enable me to state the precise number of convicts who afterwards were attacked on board the "Unité;"* but the number was considerable; neither can I say how many took the disease in the "Hebe" and "Sulphur" receiving ships, to which they had been transferred from the "Justitia;" but in the "Dreadnought" hospital ship several died. I should like to know whether a pernicious sewer was opposite to each of these ships; but I rather suspect that even the sewers had now fallen into disrepute with the authorities, for in the official returns of October, 30, we find it stated: "Almost all the cases of deaths, and even attacks amongst the convicts, have occurred amongst those who have been subjected to punishments, or confinements in the black-hole."

* Five actually died in three days, from 7th to 11th October.

After this announcement we must of course suppose, that all such punishments were for the time abolished; and then indeed, what between a liberal allowance of anti-choleric tobacco, and a freedom from choleric punishment, it might be well said, "O *felices convicti*, sua si bona norint!"

In reflecting upon the causes assigned by the non-contagionists to account for the spread of cholera, one is struck with the singularity of the fact that sewers, streams, rivers, and damp localities are blamed as the producers of this disease; for if a case of cholera occurs, and that the non-contagionists discover anything in the locality which can be accused of unusual dampness, whether it be a marsh, an arm of the sea, a drain, or a river, they immediately exclaim, "we are satisfied; we have found the 'fons et origo mali;' behold the source whose emanations have given rise to the disease!" Satisfactory as this *Εὕρηκα* may appear to such gentlemen, I doubt whether the discovery will be considered as conclusive by those who are in the habit of reasoning more philosophically. To such persons it will appear strange that the above enumerated sources of noxious miasmata should manufacture no vapours capable of producing disease during the hot summer months: and that during the most unhealthy months of autumn, likewise, they did not give rise to cholera, in August or September; but that in the months of October, November, and December, they should suddenly become endued with a power of manufacturing noxious vapours capable of infecting the neighbourhood. The philosophical reader will, no doubt, admire the simultaneousness with which all the moist and low situations on the east coast of England assumed in the beginning of October, their new and fatal function; and he will consider it as a phenomenon unexampled in nature, that rivers, sewers, canals, marshes, rivulets, and filthy water nuisances, sources from which exhalations so different in chemical composition are usually evolved;—he will admire, I say, the unique law which derives, from causes so various, effects in every case precisely similar, viz., the production of a new specific disease. Those who are satisfied with the maxim so generally adopted by mankind, "credo quia impossibile," have here abundant occasion for their faith; but see to what consequences this explanation, if persevered in, must lead us. The whole country will be despotically governed by parish authorities and sanitary committees; a new and unclassical *régime* will be formed; and its medical police, not content with the triumphs gained by flushing sewers, whitewashing houses, abating nuisances, emptying dust-holes, and performing other *hyper-Augean* labours will persecute water wherever they find it. Adieu then to the gods* who preside over fountains, over streams, over rivers; banished be the nymphs from our suburban villas; let nothing be thought of but thorough drainage, and let everything be superseded in the way of ornamental water, whether lake, cascade, or pond. It may be questioned, I say, when we have succeeded in extinguishing the chief beauties of our landscape, whether we shall have effectually exorcised the demon. May not the unclean spirit of cholera be one that "walketh through dry places?"—has it not dwelt on mountains, traversed the arid desert, and decimated the inhabitants of countries where water is not merely the chief but the dearest necessary of life?

I feel by no means disposed to perform the operation of vivisection on a very active and well-meaning body of sanitary volunteers in this city; nor am I inclined to expose the utter futility of their attempts to keep the cholera out of Dublin by enforcing cleanliness. Neither do I believe that the means they possess will ever effect more than unkennelling half-buried and half-decayed odours. In the attainment of such an object, half-measures render nuisances more offensive, and it is better, in many cases, to let them lie

* This reminds me of a strange error committed by a writer in an interesting article on Greece, published a few years ago in the *Quarterly Review*. He says it is very remarkable that the modern Greeks have ceased to use the word ὕ ωρ, and have borrowed from the Turks the word *νερον*. So then our old favourites the *nereids* of Hesiod were christened by the Turks after all.

dormant than to stir them up into fresh activity. This principle was well known to Don Quixote, and was exemplified in the advice he gave to Sancho Panza on a certain occasion, to which it is now more seemly to refer than to describe. But it appears that these gentlemen have sought and obtained the assistance of the authorities, and consequently they have at once become formidable to their fellow-citizens, for they are now empowered to forward their measures by Act of Parliament; and in pursuance of the powers thus discreetly granted, I perceive that a meeting has been this day (14th November) summoned for the parish of St. Mark, in order to levy a cess for sanitary purposes. If such tax is to be levied only off the rich, it will, in the parish of St. Mark, amount to almost nothing; if it is to be wrung from the limited resources of the thousand pauper roomkeepers who inhabit that quarter of the city, then indeed will they have reason to curse the day that the means for purchasing food were diminished by contributions intended to remove nuisances, and in vain will they be told that they must pinch their stomachs for the general purposes of cleanliness. The sanitary committee may, by the force of perseverance and of the law, effect many of the objects they have in view; but I fear, even if they entirely succeed, they will have but converted the wretched dwellings of the miserable inhabitants into whitewashed sepulchres. Had funds been raised sufficient to feed, clothe, warm, and lodge the poor inhabitants, had hospitals been provided for the reception of cholera patients, had means of carrying them to these hospitals the moment they were attacked been ready; then indeed, when the enemy arrived, some effective resistance might have been made, and if the plague could not have been averted, it might at length have been stayed. But, alas! nothing of the sort has been done; the public have been misled by the Government, and it is doubtful to decide whether the Government have been misled by or have misled their medical advisers, but in either case the poor will be the sufferers. If the latter are hungry it would be in vain to tell them that some neighbouring alley has been cleansed, and some adjacent sewer flushed. Hungry, chilled, and crowded together, they present meet fuel for the epidemic; and the more rational of them, when exhorted to be cleanly, will answer like the hungry negro, who, having patiently listened to a sermon addressed to him by a zealous missionary, and intended to convert him, submissively answered, placing his hand upon his empty stomach: "Massa, belly sick, bad palaver, very bad palaver."

One great discovery has been made by the Board of Health in London, and which is announced in the following words:* "The places in which the pestilence is now numbering its first victims are the very spots which are known to be the filthiest in their respective districts, and to be the constant seats of typhus fever and other epidemic diseases. In tracing the individual cases reported to the Board of Health, the medical inquirers who, under the direction of the Board, have made a special investigation of the circumstances connected with the earliest attacks of the disease during its present visitation, have been led not only to the streets, courts, and alleys, but sometimes even to the very houses, *that are notorious as fever nests*." So then it appears that the *fever nests* have mysteriously and unaccountably become *cholera nests*, that the same raw materials have been used for the production of a totally new manufacture, and that a new effect has been created by an old cause. But were not the localities indicated by the Commissioners nests not merely of fever, but of all diseases? Had not, during all seasons and in every year, scarlatina, measles, hooping-cough, and small-pox, been hatched in such places? Are not these localities filled with the victims of indigestion, marasmus, scrofula, and itch? Are all these evils produced by the incubation of the same ova? If so, then Pandora's box has re-appeared in a new and more frightful form, even *Hope* is scared from its bottom, and all the evils to which flesh is heir may be caused by a superabundance of

* *Morning Chronicle*, November 3.

moisture in the atmosphere.* Upon the dampness of localities, and the wetness of the weather, the genius of observers has chiefly been exercised, as is exemplified in Dr. Adair Crawford's report upon the outbreak of cholera in Petersburgh in the present year; but do these gentlemen forget that there are places in Hindoostan, where more than 200 inches of rain fall annually; that, during many months of the rainy season on the west coast of Africa, it is a constant deluge, everything flooded, the air so charged with moisture that it is impossible to keep anything dry, that the best leather decays, and the most carefully painted iron rusts? Do they forget that, in the great rivers of South and North America, the whole country, to the extent of forty or fifty miles on either side of the rivers, is flooded, and the civilized inhabitants are obliged to reside in the tops of their houses, while their more savage brethren betake themselves to their nests constructed amidst the branches of trees? Do they forget the vast population which resides in the boats innumerable that cover the surface of the great Chinese rivers? And yet all these physical causes, believed by these gentlemen to be capable of giving rise to cholera, have existed for ages, and have been powerless to generate this fell destroyer. The advocates for the production of cholera in England by means of the operation of physical causes, asserted that in 1832 the actual outbreak of the disease was preceded by a certain change in the air, not sufficiently intense to produce actual cholera, but which gave rise to indigestion and various degrees of intestinal inconvenience, and even diarrhœa. This state of the air they assumed as a necessary precursor of the more noxious atmospheric changes that were soon to follow; and, knowing that their hypothesis would appear more credible if they persuaded the public that it had actually

* November 13th.—I see that a correspondent of an English paper, writing from Berlin, under the date of November 6, says:—"Cholera is fast disappearing in this city, although for the last ten days much rain has fallen, and the weather has been unusually damp." It is plain that this correspondent was neither employed by Government, nor yet was he writing for the benefit of British capitalists.

preceded the cholera, they at once set about manufacturing facts, and produced such a goodly array of assertions respecting the invariable prevalence of bowel complaints for weeks before the invasion of cholera, that their opponents were unable to answer their arguments without questioning their veracity, and thus the non-contagionists were necessarily triumphant, at least upon this part of the question at issue. But, alas! the accurate data which the Reports of the Registrar-General now furnish have entirely dissipated this illusion, for it is proved that the public health was never in a more satisfactory state than it had been for some weeks before the outbreak of cholera! The atmospheric change, the passage from wholesome to noxious, must have been, therefore, so sharp, so well-defined and sudden, as to be *incredible*—I say *incredible* advisedly, because it must be borne in mind that for many weeks *after the cholera had gained a footing* in Edinburgh and London in 1848, these reports proved that in all other respects the public health continued good. Is it then credible that the atmosphere could be thus interstitially changed, so as to be in its general mass more than usually wholesome, while it contained here and there isolated portions of deleterious air?

So confident do the non-contagionists appear in the truth of the theory they advocate, that they scruple not (and here I must admit their honest candour) to introduce facts which evidently militate against their own opinion. Thus, in a circular printed by the Metropolitan Sanitary Commission of London, the evidence of Samuel Rogers, Fellow of the Royal College of Surgeons is given; at page 5, he states:—"I shall conclude my remarks by noticing an idea prevalent in India, and as appears not without foundation, that cholera attaches itself to large bodies of men in camps, and is by them conveyed from town to town, if it is not in some instances generated by large assemblages of people. In 1831 the 45th regiment of Native Infantry, while on their march from Madras to Kolopore, was attacked with cholera, which moved along with them, infecting every village they passed through. They reached Ballary on the 1st of February, the disease not having been seen there for many months; on the 2nd several cases occurred in that place, and from this period ten or twelve deaths were reported daily. Cholera is a usual attendant at native festivals, where crowds of people are collected. At Juggernaut it is an annual visitant. The town of Pooree contains 35,000 inhabitants, and the number of pilgrims sometimes amounts to 150,000. The inhabitants are usually quite healthy before the occurrence of the festival, which takes place in June or July; but immediately on the arrival of the pilgrims, and when the lodging-houses are literally crammed with inmates, cholera suddenly breaks out, and in the course of a few days hundreds are cut off by it. This is not an occasional or accidental occurrence, it is an invariable one; and the disease which has been thus generated as suddenly disappears on the dispersion of the crowd, a few isolated cases only occurring for two or three days after the departure of the pilgrims." Now, in my humble opinion, these facts inflict a heavy blow and great discouragement on the non-contagionists, and it was evidently felt by the committee who were examining Mr. Rogers, that he volunteered to say in his concluding remarks what they would have preferred to have remained unsaid, for immediately some member of the committee took him to task, and endeavoured to elicit, by subsequent queries, answers which might help them to hobble out of the difficulty into which they had been unexpectedly plunged.

Neither time nor space permits me to insert the queries put, or the answers elicited; but the information thus gained could not possibly shake the conviction to which the above facts, stated by Mr. Rogers, must inevitably lead every impartial inquirer. It might and did happen that a regiment affected with cholera, and leaving the station at which the disease at first appeared, would bring the seeds of disease with them; or, to express the opinion of the non-contagionists more clearly,—a body of men that in a station had inhaled the cholera miasmata, might not exhibit any symptoms of the malady for several days, during which time they would have proceeded far upon their march. This explanation is quite admissible, and may be received, so far as regards the illness of the soldiers, in spite of their change of place: but it altogether fails to elucidate how the natives of the villages, where no cholera existed previously, were attacked with the disease immediately after the arrival of the soldiers.

With respect to the hypothesis, that the cholera was generated among the pilgrims or the inhabitants of the city, from the mere fact of its being *over-crowded* during the sojourn of the pilgrims,—it is too absurd to justify a serious examination; while, on the other hand, all the circumstances of the case are quite consistent with the doctrine of contagion.

It may deserve consideration how far we can account for the cessation of cholera in towns, often long before the whole body of the inhabitants are affected. The truth seems to be, that a great number of constitutions are not susceptible of the disease, or have it so lightly that the individuals are scarcely conscious of its presence. This position is warranted by the fact that during the prevalence of cholera, *as a widely spread epidemic*, in any city, many people are found complaining of flatulence, slight nausea, diminished appetite, borborygmi, freeness of bowels, and other evident symptoms of gastric derangement: such persons, in my opinion, labour under the infection of cholera, and such cases are analogous to what we so frequently observe in persons exposed to the contagion of measles, scarlatina, whooping-cough, and even small-pox, and in whom the effect produced by the poison from each of these diseases is so slight, that they are but little troubled, and are not obliged to desist from their usual avocations. When, in any society or city, a certain number of persons have been gravely attacked with cholera, and the great majority have had it almost without knowing it, then the disease ceases from want of individuals it can affect. What the circumstances are which render the inhabitants of some cities liable to be struck with a heavier form of the disease in a greater proportion than the inhabitants of others, we probably shall never be able to explain; but many instances might be brought forward, where in two neighbouring cities the population of the one was nearly destroyed, and the population of the other comparatively spared. That such an occurrence is observed in other manifestly contagious diseases, is evident from the answers which I received to queries addressed to medical men practising in the various towns of Ireland,* and from which answers it appears that scarlatina has for many years caused a great loss of life in some towns or villages, while it was either mild or even almost unknown in contiguous localities; a fact exactly analogous to that which has excited so much astonishment with respect to cholera, and which, however unaccountable, is, therefore, not without parallel.

In confirmation of the conclusions derivable from these answers respecting scarlet fever in Ireland, a fact mentioned by Mr. Spooner in the *Provincial Medical and Surgical Journal*, already referred to, deserves special attention, for he states that small-pox and scarlet fever frequently rage in Exeter, without extending to the adjacent villages, Topsham and Dawlish. "Will any one doubt the contagious nature of these diseases on that account?" adds Mr. Spooner. And he very justly considers this as quite analogous to what Dr. Shapter held to be a very curious circumstance with respect to cholera, viz., "that the two first cases which occurred in Exeter came from two infected places, London and Plymouth, after which it spread to such an extent that 400 of the population died;" and yet he says that none of the adjacent villages were visited by the epidemic; Topsham, Dawlish, and Crediton, having only a case or two, which did not extend further.

The great plague of London of 1665 supplies us with a very remarkable example of this apparent anomaly in the course of a disease confessedly contagious; for it appears, that of the 130 parishes in and about London, four entirely

* See *Clinical Medicine*, second edition, vol. i. p. 324.

escaped the infection, and some parishes were free for months, while others were depopulated.* Here, then, is an omission, on the part of the plague, of places, quite as remarkable as any of the *skipping motions* which authors have recorded with so much wonder in the case of cholera. We now see that such anomalies in its progress are not sufficient to take it out of the category of infectious diseases.

A very striking example of the escape of certain localities from the infection of cholera is mentioned by the intelligent Roman correspondent of the *Daily News* of the 16th of November, 1848, viz., that during the last epidemic of cholera at Rome, the "Ghetto," a part of Rome inhabited by the Jews alone, altogether escaped. Now it is perfectly well known to all those who have visited the Eternal City, that this very quarter is remarkable for a concentration of every nuisance, whether solid, fluid, or gaseous, that is capable of exciting disgust or causing disease. If, then, unflushed sewers, stagnant cesspools, noisome dunghills, and all the countless abominations which render the quarter inhabited by the descendants of Abraham† a bye-word even among the Romans,—themselves the filthiest of Christians,—if, I say, cholera spared the Jews inhabiting such a locality, can it be produced anywhere by those agencies, on which the advocates of the doctrine of dirt and want of drainage being its causes, so confidently rely?

The progress of cholera in England, in 1832 and 1848, exhibits the extreme difficulty with which it gained ground, a difficulty exactly such as a contagious disease might be expected to exhibit in a country whose inhabitants live in separate families and in distinct houses, and where the fear

* See Vincent's *God's Terrible Voice in the City*, printed in 1667, and other authentic accounts of the plague of 1665.

† Who is to blame for this wretchedness of the Jews in Rome, Prague, and other continental cities? Certainly not the Jews themselves. They are "cabin'd, cribb'd, confin'd" sorely against their will; and Christendom cannot be called civilized so long as they are kept in such a state of thraldom.

of contagion most effectually prevents persons from holding, at least willingly, any communication with infected individuals. In consequence of these difficulties, cholera had to struggle long before it pravailed in England; and several months may be reckoned on as the duration of the struggle both in 1832 and 1848. In Leith and Edinburgh cholera spread with greater rapidity than in Hull, Sunderland, and London, and for the simple reason that in Scotch towns the houses, especially in Edinburgh, are constructed after the continental fashion, and each residence includes many families, who gain admission to the different *flats* by a common staircase; these circumstances facilitate the propagation of contagious diseases; and the more rapid diffusion of cholera in Edinburgh than in London, is, therefore, an additional proof of its infectious nature. With reference to this explanation of the more rapid diffusion of cholera in Edinburgh than in London, I may remark, that my views are borne out by some observations of Mr. Spooner, who says, "That in England the general immunity from cholera, at the period of its last inundation, arose probably from the fear of contagion inducing strict measures of separation and cleanliness, as well as from the comparatively small population of our towns, and the scattered character of our villages, and the *cordon sanitaire* of our cultivated fields and belts of downs." This quite agrees with my hypothesis; for I am persuaded that it is the comparatively strict isolation of English families, whether poor or rich, that renders the inhabitants of England less liable to depopulation from contagious epidemics than continental countries: and consequently the rational physician and the prudent legislator should avail themselves of this advantageous condition of the English population, and should have recourse to such measures as will tend still further to check the progress of disease. I quite agree with Mr. Spooner, that the avowal of the truth, either with regard to cholera or the plague itself, is not likely to be productive of mischief, but, on the contrary, to induce wholesome measures of caution, such as have been before employed with success in preventing the spread of cholera. Thus he says,—"In the little village of Bere, in this county (Norfolk), there were, in 1832, twelve cases of genuine Asiatic cholera, of which six proved fatal. The first case was of a person who came from London. Great care was taken to separate the sick from the healthy, and the disease did not spread to any adjacent village. "A few cases of cholera," he adds, "occurred at Pool and at Bridport in this county, but strict attention to cleanliness, ventilation, and those cautions suggested by a general belief in its contagious properties, contributed very much to arrest the progress of the disease." I am quite aware that many persons are alarmed at the notion that cholera is contagious, and think, if this statement be true, that society is threatened with a greater evil; this view of the subject can easily be shown to be fallacious, for if cholera be a disease depending on general atmospheric influence, its propagation cannot at all be guarded against, and the exertions of man will be of no more efficacy in impeding its progress than they would be in arresting the march of influenza; but if the disease spreads by contagion, human means may manifestly, on many occasions, be brought into play with benefit. This view of the subject ought, therefore, to prove more consoling to the mind than that of its being purely epidemic.

The length of time which cholera takes to make its ground good in England, amounting, as I have shown, to at least a few months, establishes the difference which I have before insisted on, between the influences that give rise to the propagation of cholera and of influenza. Let us take as an example the influenza of 1847 (an account of which has been published by Dr. Peacock), and it appears that the epidemic in London was most active from the 22nd to the 30th of November, having commenced about the 16th or 18th of that month, and that it ceased to be very prevalent between the 6th and 8th of December. The influenza, therefore, arrived at its maximum in about a week from its first appearance, and, continuing to rage with intensity for about eight days, then declined so rapidly that in ten days more very few were afflicted. In a work upon cholera published by Dr. Gavin Milroy, he writes much upon the analogy that exists between the spreading of cholera and of influenza, in order to prove that the former, like the latter, depends on the atmosphere for its propagation; but, in my humble opinion, he has been altogether unsuccessful in his attempt, nor do the facts which he has rather ingeniously brought forward justify me in altering the opinion, I have already expressed in my *Clinical Medicine,* that the spread of influenza is strikingly different from that of cholera. We have seen already how much more suddenly the former arrives at its maximum; let us now examine the rate at which the influenza of 1847 travelled, and compare it with the rate at which cholera progresses.

The epidemic was raging at Constantinople in August, and it affected the south of France and the shores of the Mediterranean in October. In Paris it commenced about the 27th of November, and was at its height on the 4th of December. In Madrid it was very general on the 11th and 19th of January; and in Geneva it appeared as a casual disease in the first week in December, suddenly became very prevalent about the 20th of that month, declined during the course of January, and had almost disappeared by the commencement of February. Observe what an extensive zone is occupied or overshadowed by the atmospheric influence producing influenza, and how rapidly that shadow overspreads all the country round and included between Constantinople, Geneva, Paris, Madrid, and London, an immense tract being thus occupied by the disease in less than three months. How different this from the slow progress of cholera! Again, how evidently do these two diseases differ as to the proportion of persons attacked by them:—thus in Christ's Hospital, Dr. Peacock relates, that of the 1,000 boys, 350, or about one-third, were more or less affected by influenza in three weeks; in Paris, in 1847, between one-fourth and one-third of the population is said to have suffered from the influenza; and in Geneva the proportion affected is said to have been not less than one-third; while the epidemic influenza of 1837 affected fully one-half of the inhabitants of London and of Paris. Here again, the difference between cholera and influenza is so striking as to require no further elucidation.

The Boards of Health, in Dublin and in London, and the College of Physicians in the latter city, have, it appears to me, incurred an immense responsibility; for they have asserted that nursetenders and others, whose duty brings them into immediate contact with cholera patients, are not more liable to contract the disease than individuals who never approach such patients. It will be seen just now that this assertion is altogether unfounded; but, in the meantime, I may observe that, granting that in well-regulated hospitals, or in well-ventilated houses, the nursetenders and physicians generally escape, this frequent immunity on their part is no proof of the non-contagiousness of the disease; for, as "Medicus Galvinensis," in the *Dublin Medical Press* of the 1st of November, 1848, very sensibly remarks, "while admitting all this, I ask, is not the same true *of all other confessedly infectious diseases?* In how many instances, during the late epidemic fever, have I in vain endeavoured to trace infection? How often, in the prosecution of my dispensary labours, in remote and isolated hovels, have I been assured in such and such a case, such a cause could not have operated; and do I, or does any man, doubt the infection of typhus? How often, in private practice, when I knew the habits of a family, or could depend upon their co-operation, have I, upon the occurrence of fever, calmed their minds, by stating confidently that, with the most ordinary precautions, the disease would not spread; and even in protracted attendances upon the worst forms of fever, this confidence has hardly, in a single instance, been disappointed; and yet, upon this weak argument of the immunity of medical and hospital attendants, how many anti-infectionists ground their belief!"

Nothing is more common than to find cases of measles, scarlatina, or hooping-cough, occurring in families living in the country, and in whose neighbourhoood we cannot discover that any other similar cases exist; in all such instances, however, no one ever dreams of attributing the origin of these diseases to the atmosphere, or to local miasmata; on the contrary, every rational physician explains the occurrence on the supposition that such cases originated in infection, although he has been unable to discover its source in the particular instance. The hypothesis of the contagiousness of cholera, by no means, therefore, presupposes the possibility of our being able always to point out the sources of infection in each case.

My friend Dr. Little, of Sligo, writes to me upon this subject: "I care not for your proofs of negation, let them be ever so numerous. I have had three of my own children in the nursery with three other of my children in the hooping-cough, and yet they never took it. I have had fifty cases of typhus fever this season, in houses with large families, and no second person in any of these houses took fever. Am I then, from these facts, to conclude that neither of these diseases is contagious? I care not, I say, for fifty negative facts; give me one positive fact, it is worth a thousand of them; and if cholera *is rarely, if ever, contagious,* I say it is madness not to act as though we believed it to be universally so, and yet the Boards of Health, both here and in London, force us to act as if the disease never was contagious, and they assure us that no one will incur any danger by this mode of proceeding."

The following paragraph, taken from an article in the *London Evening Mail,* and published some time towards the middle of last November, contains so complete and well-digested a *résumé* of the chief errors I condemn, that its preservation seems desirable, if it were only for the purpose of enabling our successors to form a just estimate of the sanitary theories now promulgated by authority. In speaking of the new notification of the London Board of Health, the writer in the *Mail* observes:—

"It will be seen from the important documents which we this day publish, that the highest authorities of the country agree in calling the cholera *epidemic* rather than contagious. They very wisely do not commit themselves either to the contagion or the non-contagion theory, confining themselves to a practical view of the disease. Experience proves that there is no perceptible danger in waiting upon cholera patients, and that whoever runs away from them is, in fact, avoiding an imaginary peril. The touch, the breath, the smell, or whatever has to do with the person of the patient, is as innocuous as the mere spectacle of suffering. To all intents and purposes, therefore, there is no contagion of the disease. But the same experience indicates certain, almost uniform, antecedents of cholera. Whatever has usually caused a disposition to typhus, to scarlet fever, and other epidemic diseases, will now produce cholera. The inhabitants of the same house, or court, or district, are affected by the same injurious circumstances. It is not the breath of one another that affects them, but the air they all breathe, the common miasma of the dunghill, the cesspool, the sewer, or the Thames. Certainly, as one passes along even the more open streets of the city, one may perceive how superfluous it is to suppose a more lethal effluvia than that which a whole neighbourhood is often forced to breathe. The mouth or the hand of the cholera patient cannot be more deadly than the fœtor which the grate vomits forth night and day, or which stagnates over the unspeakable abominations of 'the court within a court.' Meanwhile there is an immense practical difference between the words 'contagious' and 'epidemic.' The former blinds people to the facts of the case, and deters them from its duties; the latter directs attention to the most important facts, and enforces the duties by the additional stimulus of self-preservation."

The wisdom for which this writer in the *Evening Mail* gives the Board of Health credit, seems to me to be of a very questionable nature; for he praises the Board for not committing themselves to the contagion or non-contagion theory, but for confining themselves to a practical view of the disease.

Now it seems evident that the Board of Health manifestly committed themselves to the non-contagion theory, for all the directions they have given on the subject proceed on the principle that the truth of this theory had been demonstrated. We find also that the writer states, "that whatever usually causes a disposition to typhus fever, scarlet fever, and other epidemic diseases, will now produce cholera." It is, assuredly, most miraculous, that any given emanation from a sewer, or any other given exhalation from damp ground, can at any one time produce typhus fever, at another scarlatina, at another (for all these come under epidemic diseases) small-pox, or measles, or hooping-cough, or influenza. I find that this new theory, industriously supported by the Board of Health and the daily press, has found adherents in the profession. Thus, Dr. Ogier Ward, in a debate at the Westminster Medical Society, and which is reported in the *Medical Gazette* of the 17th of November, "referred to scarlet fever as epidemic in Kensington and Fulham; he traced its prevalence to bad drainage; on improving this, the disease was mitigated, and then disappeared." If Dr. Ward's method of removing scarlatina succeeds, there is no end to the benefits to society that must result; for, under a complete system of drainage, we may expect all the other epidemic diseases to cease. It would be well to chronicle the divers evils, to register the various species of manslaughters, any sewer "that exhales the lethal effluvia" of the writer in the *Evening Mail* may commit from time to time. In January, therefore, it vomits forth scarlet fever; in February, measles; in June and July, typhus; in August, hooping-cough; in September and October, small-pox. Such has been the offensive course of these criminal sewers for several centuries. But lately, tired of the monotony of effect hitherto produced, they have added, by way of variety, to their home manufacture, a new and special disease termed cholera. Such are some of the important facts, to which the writer in the *Mail* alleges the epidemic theory will conduct us. I must confess that I am among the number blinded to the facts of the case as he teaches them. But, nevertheless, I do not feel myself discharged from the duties which my belief in the contagion of cholera inculcates. I have no doubt that the modes of preservation which are derivable from that belief would be much more efficacious and useful to society, than all the efforts of those who inculcate the necessity of universal drainage. To me it appears that the sum and substance of accurately verified facts prove nothing strange in the progress of cholera; nothing to distinguish it from the manner in which other contagious diseases are propagated. True it is that wonders have been daily published, and miracles recorded, concerning its mode of travelling, and manner of attacking towns, peoples, and armies. But, like most modern miracles, an accurate examination strips them of all pretensions to that character, and shows that a belief in them is founded on misrepresentation and inaccuracy, frequently, perhaps, unintentional, but always blameable. I think that I have shown to the satisfaction of my readers, that the so-named vaunted peculiarities of cholera are shared in common with it by other contagious diseases; and, if I am not mistaken, I have proved that in its diffusion it obeys the same laws with them; and if this be true, it follows as a necessary consequence, that all proceedings founded on the recommendation of the Boards of Health in London and in Dublin are at once injurious to the public health and unjust to the patients attacked, for the non-separation of patients increases the diffusion of the disease, and renders it impossible to supply to the sick the attentions they require. The injury that will accrue to the profession if the present epidemic becomes formidable is sufficiently obvious; for, as there will be no hospitals in which cholera patients can be treated, physicians will be distracted by the multiplicity of calls; they will be fatigued by going from one abode of misery to another; they will be dejected by finding everywhere a want of those appliances that are actually necessary; and finally, being worn out by an attempt to discharge duties that are beyond their strength, and utterly impracticable, they will resemble a *forlorn hope** ordered by a bad general either to lay down their lives or perform an impossibility.

The following facts are submitted to the consideration of the Dublin Board of Health, who have informed the profession and the public that they are "anxious to impress on all persons the important difference that exists between fever and cholera, with respect to the mode of propagation of these epidemic diseases. Fever, it is well known, is highly contagious, while all experience proves that cholera is rarely, if ever, contagious."

Although I do not exactly understand how a disease can be *rarely* contagious, still the expression is intelligible; but when the Commissioners of Health assign yet stricter limits to the extension of the word *rarely,* and say, "*rarely, if ever, contagious,*" I must confess myself utterly puzzled. Let us examine, however, how far cholera deserves to be called a disease *rarely contagious;* for the present we must leave *if ever* out of the argument, reinforced though it be by the aid of experience,—no, I beg the Commissioners' pardon, *all experience,*—that is their precise expression!

In a letter I have just received from Dr. Simpson, of Edinburgh, he states:—"In our hospital here for cholera four nurses have already been attacked, three fatally." Dr. Dillon writes me word that in Tuam four out of ten nuns, who charitably employed themselves in attending the sick in

* Military and civil writers of the present day seem quite ignorant of the true meaning of the expression "*forlorn hope.*" The *adjective* has nothing to do with despair, nor the *substantive* with the "charmer which lingers still behind:" there was no such poetical depth in the words as originally used. Every corps marching in an enemy's country had a small body of men at the head (*haupt* or *hope,* or perhaps *Haufen,* a troop) of the advanced guard, and which was termed the *forelorn hope* (*lorn* being here but a termination similar to *ward* in *forward*), while another small body at the head of the rear-guard was called the *rear-lorn hope.*—See "*A Treatice of Ireland by John Dymmok,*" p. 32, written about the year 1600, and printed by the Irish Archæological Society in 1843. A reference to *Johnson's Dictionary* proves that civilians were misled, as early as the time of Dryden, by the mere sound of a technical military phrase, and in process of time even military men forgot the true meaning of the words. It grieves me to sap the foundations of an error to which we are indebted for Byron's beautiful line: "The full of hope, misnamed forlorn."

1832, caught the disease, and two died; while three of the men who were employed to bury the dead died: and in Castlebar two out of five medical men, who attended cholera patients, died. Dr. Little, of Sligo, informs me, that of nine physicians attending the sick in Sligo, seven died in the course of three months. These facts strongly confirm the statements sanctioned by the Board of Health in Dublin, *that all experience* proves that cholera is rarely, if ever contagious, and that there is no danger to those who attend cholera.

A stone-cutter employed at the Roman Catholic cathedral of Ballina, who had a house about five miles distant, at Moyne, near Killala, had some of his children with him at Ballina; one of them sickened there and died. He then sent the rest (three in number) to the mother at Moyne, these sickened and died. A journeyman who lodged in the house with this man's wife, at Moyne, took fright and fled to Killala. He took ill the day he arrived at Killala, and died. Immediately after, the malady spread all over the town of Killala (his having been the first case there), several cases occurring in the meantime at Moyne, all of which proved fatal, the patients refusing medical assistance.

The following fact, bearing on the same question, rests on the same authority: "Cholera first appeared in Tuam (county of Galway) on the 4th of June, 1832, having attacked Galway, the nearest sea-port, on the 12th of May preceding. The first case was a fish kedger's wife, *who had purchased the clothes of a woman who had died in the cholera hospital of Galway.* She died the following night. Her sister, from a remote part of the town, who attended her and washed her body, was the second. A relative from a neighbouring village, who also attended her, and assisted in the washing, was the third. None lived above twelve hours.

"Cholera ceased for the first time in Tuam in August; the bedding was all put up clean in store. In September, the court-house (which had been our hospital), was required for the sessions; Mr. Hartnett, the dispensary apothecary, with two other persons, were employed for nearly a whole day in the removal of the stores. *Mr. Hartnett and one of the men were seized with cholera the following night and both died.* There had not been a case of cholera in Tuam for upwards of a month.

"Mrs. Thornton, the widow of an old resident, entered a house where Dr. Little (at present of the Sligo infirmary), the principal medical officer of the Tuam cholera hospital, and Mr. Rothe, the Protestant curate of the town, had been. They had just left the hospital, after a protracted visit. On entering, she immediately expressed herself faintish and impressed with a disagreeable smell. In less than an hour she was in the full collapse of cholera. Her son, an ill-conducted drunkard, entered the house on the alarm of his mother's illness, rudely denied it, and wished to prevent her conveyance to the hospital: to show his disbelief he kissed her several times. At 2 o'clock, A.M., he was brought to hospital, where both died in a few hours. During the first irruption of the cholera we lost six nurses and four porters, having had six of each.

"A few days after this a woman arrived in town with a detachment of military. She was seized with cholera on her arrival, and died that night. Her death was followed by that of three others, all within half a dozen doors of the house in which she died. Mr. Robin Potter, linen merchant of Tuam, who lived in the immediate neighbourhood where these cases occurred, was attacked with cholera a day or two after. I attended him in consultation with Dr. Bodkin, at present of that town; he lived but nine hours. During his illness I had repeatedly warned his maid-servant, who was uselessly officious in her attendance, and hung over his person, sobbing, and wiping his face, to take more care of herself; the following day she was attacked with cholera, and died in the hospital. A relative who came from a village in the country, to see her in hospital, was attacked the following day, but recovered. The man who placed the body of Mr. Potter in the coffin was immediately attacked, and died on the following day. Mary Qualter, the servant maid of a Mr. Egan, a solicitor, who lived in the adjoining house to No. 1, had attended her friend in No. 2, before her removal to hospital; she was seized with mild cholera on the following day, and recovered."

The following facts tend to prove the correctness of the opinion published by the Board of Health, that persons ought not to be afraid to approach cholera patients; that in truth, if there is no apprehension there is no danger. Dr. Little, says that in Sligo, in 1832, a man of the name of Middleton, who was rather an enthusiast in all he did, placarded his house and all the town thus, "Fear is cholera, and cholera is fear;" and he preached about the streets on this text, warning the people against entertaining fear. This man went most zealously and fearlessly to all infected places, to prove his doctrine; but, like Maclean and Wright, who died of the plague, he caught the cholera and died a victim to his own theory.

After recounting some cases, manifestly proving the contagious nature of cholera, Dr. Little thus proceeds in a letter with which he has favoured me:

"The idea of the contagious character of cholera was forced upon me when it was scarcely a contested point, and when there was not that opposition to the opinion, which only has the effect of strengthening prejudices. In fact there was scarcely a single case which I had, out of 550, attended in Tuam in 1832, which I could not and did not palpably trace to contagion, as satisfactorily as ever such a tracing could be effected. Every case of cholera which came from any house, was followed by one, two, or three more; and in many instances where patients returned from hospital, cases were brought into hospital, from the houses into which they went, within twelve or twenty-four hours of their entrance. We lost four nurses out of ten, and three porters out of nine employed; insomuch that, of the several medical men we had attending the hospital, not one remained who entertained the slightest doubt of the contagious nature of the disease. I kept in my house the medicines which we had for the hospital, over and above those in absolute use: they lay in my study. One day, in my absence, two of the porters, though prohibited from coming to my house, were sent down for medicines. My sister-in-law, Mrs. Westropp, brought the key to them into the hall, when she fancied that some peculiar odour arose from these men; she that night sickened, and suffered a very severe attack of the disease, being dangerously ill; the maid-servant who attended her sickened two days afterwards, and was also very ill."

Postscript.—There is another point brought forward by the London Board of Health which requires a passing notice. They state that it has been observed that, concurrently with the outbreak of almost all great epidemics, there is some atmospheric condition, which, in proportion to the power and extent of the epidemic, depresses the general health of the public; and evidence of this is more definite and full in regard to cholera, than in reference to any other epidemic. Such a statement made by the Board of Health is most astounding; for, as I have before shown, at the very moment they were making it, a reference to the reports of the Registrar-General would have been sufficient to convince them that the general health of the population was by no means depressed, but, on the contrary, was unusually good in all the very districts where cholera had made its appearance, in England or Scotland.

In the face of such an undeniable fact, even Dr. Adair Crawford's curious observations concerning the extraordinary changes which, according to him, prevailed in the state of the atmosphere in Petersburgh for several weeks before the recent outbreak of cholera, ought to have had less weight with the London Board of Health, particularly as that gentleman seems to have indulged in a sort of philosophical mysticism, which induced a frame of mind nearly allied to blind credulity. This is the only explanation I can give of Dr. Adair Crawford's recording that the crows in St. Petersburgh had forsaken some of their usual roosting-places in the public gardens of the city and suburbs, where they are generally found in great numbers, and had flown to the nearest high grounds. The learned doctor does not inform us whether this migration was preceded by any unusual mortality in the rookery. If no such mortality took place, then I have too much respect for the wisdom of crows to believe that this alleged flight had any connexion with the cholera or deleterious changes in the atmosphere; but we are, I suppose, to go back to the Pagan superstition, and assign to Dr. Crawford the duties of an augur,—
"Observans quæ signa ferant, quò tendere pergant."

LIEBIG'S THEORIES OF ANIMAL HEAT AND OF DISEASE.

In order to exemplify how much physiology and pathology are indebted to the researches of chemists, I beg leave to refer to the *Quarterly Review*, June, 1842 (pages 99 and 121).

Professor Liebig applies the name of *metamorphosis* to those chemical actions in which a given compound, by the presence of a peculiar substance, is made to resolve itself into two or more compounds, *e. g.*, sugar by presence of yeast, into alcohol and carbonic acid.

Now, putrefying animal matters as well as yeast, will cause sugar to ferment: the explanation of which is, that the ferment or exciting body is invariably a substance in an active state of decomposition, and therefore its particles are in motion; this motion is communicated to the particles of the body to be metamorphosed, and is sufficient to overturn their very unstable equilibrium, and to cause the formation of new and more stable compounds. Liebig explains the action of certain medicines and poisons on the human body in the same way—thus there are many medicines and poisons which produce a very marked effect without their elements taking a direct share in the changes which ensue; those bodies originate, as it were, an action, which is subsequently propagated from particle to particle; they are uniformly substances in a state of change, and appear to act on the blood, as yeast does on a solution of sugar. In this class appear miasms, contagions, and the singular sausage poison of Würtemberg; the latter is an excellent example. Sausages, made in a peculiar way, are much used in that country; when ill-prepared they become poisonous, and their effects are invariably fatal: the patient gradually dries up into a sort of mummy, and after weeks or months of misery, death closes the scene; but there is no poisonous *substance* to be detected in the sausage. It is, according to Liebig, in a peculiar state of fermentation, which is not checked by the action of the stomach, and which, unfortunately, is communicated to the blood, and never ceases until every part capable of solution has been destroyed, when death of course must follow. *Miasms* and *contagions* act on the very same principle, and the reason that all are not affected by them seems to be, that they require the presence of a peculiar compound in the blood, which enters into decomposition, and when the whole of this peculiar matter is destroyed, the disease disappears. If there be much of this matter the case is *severe,* if little, the case is *mild;* and apparently in many contagious diseases, *the peculiar decomposable matter once destroyed can never be renewed, so that these diseases occur but once.*

Such is Professor Liebig's theory of poisoning and contagion—a theory which, though it comes to us recommended by the abilities of the first organic chemist of the age, and sanctioned by his anonymous but able reviewer in the *Quarterly,* can nevertheless be easily proved to rest on almost as many assumed as *proven* facts. Thus how can Liebig so positively assert that there is no poisonous substance in the fatal sausages? True it is that no chemist has yet insulated such a substance; but Liebig knows better than any one else, how profoundly concealed any particular animal principle may be, by being mixed with a great variety of other animal principles. Thus how long did sugar, in the blood of diabetic patients, elude the searches of chemists? and yet they were looking for a principle with whose chemical qualities they were already accurately acquainted. How much more difficult of detection must the poisonous principle be, which exists in so compound a body as a Würtemberg sausage? Besides, what chemist was ever sure that he was actually analysing a poisonous sausage? Here a special difficulty lies, for hitherto there has been discovered no *a priori* method of distinguishing a poisonous from a wholesome sausage until both have been eaten, when it is too late for analysis. How long has the poisonous quality of ergot of rye been known? and yet the principle to which its effects are owing, though often sought, has been only lately insulated.

It is obvious, therefore, that Professor Liebig's main example of his new pathological explanation is not by any means *proven*, and consequently it is unnecessary to follow him into the regions of fancy, where he has been enticed by a specious and seductive analogy. Pathology will cease to be a science when the study of facts gives place to such reveries as the above-cited passage contains—relative to miasms, contagions, mild cases, severe cases, diseases occurring but once in life, &c.

According to this hypothesis, three different animal poisons, all acting chemically, produce at first three different diseases, and at last the same disease. With regard to this hypothesis, I may further remark, that when a brewer takes a certain quantity of sweet wort, puts it in a vessel, and adds a given portion of yeast to it, he knows that if he simultaneously fills in the same way fifty similar vessels, the process of fermentation will produce in each, thirty times as much yeast as was originally added to the wort. But when the virus of small-pox is introduced into the blood of fifty individuals, is a multiplication of the small-pox matter thus proportioned to the quantity of blood in each? It certainly is not; a fact conceded by the supporters of Liebig's hypothesis, but which they try to evade by saying that the particles of the blood which are susceptible of this particular decomposition and metamorphosis, exist in different proportions in different individuals.

This method of ratiocination is as inconclusive as it is novel, and may be aptly termed, arguing not *in* but *outside* of a circle.

The following quotation, taken from the *Provincial Medical Journal*, contains a condensed but very accurate analysis of Liebig's theory of heat, and the pathological inferences which necessarily appear to flow from it:—

"The carbon and hydrogen of food, in being converted by oxygen into carbonic acid and water, must give out as much heat as if they were burned in the open air. The only difference is, that this heat is spread over unequal spaces of time; but the actual amount is always the same. The temperature of the human body is the same in the torrid as in the frigid zone. But as the body may be considered in the light of a heated vessel, which cools with an accelerated rapidity the colder the surrounding medium, it is obvious that the fuel necessary to retain its heat must vary in different climates. Thus, less heat is necessary in Palermo, where the temperature of the air is that of the human body, than in the polar regions, where it is about 90° lower. In the animal body, the food is the fuel; and, by a proper supply of oxygen, we obtain the heat given out during its combustion in winter. When we take exercise in a cold atmosphere, we respire a greater amount of oxygen, which implies a more abundant supply of carbon in the food; and, by taking this food, we form the most efficient protection against the cold. A starving man is soon frozen to death: *and every one knows that the animals of prey of the arctic regions are far more voracious than those of the torrid zone.**

* I cannot guess how *every body* comes to know all this; for my own part, I think it may be maintained that a Bengal tiger, or a Cape hyæna, requires, in proportion to its size, quite as abundant *rations* as any of the arctic carnivora; and as to the vultures of Hindoostan and Persia, where on earth, in air, or in water, can be found such gluttons? Neither do I think that any one (not to say *everybody*) would be prudent in counting on the abstinence of a shark, even within the tropics! Although religious ordinances prevent the Hindoos from eating beef, yet both they and the Arabs occasionally devour mutton in astonishing quantities. Those who ride over the Pampas, in South America, at the rate of 100 miles a day, exposed to a burning sun, subsist

Our clothing is merely an equivalent for food; and the more warmly we are clothed the less food we require. Were we to go destitute of clothes like certain savage tribes—or, if in hunting or fishing, we were exposed to the same degree of cold as the Samoyedes—we could, with ease consume 10lbs. of flesh, and, perhaps, a dozen tallow candles into the bargain, as warmly-clad travellers have related, with astonishment, of those people. Then could we take the same quantity of brandy or blubber of fish without bad effects, and learn to appreciate the delicacy of train oil.

"We thus perceive an explanation of the apparently anomalous habits of different nations. The maccaroni of the Italian, and the train oil of the Greenlander and the Russian, are not adventitious freaks of taste, but necessary articles, fitted to administer to their comfort in the climates in which they have been born. The colder the region, the more combustible must the food be."

It is, I must confess, quite new to me that our clothing is merely an equivalent for food, and that the more warmly we are clothed the less food we require. Take the well-clad and warmly-clothed country squire, and compare the quantity of food he devours with that which is consumed by his ragged labourers, and it may be asserted that the balance will be as much in favour of the squire's food as of his raiment. The voracious Samoyedes referred to, however barbarous in their manners, are pre-eminently a warmly-clothed race, and the semi-putrid fat and blubber of whales, agrees with the stomach of the Laplander as well in the heat of summer as in winter. In the arctic and cold regions of the earth man is driven by necessity to subsist on animal food, which is supplied to him by the unfrozen depths of the ocean, for in these inhospitable regions vegetable life is almost a stranger, and therefore it is that the Laplander, the Greenlander, and

entirely on boiled beef and water, without a particle of vegetable food of any kind, and yet they attain to an extraordinary *condition*, and capability of enduring violent and long-continued exertion. Liebig's theory must be very ductile, if it can explain how it happens that an exclusively animal diet agrees with man, quite as well at the equator as within the arctic circle.

Samoyede subsist almost exclusively on animal food. In the expeditions of Franklin, Parry, and Ross, our countrymen braved all the rigours of an arctic winter on the same food which they were in the habit of consuming in milder climates; and if it be true, as stated in the above passage, that in the animal body the food is the fuel, and that by a proper supply of food, we obtain the heat given out by its combustion in winter: if this be true, it is strange that there is no record of its being found necessary to give our sailors more food during the extreme cold than at other periods.

Facts are wholly inconsistent with many of Liebig's allegations. All hunting tribes of mankind, whether in northern, temperate, or tropical regions, subsist chiefly on animal food. This is true of the North and South American Indians, and it is true of the Hottentots, and indeed our travellers relate prodigies of gluttony enacted by the latter; for when, after a long fast, they suddenly obtain abundance of game, they will sit up the whole night, occupied in cooking and devouring steak after steak unaccompanied by a morsel of vegetable food. At such times, so indefatigable are they in the business of eating, that the party which over night had tightened their famine girdles to the last hole, have enormously distended abdomens on the following morning,—this, too, in the heat of Africa, where certainly no additional fuel is required for supporting the animal temperature. If Liebig's theory be correct, that animal food is peculiarly adapted to cold climates, how comes it that the most voracious carnivorous animals abound in the hottest regions of the earth. The Bengal tiger, and the African lion, and the boa constrictor of South America, together with the alligators and crocodiles of the Nile, the Ganges, and the Oronooko, all subsist solely upon animal food; and on the other hand, the whale tribe abound in every varieties of degree of oceanic temperature, where the appropriate animal food occurs, and the same observation applies to fishes in general. Take the antelope and the gazelle of Africa, which would shiver from cold during the warmth of an English summer, and compare them with the reindeer, that bears with impunity, and that for months together, a temperature far below zero, and how can we explain the difference by Liebig's theory, for they both subsist on vegetable food? Facts such as these are not merely irreconcileable with, but destructive of, that theory.

I would not be understood here as wishing to depreciate any department of human knowledge. Far be it from me. Besides, the attempt would be useless. But I am anxious that young men should concentrate all their energies on the proper objects of medical pursuit, and devote the largest share of their attention to those acquirements which will render them good practitioners I have seen students led astray by false notions, wasting half of the time which should be spent in hospital, and by the sick bed, in wandering through the fields on botanical excursions, or working in the laboratory, engaged in the solution of some unimportant problem. Now this is not what will teach them to relieve suffering, and cure disease. When I look round me, and behold so many young gentlemen entering upon an honourable and important profession, I feel that my responsibility is great. I consider them all as instruments of good or evil, and cannot help being conscious that I should be guilty of a great crime, did I not use every means in my power to render them able and efficient practitioners. The teacher of clinical medicine occupies in every nation a post of heavy responsibility. But when he happens to preside over the medical education of those who resort to the wards of a metropolitan hospital—when the metropolis is a British one, and the hospital destined to send forth annually practitioners to every quarter of the globe—to North and South America, to New Holland, to the Cape of Good Hope, to the East and West Indies, and the countless isles which, in either hemisphere, are visited by the British flag, then indeed does that teacher become himself an instrument of good or evil, to an extent which it is fearful to contemplate.

He who gives instruction to a clinical class in Berlin, Stockholm, Vienna or Paris, has much to answer for, if he discharge not his duties with zeal and diligence. Yet if he fails to make his pupils good practitioners, their errors, however deplorable, are circumscribed within comparatively narrow bounds, and are limited, in a great degree, to their own countrymen. But the British teacher sits in the centre of a circle far wider than Sweden or Prussia, Austria or France; his pupils are to be met with practising in every climate, exercising their art in almost every habitable region of the globe, and dispensing the blessings of health to all races of mankind :—to the hardy white settlers of Canada, the aboriginal red-skins of North America, the Negroes of Jamaica, the Hottentots and Caffres of Africa, and the countless tribes of Hindoostan.

In truth, the British teacher of practical medicine exercises an influence without parallel in importance and extent, and his opportunities of benefiting or injuring his fellow-men are incalculably great. If he neglect his duty, if he teach erroneously, his negligence and his errors in practice are multiplied indefinitely, by means of those whom he ought to have better instructed; the scene of his guilt—for it deserves no better name—becomes fearfully enlarged, for there is no country so remote that it may not contribute victims to the incapacity of his pupils. But if, on the contrary, he works with zeal and diligence; if he labours conscientiously and perseveringly in performing the important task he has undertaken, a compensation awaits him, to which scarcely any member of any profession can attain. Can any reward exceed in value the reflection that he has assisted, materially assisted, in imparting practical knowledge to multitudes of enterprising young men, who, year after year, leave our hospitals to engage in the sacred duties of the medical profession, throughout the world? Is it not a high privilege to be enabled to combat death, and conquer disease, as it were by proxy, in so many different localities? Can man enjoy a purer, prouder, more gratifying reflection? When I hear that a favourite pupil, who acquired a solid stock of practical knowledge in our hospital, has settled in any particular town or district, I cannot help feeling, on the part of my colleagues and myself, that we have been the humble means of conferring a blessing on the people entrusted to his care; and I cannot refrain from congratulating myself upon holding a situation which multiplies a thousand-fold our efforts to be useful, and enables us to stretch forth our hands to heal men of all nations and all languages. The hero and the despot may extend a sovereignty over distant regions—may exert an unlimited control over millions of vassals—may dispense honours and rewards, or inflict punishment and death: they may, like Alexander, grieve at the narrow limits of a conquered world, and sigh for other scenes of glory, but they cannot chase away pain; they cannot bid the burning thirst to cease, or give back repose to the sleepless; they cannot impart feeling or motion to the paralysed, or sight to the blind; and above all, they cannot imitate that almost godlike function of the healing art, by which man is enabled to recall to his fellow-man reason long banished, and restore to society the hapless victim of insanity.

INDEX.

D.

E.

F.

G.

H.

I.

L.

W.

Y.

PRINTED BY HARRISON AND SONS, ST. MARTIN'S LANE, W.C.

London, New Burlington Street,
May, 1863.

MESSRS. CHURCHILL & SONS'

Publications,

IN

MEDICINE AND OTHER BRANCHES

OF

NATURAL SCIENCE.

"It would be unjust to conclude this notice without saying a few words in favour of Mr. Churchill, from whom the profession is receiving, it may be truly said, the most beautiful series of Illustrated Medical Works which has ever been published."—*Lancet.*

"All the publications of Mr. Churchill are prepared with so much taste and neatness, that it is superfluous to speak of them in terms of commendation."—*Edinburgh Medical and Surgical Journal.*

"No one is more distinguished for the elegance and *recherché* style of his publications than Mr. Churchill."—*Provincial Medical Journal.*

"Mr. Churchill's publications are very handsomely got up: the engravings are remarkably well executed."—*Dublin Medical Press.*

"The typography, illustrations, and getting up are, in all Mr. Churchill's publications, most beautiful."—*Monthly Journal of Medical Science.*

"Mr. Churchill's illustrated works are among the best that emanate from the Medical Press."—*Medical Times.*

"We have before called the attention of both students and practitioners to the great advantage which Mr. Churchill has conferred on the profession, in the issue, at such a moderate cost, of works so highly creditable in point of artistic execution and scientific merit."—*Dublin Quarterly Journal.*

A CLASSIFIED INDEX

TO

MESSRS. CHURCHILL & SONS' CATALOGUE.

CLASSIFIED INDEX.

MICROSCOPE.

MISCELLANEOUS.

NERVOUS DISEASES AND INDIGESTION.

OBSTETRICS.

OPHTHALMOLOGY.

OPHTHALMOLOGY—contd.

PHYSIOLOGY.

PSYCHOLOGY.

PULMONARY and CHEST DISEASES, &c.

RENAL and URINARY DISEASES.

SCIENCE.

SURGERY.

DR. ARLIDGE.

ON THE STATE OF LUNACY AND THE LEGAL PROVISION

FOR THE INSANE; with Observations on the Construction and Organisation of Asylums. 8vo. cloth, 7*s.*

DR. ALEXANDER ARMSTRONG, R.N.

OBSERVATIONS ON NAVAL HYGIENE AND SCURVY.

More particularly as the latter appeared during a Polar Voyage. 8vo. cloth, 5*s.*

MR. T. J. ASHTON.

I.

ON THE DISEASES, INJURIES, AND MALFORMATIONS

OF THE RECTUM AND ANUS. Third Edition. 8vo. cloth, 8*s.*

II.

PROLAPSUS, FISTULA IN ANO, AND HÆMORRHOIDAL

AFFECTIONS; their Pathology and Treatment. Post 8vo. cloth, 2*s.* 6*d.*

MR. THOS. J. AUSTIN, M.R.C.S. ENG.

A PRACTICAL ACCOUNT OF GENERAL PARALYSIS:

Its Mental and Physical Symptoms, Statistics, Causes, Seat, and Treatment. 8vo. cloth, 6*s.*

DR. THOMAS BALLARD, M.D.

A NEW AND RATIONAL EXPLANATION OF THE DIS-

EASES PECULIAR TO INFANTS AND MOTHERS; with obvious Suggestions for their Prevention and Cure. Post 8vo. cloth, 4*s.* 6*d.*

DR. BARCLAY.

A MANUAL OF MEDICAL DIAGNOSIS.

Second Edition. Foolscap 8vo. cloth, 8*s.* 6*d.*

DR. W. G. BARKER.

ON THE CLIMATE OF WORTHING:

its Remedial Influence in Disease, especially of the Lungs. Crown 8vo. cloth, 3*s.*

DR. BARLOW.

A MANUAL OF THE PRACTICE OF MEDICINE.

Second Edition. Fcap. 8vo. cloth, 12*s.* 6*d.*

DR. BARNES.

THE PHYSIOLOGY AND TREATMENT OF PLACENTA

PRÆVIA; being the Lettsomian Lectures on Midwifery for 1857. Post 8vo. cloth, 6*s.*

MR. BARWELL, F.R.C.S.

A TREATISE ON DISEASES OF THE JOINTS.

With Engravings. 8vo. cloth, 12*s.*

DR. BASCOME.

A HISTORY OF EPIDEMIC PESTILENCES, FROM THE

EARLIEST AGES. 8vo. cloth, 8*s.*

DR. BASHAM.

ON DROPSY, CONNECTED WITH DISEASE OF THE

KIDNEYS (MORBUS BRIGHTII), and on some other Diseases of those Organs, associated with Albuminous and Purulent Urine. Illustrated by numerous Drawings from the Microscope. Second Edition. 8vo. cloth, 9*s.*

MR. H. F. BAXTER, M.R.C.S.L.

ON ORGANIC POLARITY; showing a Connexion to exist between Organic Forces and Ordinary Polar Forces. Crown 8vo. cloth, 5*s.*

MR. BATEMAN.

MAGNACOPIA: A Practical Library of Profitable Knowledge, communicating the general Minutiæ of Chemical and Pharmaceutic Routine, together with the generality of Secret Forms of Preparations. Third Edition. 18mo. 6*s.*

MR. LIONEL J. BEALE, M.R.C.S.

I.

THE LAWS OF HEALTH IN THEIR RELATIONS TO MIND AND BODY. A Series of Letters from an Old Practitioner to a Patient. Post 8vo. cloth, 7*s.* 6*d.*

II.

HEALTH AND DISEASE, IN CONNECTION WITH THE GENERAL PRINCIPLES OF HYGIENE. Fcap. 8vo., 2*s.* 6*d.*

DR. BEALE, F.R.S.

I.

ON URINE, URINARY DEPOSITS, AND CALCULI: their Microscopical and Chemical Examination; the Anatomy of the Kidney, and General Remarks on the Treatment of certain Urinary Diseases. Numerous Engravings. Post 8vo. cloth, 8*s.* 6*d.*

II.

HOW TO WORK WITH THE MICROSCOPE. Illustrated Edition. Crown 8vo. cloth, 5*s.* 6*d.*

III.

THE MICROSCOPE, IN ITS APPLICATION TO PRACTICAL MEDICINE. With a Coloured Plate, and 270 Woodcuts. Second Edition. 8vo. cloth, 14*s.*

IV.

ON THE ANATOMY OF THE LIVER. Illustrated with 66 Photographs of the Author's Drawings. 8vo. cloth, 6*s.* 6*d.*

V.

ILLUSTRATIONS OF THE SALTS OF URINE, URINARY DEPOSITS, and CALCULI. 37 Plates, containing upwards of 170 Figures copied from Nature, with descriptive Letterpress. 8vo. cloth, 9*s.* 6*d.*

MR. BEASLEY.

I.

THE BOOK OF PRESCRIPTIONS; containing 3000 Prescriptions. Collected from the Practice of the most eminent Physicians and Surgeons, English and Foreign. Second Edition. 18mo. cloth, 6*s.*

II.

THE DRUGGIST'S GENERAL RECEIPT-BOOK: comprising a copious Veterinary Formulary and Table of Veterinary Materia Medica; Patent and Proprietary Medicines, Druggists' Nostrums, &c.; Perfumery, Skin Cosmetics, Hair Cosmetics, and Teeth Cosmetics; Beverages, Dietetic Articles, and Condiments; Trade Chemicals, Miscellaneous Preparations and Compounds used in the Arts, &c.; with useful Memoranda and Tables. Fifth Edition. 18mo. cloth, 6*s.*

III.

THE POCKET FORMULARY AND SYNOPSIS OF THE BRITISH AND FOREIGN PHARMACOPŒIAS; comprising standard and approved Formulæ for the Preparations and Compounds employed in Medical Practice. Seventh Edition, corrected and enlarged. 18mo. cloth, 6*s.*

DR. HENRY BENNET.

I.

A PRACTICAL TREATISE ON INFLAMMATION AND OTHER DISEASES OF THE UTERUS. Fourth Edition, revised, with Additions. 8vo. cloth, 16*s.*

II.

A REVIEW OF THE PRESENT STATE OF UTERINE PATHOLOGY. 8vo. cloth, 4*s.*

III.

NUTRITION IN HEALTH AND DISEASE. Post 8vo. cloth, 5*s.*

IV.

MENTONE, THE RIVIERA, CORSICA, AND BIARRITZ, AS WINTER CLIMATES. Second Edition. Post 8vo. cloth, 5*s.*

PROFESSOR BENTLEY, F.L.S.

A MANUAL OF BOTANY. With nearly 1,200 Engravings on Wood. Fcap. 8vo. cloth, 12*s.* 6*d.*

MR. HENR HEATHER BIGG.

I.

THE MECHANICAL APPLIANCES NECESSARY FOR THE TREATMENT OF DEFORMITIES.

PART I.—The Lower Limbs. Post 8vo. cloth, 4*s.*

PART II.—The Spine and Upper Extremities. Post 8vo. cloth, 4*s.* 6*d.*

II.

ARTIFICIAL LIMBS; THEIR CONSTRUCTION AND APPLICATION. With Engravings on Wood. 8vo. cloth, 3*s.*

DR. BILLING, F.R.S.

ON DISEASES OF THE LUNGS AND HEART. 8vo. cloth, 6*s.*

DR. S. B. BIRCH, M.D.

CONSTIPATED BOWELS: the Various Causes and the Rational Means of Cure. Post 8vo. cloth, 2*s.* 6*d.*

DR. GOLDING BIRD, F.R.S.

I.

URINARY DEPOSITS; THEIR DIAGNOSIS, PATHOLOGY, AND THERAPEUTICAL INDICATIONS. With Engravings. Fifth Edition. Edited by E. LLOYD BIRKETT, M.D. Post 8vo. cloth, 10*s.* 6*d.*

II.

ELEMENTS OF NATURAL PHILOSOPHY; being an Experimental Introduction to the Study of the Physical Sciences. With numerous Engravings. Fifth Edition. Edited by CHARLES BROOKE, M.B. Cantab., F.R.S. Fcap. 8vo. cloth, 12*s.* 6*d.*

MR. BISHOP, F.R.S.

I.

ON DEFORMITIES OF THE HUMAN BODY, their Pathology and Treatment. With Engravings on Wood. 8vo. cloth, 10*s.*

II.

ON ARTICULATE SOUNDS, AND ON THE CAUSES AND CURE OF IMPEDIMENTS OF SPEECH. 8vo. cloth, 4*s.*

MR. P. HINCKES BIRD, F.R.C.S.

PRACTICAL TREATISE ON THE DISEASES OF CHILDREN AND INFANTS AT THE BREAST. Translated from the French of M. BOUCHUT, with Notes and Additions. 8vo. cloth. 20*s.*

MR. ROBERT HOWARTH BLAKE, M.R.C.S.L.

A PRACTICAL TREATISE ON DISEASES OF THE SKIN IN CHILDREN. From the French of CAILLAULT. With Notes. Post 8vo. cloth, 8*s.* 6*d.*

DR. BLAKISTON, F.R.S.

PRACTICAL OBSERVATIONS ON CERTAIN DISEASES OF THE CHEST; and on the Principles of Auscultation. 8vo. cloth, 12*s.*

MR. JOHN E. BOWMAN, & MR. C. L. BLOXAM.

I.

PRACTICAL CHEMISTRY, including Analysis. With numerous Illustrations on Wood. Fourth Edition. Foolscap 8vo. cloth, 6*s.* 6*d.*

II.

MEDICAL CHEMISTRY; with Illustrations on Wood. Fourth Edition, carefully evised. Fcap. 8vo. cloth, 6*s.* 6*d.*

DR. JAMES BRIGHT.

ON DISEASES OF THE HEART, LUNGS, & AIR PASSAGES; with a Review of the several Climates recommended in these Affections. Third Edition. Post 8vo. cloth, 9*s.*

DR. BRINTON.

I.

THE DISEASES OF THE STOMACH, with an Introduction on its Anatomy and Physiology; being Lectures delivered at St. Thomas's Hospital. Post 8vo. cloth, 10*s.* 6*d.*

II.

THE SYMPTOMS, PATHOLOGY, AND TREATMENT OF ULCER OF THE STOMACH. Post 8vo. cloth, 5*s.*

MR. BERNARD E. BRODHURST, F.R.C.S.

I.

ON LATERAL CURVATURE OF THE SPINE: its Pathology and Treatment. Post 8vo. cloth, with Plates, 3*s.*

II.

ON THE NATURE AND TREATMENT OF CLUBFOOT AND ANALOGOUS DISTORTIONS involving the TIBIO-TARSAL ARTICULATION. With Engravings on Wood. 8vo. cloth; 4*s.* 6*d.*

III.

PRACTICAL OBSERVATIONS ON THE DISEASES OF THE JOINTS INVOLVING ANCHYLOSIS, and on the TREATMENT for the RESTORATION of MOTION. Third Edition, much enlarged, 8vo. cloth, 4*s.* 6*d.*

MR. THOMAS BRYANT, F.R.C.S.

ON THE DISEASES AND INJURIES OF THE JOINTS. CLINICAL AND PATHOLOGICAL OBSERVATIONS. Post 8vo. cloth, 7*s.* 6*d.*

DR. BRYCE.

ENGLAND AND FRANCE BEFORE SEBASTOPOL, looked at from a Medical Point of View. 8vo. cloth, 6*s.*

DR. BUDD, F.R.S.

I.

ON DISEASES OF THE LIVER.

Illustrated with Coloured Plates and Engravings on Wood. Third Edition. 8vo. cloth, 16*s.*

II.

ON THE ORGANIC DISEASES AND FUNCTIONAL DISORDERS OF THE STOMACH. 8vo. cloth, 9*s.*

DR. JOHN CHARLES BUCKNILL, & DR. DANIEL H. TUKE.

A MANUAL OF PSYCHOLOGICAL MEDICINE: containing the History, Nosology, Description, Statistics, Diagnosis, Pathology, and Treatment of Insanity. Second Edition. 8vo. cloth, 15*s.*

MR. CALLENDER, F.R.C.S.

FEMORAL RUPTURE: Anatomy of the Parts concerned. With Plates. 8vo. cloth, 4*s.*

DR. JOHN M. CAMPLIN, F.L.S.

ON DIABETES, AND ITS SUCCESSFUL TREATMENT. Second Edition. Fcap. 8vo. cloth, 3*s.* 6*d.*

MR. ROBERT B. CARTER, M.R.C.S.

I.

ON THE INFLUENCE OF EDUCATION AND TRAINING IN PREVENTING DISEASES OF THE NERVOUS SYSTEM. Fcap. 8vo., 6*s.*

II.

THE PATHOLOGY AND TREATMENT OF HYSTERIA. Post 8vo. cloth, 4*s.* 6*d.*

DR. CARPENTER, F.R.S.

I.

PRINCIPLES OF HUMAN PHYSIOLOGY. With numerous Illustrations on Steel and Wood. Fifth Edition. 8vo. cloth, 26*s.*

II.

PRINCIPLES OF COMPARATIVE PHYSIOLOGY. Illustrated with 300 Engravings on Wood. Fourth Edition. 8vo. cloth, 24*s.*

III.

A MANUAL OF PHYSIOLOGY. With numerous Illustrations on Steel and Wood. Third Edition. Fcap. 8vo. cloth, 12*s.* 6*d.*

IV.

THE MICROSCOPE AND ITS REVELATIONS. With numerous Engravings on Steel and Wood. Third Edition. Fcap. 8vo. cloth, 12*s.* 6*d.*

DR. CHAMBERS.

I.

THE RENEWAL OF LIFE. Clinical Lectures illustrative of a Restorative System of Medicine. Second Edition. Post 8vo. cloth, 6*s.* 6*d.*

II.

DIGESTION AND ITS DERANGEMENTS. Post 8vo. cloth, 10*s.* 6*d.*

DR. CHANCE, M.B.

VIRCHOW'S CELLULAR PATHOLOGY, AS BASED UPON PHYSIOLOGICAL AND PATHOLOGICAL HISTOLOGY. With 144 Engravings on Wood. 8vo. cloth, 16*s.*

MR. H. T. CHAPMAN, F.R.C.S.

I.

THE TREATMENT OF OBSTINATE ULCERS AND CUTANEOUS ERUPTIONS OF THE LEG WITHOUT CONFINEMENT. Third Edition. Post 8vo. cloth, 3*s*. 6*d*.

II.

VARICOSE VEINS: their Nature, Consequences, and Treatment, Palliative and Curative. Post 8vo. cloth, 3*s*. 6*d*.

MR. PYE HENRY CHAVASSE, F.R.C.S.

I.

ADVICE TO A MOTHER ON THE MANAGEMENT OF HER OFFSPRING. Sixth Edition. Foolscap 8vo., 2*s*. 6*d*.

II.

ADVICE TO A WIFE ON THE MANAGEMENT OF HER OWN HEALTH. With an Introductory Chapter, especially addressed to a Young Wife. Fifth Edition. Fcap. 8vo., 2*s*. 6*d*.

MR. JOHN CLAY, M.R.C.S.

KIWISCH ON DISEASES OF THE OVARIES: Translated, by permission, from the last German Edition of his Clinical Lectures on the Special Pathology and Treatment of the Diseases of Women. With Notes, and an Appendix on the Operation of Ovariotomy. Royal 12mo. cloth, 16*s*.

DR. CONOLLY.

THE CONSTRUCTION AND GOVERNMENT OF LUNATIC ASYLUMS AND HOSPITALS FOR THE INSANE. With Plans. Post 8vo. cloth, 6*s*.

MR. COOLEY.

COMPREHENSIVE SUPPLEMENT TO THE PHARMACOPŒIAS.

THE CYCLOPÆDIA OF PRACTICAL RECEIPTS, AND COLLATERAL INFORMATION IN THE ARTS, PROFESSIONS, MANUFACTURES, AND TRADES, INCLUDING MEDICINE, PHARMACY, AND DOMESTIC ECONOMY; designed as a Compendious Book of Reference for the Manufacturer, Tradesman, Amateur, and Heads of Families. Third and greatly enlarged Edition, 8vo. cloth, 26*s*.

SIR ASTLEY COOPER, BART., F.R.S.

ON THE STRUCTURE AND DISEASES OF THE TESTIS. With 24 Plates. Second Edition. Royal 4to., 20*s*.

MR. W. WHITE COOPER.

I.

ON WOUNDS AND INJURIES OF THE EYE. Illustrated by 17 Coloured Figures and 41 Woodcuts. 8vo. cloth, 12*s*.

II.

ON NEAR SIGHT, AGED SIGHT, IMPAIRED VISION, AND THE MEANS OF ASSISTING SIGHT. With 31 Illustrations on Wood. Second Edition. Fcap. 8vo. cloth, 7*s*. 6*d*.

MR. COOPER.

A DICTIONARY OF PRACTICAL SURGERY AND ENCYCLOPÆDIA OF SURGICAL SCIENCE. New Edition, brought down to the present time. By SAMUEL A. LANE, F.R.C.S., assisted by various eminent Surgeons. Vol. I., 8vo. cloth, £1. 5*s*.

MR. HOLMES COOTE, F.R.C.S.

A REPORT ON SOME IMPORTANT POINTS IN THE TREATMENT OF SYPHILIS. 8vo. cloth, 5*s*.

DR. COTTON.

I.

ON CONSUMPTION: Its Nature, Symptoms, and Treatment. To which Essay was awarded the Fothergillian Gold Medal of the Medical Society of London. Second Edition. 8vo. cloth, 8*s*.

II.

PHTHISIS AND THE STETHOSCOPE; OR, THE PHYSICAL SIGNS OF CONSUMPTION. Second Edition. Foolscap 8vo. cloth, 3*s*.

MR. COULSON.

I.

ON DISEASES OF THE BLADDER AND PROSTATE GLAND. The Fifth Edition, revised and enlarged. 8vo. cloth, 10*s*. 6*d*.

II.

ON LITHOTRITY AND LITHOTOMY; with Engravings on Wood. 8vo. cloth, 8*s*.

MR. WILLIAM CRAIG, L.F.P.S., GLASGOW.

ON THE INFLUENCE OF VARIATIONS OF ELECTRIC TENSION AS THE REMOTE CAUSE OF EPIDEMIC AND OTHER DISEASES. 8vo. cloth, 10*s*.

MR. CURLING, F.R.S.

I.

OBSERVATIONS ON DISEASES OF THE RECTUM. Third Edition. 8vo. cloth, 7*s*. 6*d*.

II.

A PRACTICAL TREATISE ON DISEASES OF THE TESTIS, SPERMATIC CORD, AND SCROTUM. Second Edition, with Additions. 8vo. cloth, 14*s*.

DR. DALRYMPLE, M.D. LOND., F.R.C.S.

THE CLIMATE OF EGYPT: METEOROLOGICAL AND MEDICAL OBSERVATIONS, with Practical Hints for Invalid Travellers. Post 8vo. cloth, 4*s*.

MR. JOHN DALRYMPLE, F.R.S., F.R.C.S.

PATHOLOGY OF THE HUMAN EYE. Complete in Nine Fasciculi: imperial 4to., 20*s*. each; half-bound morocco, gilt tops, 9*l*. 15*s*.

DR. DAVEY.

I.

THE GANGLIONIC NERVOUS SYSTEM: its Structure, Functions, and Diseases. 8vo. cloth, 9*s*.

II.

ON THE NATURE AND PROXIMATE CAUSE OF INSANITY. Post 8vo. cloth, 3*s*.

DR. HERBERT DAVIES.

ON THE PHYSICAL DIAGNOSIS OF DISEASES OF THE LUNGS AND HEART. Second Edition. Post 8vo. cloth, 8*s.*

DR. HALL DAVIS.

ILLUSTRATIONS OF DIFFICULT PARTURITION. Post 8vo. cloth, 6*s.* 6*d.*

MR. DIXON.

A GUIDE TO THE PRACTICAL STUDY OF DISEASES OF THE EYE. Second Edition. Post 8vo. cloth, 9*s.*

DR. DOBELL.

I.

DEMONSTRATIONS OF DISEASES IN THE CHEST, AND THEIR PHYSICAL DIAGNOSIS. With Coloured Plates. 8vo. cloth, 12*s.* 6*d.*

II.

LECTURES ON THE GERMS AND VESTIGES OF DISEASE, and on the Prevention of the Invasion and Fatality of Disease by Periodical Examinations. 8vo. cloth, 6*s.* 6*d.*

DR. TOOGOOD DOWNING.

NEURALGIA: its various Forms, Pathology, and Treatment. THE JACKSONIAN PRIZE ESSAY FOR 1850. 8vo. cloth, 10*s.* 6*d.*

DR. DRUITT, F.R.C.S.

THE SURGEON'S VADE-MECUM; with numerous Engravings on Wood. Eighth Edition. Foolscap 8vo. cloth, 12*s.* 6*d.*

MR. DUNN, F.R.C.S.

AN ESSAY ON PHYSIOLOGICAL PSYCHOLOGY. 8vo. cloth, 4*s.*

SIR JAMES EYRE, M.D.

I.

THE STOMACH AND ITS DIFFICULTIES. Fifth Edition. Fcap. 8vo. cloth, 2*s.* 6*d.*

II.

PRACTICAL REMARKS ON SOME EXHAUSTING DISEASES. Second Edition. Post 8vo. cloth, 4*s.* 6*d.*

DR. FENWICK.

ON SCROFULA AND CONSUMPTION. Clergyman's Sore Throat, Catarrh, Croup, Bronchitis, Asthma. Fcap. 8vo., 2*s.* 6*d.*

MR. FERGUSSON, F.R.S.

A SYSTEM OF PRACTICAL SURGERY; with numerous Illustrations on Wood. Fourth Edition. Fcap. 8vo. cloth, 12*s.* 6*d.*

MR. FLOWER, F.R.C.S.

DIAGRAMS OF THE NERVES OF THE HUMAN BODY, exhibiting their Origin, Divisions, and Connexions, with their Distribution to the various Regions of the Cutaneous Surface, and to all the Muscles. Folio, containing Six Plates, 14*s.*

DR. GIBB, M.R.C.P.

ON DISEASES OF THE THROAT, EPIGLOTTIS, AND WINDPIPE. Post 8vo. cloth, 5*s.*

MRS. GODFREY.

ON THE NATURE, PREVENTION, TREATMENT, AND CURE OF SPINAL CURVATURES and DEFORMITIES of the CHEST and LIMBS, without ARTIFICIAL SUPPORTS or any MECHANICAL APPLIANCES. Third Edition, Revised and Enlarged. 8vo. cloth, 5*s.*

DR. GORDON, M.D., C.B.

CHINA, FROM A MEDICAL POINT OF VIEW, IN 1860 AND 1861; With a Chapter on Nagasaki as a Sanatarium. With Plans. 8vo. cloth, 10*s.* 6*d.*

DR. GRANVILLE, F.R.S.

I.

THE MINERAL SPRINGS OF VICHY: their Efficacy in the Treatment of Gout, Indigestion, Gravel, &c. 8vo. cloth, 5*s.*

II.

ON SUDDEN DEATH. Post 8vo., 2*s.* 6*d.*

MR. GRAY, M.R.C.S.

PRESERVATION OF THE TEETH indispensable to Comfort and Appearance, Health, and Longevity. 18mo. cloth, 3*s.*

MR. GRIFFITHS.

CHEMISTRY OF THE FOUR SEASONS—Spring, Summer, Autumn, Winter. Illustrated with Engravings on Wood. Second Edition. Foolscap 8vo. cloth, 7*s.* 6*d.*

DR. GULLY.

THE SIMPLE TREATMENT OF DISEASE; deduced from the Methods of Expectancy and Revulsion. 18mo. cloth, 4*s.*

DR. GUY.

HOOPER'S PHYSICIAN'S VADE-MECUM; OR, MANUAL OF THE PRINCIPLES AND PRACTICE OF PHYSIC. New Edition, considerably enlarged, and rewritten. Foolscap 8vo. cloth, 12*s.* 6*d.*

GUY'S HOSPITAL REPORTS. Third Series. Vols. I. to VIII., 8vo., 7*s.* 6*d.* each.

DR. HABERSHON, F.R.C.P.

I.

PATHOLOGICAL AND PRACTICAL OBSERVATIONS ON DISEASES OF THE ABDOMEN, comprising those of the Stomach and other Parts of the Alimentary Canal, Œsophagus, Stomach, Cæcum, Intestines, and Peritoneum. Second Edition, with Plates. 8vo. cloth, 14*s.*

II.

ON THE INJURIOUS EFFECTS OF MERCURY IN THE TREATMENT OF DISEASE. Post 8vo. cloth, 3*s.* 6*d.*

DR. MARSHALL HALL, F.R.S.

I.

PRONE AND POSTURAL RESPIRATION IN DROWNING AND OTHER FORMS OF APNŒA OR SUSPENDED RESPIRATION. Post 8vo. cloth. 5*s.*

II.

PRACTICAL OBSERVATIONS AND SUGGESTIONS IN MEDICINE. Second Series. Post 8vo. cloth, 8*s.* 6*d.*

DR. C. RADCLYFFE HALL.

TORQUAY IN ITS MEDICAL ASPECT AS A RESORT FOR PULMONARY INVALIDS. Post 8vo. cloth, *5s.*

MR. HARDWICH.

A MANUAL OF PHOTOGRAPHIC CHEMISTRY. Sixth Edition. Foolscap 8vo. cloth, *7s. 6d.*

MR. HARE, F.R.C.S.

PRACTICAL OBSERVATIONS ON THE PREVENTION, CAUSES, AND TREATMENT OF CURVATURES OF THE SPINE; with Engravings. Third Edition. 8vo. cloth, *6s.*

DR. J. BOWER HARRISON, M.D., M.R.C.P.

I.

LETTERS TO A YOUNG PRACTITIONER ON THE DISEASES OF CHILDREN. Foolscap 8vo. cloth, *3s.*

II.

ON THE CONTAMINATION OF WATER BY THE POISON OF LEAD, and its Effects on the Human Body. Foolscap 8vo. cloth, *3s. 6d.*

DR. HARTWIG.

I.

ON SEA BATHING AND SEA AIR. Second Edition. Fcap. 8vo., *2s. 6d.*

II.

ON THE PHYSICAL EDUCATION OF CHILDREN. Fcap. 8vo., *2s. 6d.*

DR. A. H. HASSALL.

I.

THE URINE, IN HEALTH AND DISEASE; being an Explanation of the Composition of the Urine, and of the Pathology and Treatment of Urinary and Renal Disorders. Second Edition. With 79 Engravings (23 Coloured). Post 8vo. cloth, *12s. 6d.*

II.

THE MICROSCOPIC ANATOMY OF THE HUMAN BODY, IN HEALTH AND DISEASE. Illustrated with Several Hundred Drawings in Colour. Two vols. 8vo. cloth, *£1. 10s.*

MR. ALFRED HAVILAND, M.R.C.S.

CLIMATE, WEATHER, AND DISEASE; being a Sketch of the Opinions of the most celebrated Ancient and Modern Writers with regard to the Influence of Climate and Weather in producing Disease. With Four coloured Engravings. 8vo. cloth, *7s.*

DR. HEADLAND.

ON THE ACTION OF MEDICINES IN THE SYSTEM. Being the Prize Essay to which the Medical Society of London awarded the Fothergillian Gold Medal for 1852. Third Edition. 8vo. cloth, *12s. 6d.*

DR. HEALE.

I.

A TREATISE ON THE PHYSIOLOGICAL ANATOMY OF THE LUNGS. With Engravings. 8vo. cloth, 8*s.*

II.

A TREATISE ON VITAL CAUSES. 8vo. cloth, 9*s.*

MR. CHRISTOPHER HEATH, F.R.C.S.

A MANUAL OF MINOR SURGERY AND BANDAGING, FOR THE USE OF HOUSE-SURGEONS, DRESSERS, AND JUNIOR PRACTITIONERS. With Illustrations. Second Edition. Fcap. 8vo. cloth, 5*s.*

MR. HIGGINBOTTOM, F.R.S., F.R.C.S.E.

I.

AN ESSAY ON THE USE OF THE NITRATE OF SILVER IN THE CURE OF INFLAMMATION, WOUNDS, AND ULCERS. Second Edition. Price 5*s.*

II.

ADDITIONAL OBSERVATIONS ON THE NITRATE OF SIL-VER; with full Directions for its Use as a Therapeutic Agent. 8vo., 2*s.* 6*d.*

DR. HINDS.

THE HARMONIES OF PHYSICAL SCIENCE IN RELATION TO THE HIGHER SENTIMENTS; with Observations on Medical Studies, and on the Moral and Scientific Relations of Medical Life. Post 8vo., cloth, 4*s.*

DR. DECIMUS HODGSON.

THE PROSTATE GLAND, AND ITS ENLARGEMENT IN OLD AGE. With 12 Plates. Royal 8vo., cloth, 6*s.*

MR. JABEZ HOGG.

THE OPHTHALMOSCOPE: an Essay on its value in the Exploration of Internal Eye Diseases. Second Edition. Cloth, 3*s.* 6*d.*

MR. LUTHER HOLDEN, F.R.C.S.

I.

HUMAN OSTEOLOGY: with Plates, showing the Attachments of the Muscles. Third Edition. 8vo. cloth, 16*s.*

II.

A MANUAL OF THE DISSECTION OF THE HUMAN BODY. With Engravings on Wood. Second Edition. 8vo. cloth, 16*s.*

MR. BARNARD HOLT, F.R.C.S.

ON THE IMMEDIATE TREATMENT OF STRICTURE OF THE URETHRA. 8vo. cloth, 3*s.*

MR. C. HOLTHOUSE.

I.

ON SQUINTING, PARALYTIC AFFECTIONS OF THE EYE, and CERTAIN FORMS OF IMPAIRED VISION. Fcap. 8vo. cloth, 4*s.* 6*d.*

II.

LECTURES ON STRABISMUS, delivered at the Westminster Hospital. 8vo. cloth, 4*s.*

DR. W. CHARLES HOOD.

SUGGESTIONS FOR THE FUTURE PROVISION OF CRIMINAL LUNATICS. 8vo. cloth, 5s. 6d.

MR. P. HOOD.

THE SUCCESSFUL TREATMENT OF SCARLET FEVER; also, OBSERVATIONS ON THE PATHOLOGY AND TREATMENT OF CROWING INSPIRATIONS OF INFANTS. Post 8vo. cloth, 5s.

MR. JOHN HORSLEY.

A CATECHISM OF CHEMICAL PHILOSOPHY; being a Familiar Exposition of the Principles of Chemistry and Physics. With Engravings on Wood. Designed for the Use of Schools and Private Teachers. Post 8vo. cloth, 6s. 6d.

DR. HUFELAND.

THE ART OF PROLONGING LIFE. Second Edition. Edited by ERASMUS WILSON, F.R.S. Foolscap 8vo., 2s. 6d.

MR. W. CURTIS HUGMAN, F.R.C.S.

ON HIP-JOINT DISEASE; with reference especially to Treatment by Mechanical Means for the Relief of Contraction and Deformity of the Affected Limb. 8vo. cloth, 3s. 6d.

MR. HULKE, F.R.C.S.

A PRACTICAL TREATISE ON THE USE OF THE OPHTHALMOSCOPE. Being the Jacksonian Prize Essay for 1859. Royal 8vo. cloth, 8s.

DR. HENRY HUNT.

ON HEARTBURN AND INDIGESTION. 8vo. cloth, 5s.

MR. JONATHAN HUTCHINSON, F.R.C.S.

A CLINICAL MEMOIR ON CERTAIN DISEASES OF THE EYE AND EAR, CONSEQUENT ON INHERITED SYPHILIS; with an appended Chapter of Commentaries on the Transmission of Syphilis from Parent to Offspring, and its more remote Consequences. With Plates and Woodcuts, 8vo. cloth, 9s.

DR. INMAN, M.R.C.P.

I.

ON MYALGIA: ITS NATURE, CAUSES, AND TREATMENT; being a Treatise on Painful and other Affections of the Muscular System. Second Edition. 8vo. cloth, 9s.

II.

FOUNDATION FOR A NEW THEORY AND PRACTICE OF MEDICINE. Second Edition. Crown 8vo. cloth, 10s.

DR. ARTHUR JACOB, F.R.C.S.

A TREATISE ON THE INFLAMMATIONS OF THE EYE-BALL. Foolscap 8vo. cloth, 5s.

MR. J. H. JAMES, F.R.C.S.

PRACTICAL OBSERVATIONS ON THE OPERATIONS FOR STRANGULATED HERNIA. 8vo. cloth, 5s.

DR. PROSSER JAMES, M.D.

SORE-THROAT: ITS NATURE, VARIETIES, AND TREATMENT; including the Use of the LARYNGOSCOPE as an Aid to Diagnosis. Post 8vo. cloth, 4*s*. 6*d*.

DR. BENCE JONES, F.R.S.

I.

MULDER ON WINE. Foolscap 8vo. cloth, 6*s*.

II.

ON ANIMAL CHEMISTRY, in its relation to STOMACH and RENAL DISEASES. 8vo. cloth, 6*s*.

DR. HANDFIELD JONES, F.R.S., & DR. EDWARD H. SIEVEKING.

A MANUAL OF PATHOLOGICAL ANATOMY. Illustrated with numerous Engravings on Wood. Foolscap 8vo. cloth, 12*s*. 6*d*.

DR. JAMES JONES, M.D., M.R.C.P.

ON THE USE OF PERCHLORIDE OF IRON AND OTHER CHALYBEATE SALTS IN THE TREATMENT OF CONSUMPTION. Crown 8vo. cloth, 3*s*. 6*d*.

MR. WHARTON JONES, F.R.S.

I.

A MANUAL OF THE PRINCIPLES AND PRACTICE OF OPHTHALMIC MEDICINE AND SURGERY; illustrated with Engravings, plain and coloured. Second Edition. Foolscap 8vo. cloth, 12*s*. 6*d*.

II.

THE WISDOM AND BENEFICENCE OF THE ALMIGHTY, AS DISPLAYED IN THE SENSE OF VISION; being the Actonian Prize Essay for 1851. With Illustrations on Steel and Wood. Foolscap 8vo. cloth, 4*s*. 6*d*.

III.

DEFECTS OF SIGHT: their Nature, Causes, Prevention, and General Management. Fcap. 8vo. 2*s*. 6*d*.

IV.

A CATECHISM OF THE MEDICINE AND SURGERY OF THE EYE AND EAR. For the Clinical Use of Hospital Students. Fcap. 8vo. 2*s*. 6*d*.

V.

A CATECHISM OF THE PHYSIOLOGY AND PHILOSOPHY OF BODY, SENSE, AND MIND. For Use in Schools and Colleges. Fcap. 8vo., 2*s*. 6*d*.

MR. FURNEAUX JORDAN, M.R.C.S.

AN INTRODUCTION TO CLINICAL SURGERY; WITH A Method of Investigating and Reporting Surgical Cases. Fcap. 8vo. cloth, 5*s*.

MR. JUDD.

A PRACTICAL TREATISE ON URETHRITIS AND SYPHILIS: including Observations on the Power of the Menstruous Fluid, and of the Discharge from Leucorrhœa and Sores to produce Urethritis: with a variety of Examples, Experiments, Remedies, and Cures. 8vo. cloth, £1. 5*s*.

DR. LAENNEC.

A MANUAL OF AUSCULTATION AND PERCUSSION. Translated and Edited by J. B. Sharpe, M.R.C.S. 3*s*.

DR. LANE, M.A.

HYDROPATHY; OR, HYGIENIC MEDICINE. An Explanatory Essay. Second Edition. Post 8vo. cloth, 5*s*.

MR. LAWRENCE, F.R.S.

I.

LECTURES ON SURGERY. 8vo. cloth, 16*s*.

II.

A TREATISE ON RUPTURES. The Fifth Edition, considerably enlarged. 8vo. cloth, 16*s*.

DR. LEARED, M.R.C.P.

IMPERFECT DIGESTION: ITS CAUSES AND TREATMENT. Second Edition. Foolscap 8vo. cloth, 3*s*. 6*d*.

DR. EDWIN LEE.

I.

THE EFFECT OF CLIMATE ON TUBERCULOUS DISEASE, with Notices of the chief Foreign Places of Winter Resort. Small 8vo. cloth, 4*s*. 6*d*.

II.

THE WATERING PLACES OF ENGLAND, CONSIDERED with Reference to their Medical Topography. Fourth Edition. Foolscap 8vo. cloth, 7*s*. 6*d*.

III.

THE BATHS OF RHENISH GERMANY. Post 8vo. cloth, 3*s*.

IV.

HOMŒOPATHY AND HYDROPATHY IMPARTIALLY APPRECIATED. With Notes illustrative of the Influence of the Mind over the Body. Fourth Edition. Post 8vo. cloth, 3*s*. 6*d*.

MR. HENRY LEE, F.R.C.S.

ON SYPHILIS. Second Edition. With Coloured Plates. 8vo. cloth, 10*s*.

DR. ROBERT LEE, F.R.S.

I.

A TREATISE ON THE SPECULUM; with Three Hundred Cases. 8vo. cloth, 4*s*. 6*d*.

II.

CLINICAL REPORTS OF OVARIAN AND UTERINE DISEASES, with Commentaries. Foolscap 8vo. cloth, 6*s*. 6*d*.

III.

CLINICAL MIDWIFERY: comprising the Histories of 545 Cases of Difficult, Preternatural, and Complicated Labour, with Commentaries. Second Edition. Foolscap 8vo. cloth, 5*s*.

IV.

PRACTICAL OBSERVATIONS ON DISEASES OF THE UTERUS. With coloured Plates. Two Parts. Imperial 4to., 7*s*. 6*d*. each Part.

MR. LISTON, F.R.S.

PRACTICAL SURGERY. Fourth Edition. 8vo. cloth, 22*s.*

MR. H. W. LOBB, L.S.A., M.R.C.S.E.

ON SOME OF THE MORE OBSCURE FORMS OF NERVOUS AFFECTIONS, THEIR PATHOLOGY AND TREATMENT. With an Introduction on the Physiology of Digestion and Assimilation, and the Generation and Distribution of Nerve Force. Based upon Original Microscopical Observations. With Engravings. 8vo. cloth, 10*s.* 6*d.*

LONDON MEDICAL SOCIETY OF OBSERVATION.

WHAT TO OBSERVE AT THE BED-SIDE, AND AFTER DEATH. Published by Authority. Second Edition. Foolscap 8vo. cloth, 4*s.* 6*d.*

DR. MACKENZIE, M.D., M.R.C.P.

THE PATHOLOGY AND TREATMENT OF PHLEGMASIA DOLENS, as deduced from Clinical and Physiological Researches. Being the Lettsomian Lectures on Midwifery, delivered before the Medical Society of London during the Session 1861-62. 8vo. cloth, 6*s.*

MR. M'CLELLAND, F.L.S., F.G.S.

SKETCH OF THE MEDICAL TOPOGRAPHY, OR CLIMATE AND SOILS, OF BENGAL AND THE N. W. PROVINCES. Post 8vo. cloth, 4*s.* 6*d.*

DR. GEORGE H. B. MACLEOD, F.R.C.S. (EDIN.)

NOTES ON THE SURGERY OF THE CRIMEAN WAR; with REMARKS on GUN-SHOT WOUNDS. 8vo. cloth, 10*s.* 6*d.*

MR. JOSEPH MACLISE, F.R.C.S.

I.

SURGICAL ANATOMY. A Series of Dissections, illustrating the Principal Regions of the Human Body.

The Second Edition, imperial folio, cloth, £3. 12*s.*; half-morocco, £4. 4*s.*

II.

ON DISLOCATIONS AND FRACTURES. This Work is Uniform with the Author's "Surgical Anatomy;" each Fasciculus contains Four beautifully executed Lithographic Drawings. Imperial folio, cloth, £2. 10*s.*; half-morocco, £2. 17*s.*

DR. MC NICOLL, M.R.C.P.

A HAND-BOOK FOR SOUTHPORT, MEDICAL & GENERAL; with Copious Notices of the Natural History of the District. Second Edition. Post 8vo. cloth, 3*s.* 6*d.*

DR. MARCET, F.R.S.

I.

ON THE COMPOSITION OF FOOD, AND HOW IT IS ADULTERATED; with Practical Directions for its Analysis. 8vo. cloth, 6*s.* 6*d.*

II.

ON CHRONIC ALCOHOLIC INTOXICATION; with an INQUIRY INTO THE INFLUENCE OF THE ABUSE OF ALCOHOL AS A PREDISPOSING CAUSE OF DISEASE. Second Edition, much enlarged. Foolscap 8vo. cloth, 4*s.* 6*d.*

DR. MARKHAM.

I.

DISEASES OF THE HEART: THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT. Second Edition. Post 8vo. cloth, 6*s.*

II.

SKODA ON AUSCULTATION AND PERCUSSION. Post 8vo. cloth, 6*s.*

SIR RANALD MARTIN, K.C.B., F.R.S.

INFLUENCE OF TROPICAL CLIMATES IN PRODUCING THE ACUTE ENDEMIC DISEASES OF EUROPEANS; including Practical Observations on their Chronic Sequelæ under the Influences of the Climate of Europe. Second Edition, much enlarged. 8vo. cloth, 20*s.*

DR. MASSY.

ON THE EXAMINATION OF RECRUITS; intended for the Use of Young Medical Officers on Entering the Army. 8vo. cloth, 5*s.*

MR. C. F. MAUNDER, F.R.C.S.

OPERATIVE SURGERY. With 158 Engravings. Post 8vo. 6*s.*

DR. MAYNE.

I.

AN EXPOSITORY LEXICON OF THE TERMS, ANCIENT AND MODERN, IN MEDICAL AND GENERAL SCIENCE, including a complete MEDICAL AND MEDICO-LEGAL VOCABULARY, and presenting the correct Pronunciation, Derivation, Definition, and Explanation of the Names, Analogues, Synonymes, and Phrases (in English, Latin, Greek, French, and German,) employed in Science and connected with Medicine. Complete in 10 Parts, price 5*s.* each. The entire work, cloth, £2. 10*s.*

II.

A MEDICAL VOCABULARY; or, an Explanation of all Names, Synonymes, Terms, and Phrases used in Medicine and the relative branches of Medical Science, intended specially as a Book of Reference for the Young Student. Second Edition. Fcap. 8vo. cloth, 8*s.* 6*d.*

DR. MILLINGEN.

ON THE TREATMENT AND MANAGEMENT OF THE INSANE; with Considerations on Public and Private Lunatic Asylums. 18mo. cloth, 4*s.* 6*d.*

DR. W. J. MOORE, M.D.

I.

HEALTH IN THE TROPICS; or, Sanitary Art applied to Europeans in India. 8vo. cloth, 9*s.*

II.

A MANUAL OF THE DISEASES OF INDIA. Fcap. 8vo. cloth, 5*s.*

DR. NOBLE.

THE HUMAN MIND IN ITS RELATIONS WITH THE BRAIN AND NERVOUS SYSTEM. Post 8vo. cloth, 4*s.* 6*d.*

MR. NUNNELEY, F.R.C.S.E.

I.

ON THE ORGANS OF VISION: THEIR ANATOMY AND PHYSIOLOGY. With Plates, 8vo. cloth, 15*s.*

II.

A TREATISE ON THE NATURE, CAUSES, AND TREATMENT OF ERYSIPELAS. 8vo. cloth, 10*s.* 6*d.*

DR. O'REILLY.

THE PLACENTA, THE ORGANIC NERVOUS SYSTEM, THE BLOOD, THE OXYGEN, AND THE ANIMAL NERVOUS SYSTEM, PHYSIOLOGICALLY EXAMINED. With Engravings. 8vo. cloth, 5*s.*

MR. LANGSTON PARKER.

THE MODERN TREATMENT OF SYPHILITIC DISEASES, both Primary and Secondary; comprising the Treatment of Constitutional and Confirmed Syphilis, by a safe and successful Method. Fourth Edition, 8vo. cloth, 10*s.*

DR. PARKES, F.R.C.P.

THE URINE: ITS COMPOSITION IN HEALTH AND DISEASE, AND UNDER THE ACTION OF REMEDIES. 8vo. cloth, 12*s.*

DR. PARKIN.

THE CAUSATION AND PREVENTION OF DISEASE. 8vo. cloth, 5*s.*

MR. JAMES PART, F.R.C.S.

THE MEDICAL AND SURGICAL POCKET CASE BOOK, for the Registration of important Cases in Private Practice, and to assist the Student of Hospital Practice. Second Edition. 2*s.* 6*d.*

DR. PAVY, M.D., F.R.C.P.

RESEARCHES ON THE NATURE AND TREATMENT OF DIABETES. 8vo. cloth, 8*s.* 6*d.*

DR. THOMAS B. PEACOCK, M.D.

ON THE INFLUENZA, OR EPIDEMIC CATARRHAL FEVER OF 1847-8. 8vo. cloth, 5*s.* 6*d.*

DR. PEREIRA, F.R.S.

SELECTA E PRÆSCRIPTIS: with a Key, containing the Prescriptions in an Unabbreviated Form, and a Literal Translation. Thirteenth Edition. 24mo. cloth, 5*s.*

DR. PICKFORD.

HYGIENE; or, Health as Depending upon the Conditions of the Atmosphere, Food and Drinks, Motion and Rest, Sleep and Wakefulness, Secretions, Excretions, and Retentions, Mental Emotions, Clothing, Bathing, &c. Vol. I. 8vo. cloth, 9*s.*

MR. PIRRIE, F.R.S.E.

THE PRINCIPLES AND PRACTICE OF SURGERY. With numerous Engravings on Wood. Second Edition. 8vo. cloth, 24*s.*

PHARMACOPŒIA COLLEGII REGALIS MEDICORUM LONDINENSIS. 8vo. cloth, 9*s.*; or 24mo. 5*s.*

IMPRIMATUR.

Hic liber, cui titulus, PHARMACOPŒIA COLLEGII REGALIS MEDICORUM LONDINENSIS. Datum ex Ædibus Collegii in comitiis censoriis, Novembris Mensis 14to 1850.

JOHANNES AYRTON PARIS. *Præses.*

PROFESSORS PLATTNER & MUSPRATT.

THE USE OF THE BLOWPIPE IN THE EXAMINATION OF MINERALS, ORES, AND OTHER METALLIC COMBINATIONS. Illustrated by numerous Engravings on Wood. Third Edition. 8vo. cloth, 10*s.* 6*d.*

DR. HENRY PRATT, M.D., M.R.C.P.

I.

THE GENEALOGY OF CREATION, newly Translated from the Unpointed Hebrew Text of the Book of Genesis, showing the General Scientific Accuracy of the Cosmogony of Moses and the Philosophy of Creation. 8vo. cloth, 14*s.*

II.

ON ECCENTRIC AND CENTRIC FORCE: A New Theory of Projection. With Engravings. 8vo. cloth, 10*s.*

THE PRESCRIBER'S PHARMACOPŒIA; containing all the Medicines in the London Pharmacopœia, arranged in Classes according to their Action, with their Composition and Doses. By a Practising Physician. Fourth Edition. 32mo. cloth, 2*s.* 6*d.*; roan tuck (for the pocket), 3*s.* 6*d.*

DR. JOHN ROWLISON PRETTY.

AIDS DURING LABOUR, including the Administration of Chloroform, the Management of Placenta and Post-partum Hæmorrhage. Fcap. 8vo. cloth, 4*s.* 6*d.*

MR. LAKE PRICE.

PHOTOGRAPHIC MANIPULATION: Treating of the Practice of the Art, and its various appliances to Nature. With Fifty Engravings on Wood. Post 8vo. cloth, 6*s.* 6*d.*

MR. P. C. PRICE, F.R.C.S.E.

I.

SCROFULOUS DISEASES OF THE EXTERNAL LYMPHATIC GLANDS: their Nature, Variety, and Treatment; with Remarks on the Management of Scrofulous Ulcerations, Scars, and Cicatrices. Post 8vo. cloth, 3*s.* 6*d.*

II.

THE WINTER CLIMATE OF MENTON, WITH HINTS TO INVALIDS INTENDING TO RESIDE THERE. Fcap. 8vo. cloth, 3*s.*

DR. PRIESTLEY.

LECTURES ON THE DEVELOPMENT OF THE GRAVID UTERUS. 8vo. cloth, 5*s.* 6*d.*

DR. RADCLIFFE, F.R.C.P. LOND.

ON EPILEPTIC AND OTHER CONVULSIVE AFFECTIONS OF THE NERVOUS SYSTEM. Third Edition. Post 8vo. cloth, 7*s.* 6*d.*

MR. RAINEY.

ON THE MODE OF FORMATION OF SHELLS OF ANIMALS, OF BONE, AND OF SEVERAL OTHER STRUCTURES, by a Process of Molecular Coalescence, Demonstrable in certain Artificially-formed Products. Fcap. 8vo. cloth, 4*s.* 6*d.*

DR. F. H. RAMSBOTHAM.

THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY. Illustrated with One Hundred and Twenty Plates on Steel and Wood; forming one thick handsome volume. Fourth Edition. 8vo. cloth, 22*s.*

DR. RAMSBOTHAM.

PRACTICAL OBSERVATIONS ON MIDWIFERY, with a Selection of Cases. Second Edition. 8vo. cloth, 12*s.*

PROFESSOR REDWOOD, PH.D.

A SUPPLEMENT TO THE PHARMACOPŒIA: A concise but comprehensive Dispensatory, and Manual of Facts and Formulæ, for the use of Practitioners in Medicine and Pharmacy. Third Edition. 8vo. cloth, 22*s.*

DR. DU BOIS REYMOND.

ANIMAL ELECTRICITY; Edited by H. Bence Jones, M.D., F.R.S. With Fifty Engravings on Wood. Foolscap 8vo. cloth, 6*s.*

DR. REYNOLDS, M.D., LOND.

I.

EPILEPSY: ITS SYMPTOMS, TREATMENT, AND RELATION TO OTHER CHRONIC CONVULSIVE DISEASES. 8vo. cloth, 10*s.*

II.

THE DIAGNOSIS OF DISEASES OF THE BRAIN, SPINAL CORD, AND THEIR APPENDAGES. 8vo. cloth, 8*s.*

DR. B. W. RICHARDSON.

I.

ON THE CAUSE OF THE COAGULATION OF THE BLOOD. Being the Astley Cooper Prize Essay for 1856. With a Practical Appendix. 8vo. cloth, 16*s.*

II.

THE HYGIENIC TREATMENT OF PULMONARY CONSUMPTION. 8vo. cloth, 5*s.* 6*d.*

III.

THE ASCLEPIAD. Vol. I., Clinical Essays. 8vo. cloth, 6*s.* 6*d.*

MR. WILLIAM ROBERTS.

AN ESSAY ON WASTING PALSY; being a Systematic Treatise on the Disease hitherto described as ATROPHIE MUSCULAIRE PROGRESSIVE. With Four Plates. 8vo. cloth, 7*s.* 6*d.*

DR. W. H. ROBERTSON.

I.

THE NATURE AND TREATMENT OF GOUT.

8vo. cloth, 10*s.* 6*d.*

II.

A TREATISE ON DIET AND REGIMEN.

Fourth Edition. 2 vols. post 8vo. cloth, 12*s.*

DR. ROUTH.

INFANT FEEDING, AND ITS INFLUENCES ON LIFE;

Or, the Causes and Prevention of Infant Mortality. Fcap. 8vo. cloth, 5*s.*

DR. ROWE.

NERVOUS DISEASES, LIVER AND STOMACH COMPLAINTS, LOW SPIRITS, INDIGESTION, GOUT, ASTHMA, AND DISORDERS PRODUCED BY TROPICAL CLIMATES. With Cases. Sixteenth Edition. Fcap. 8vo. 2*s.* 6*d.*

DR. ROYLE, F.R.S., AND DR. HEADLAND, M.D.

A MANUAL OF MATERIA MEDICA AND THERAPEUTICS.

With numerous Engravings on Wood. Third Edition. Fcap. 8vo. cloth, 12*s.* 6*d.*

MR. RUMSEY, F.R.C.S.

ESSAYS ON STATE MEDICINE. 8vo. cloth, 10*s.* 6*d.*

DR. RYAN, M.D.

INFANTICIDE: ITS LAW, PREVALENCE, PREVENTION, AND HISTORY. 8vo. cloth, 5*s.*

ST. BARTHOLOMEW'S HOSPITAL:

A DESCRIPTIVE CATALOGUE OF THE ANATOMICAL MUSEUM.

Vol. I. (1846), 8vo. cloth, 5*s.*;
Vol. II. (1851), 8vo. cloth, 5*s.*;
Vol. III. (1862), 8vo. cloth, 5*s.*

DR. SALTER, F.R.S.

ON ASTHMA: its Pathology, Causes, Consequences, and Treatment. 8vo. cloth, 10*s.*

DR. SAVAGE, M.D. LOND., F.R.C.S.

ILLUSTRATIONS OF THE SURGERY OF THE FEMALE PELVIC ORGANS, in a Series of Plates taken from Nature, with Physiological and Pathological References. Royal 4to. cloth, 20*s.*

*** These Plates give 40 Illustrations taken from original Dissections, and are drawn and coloured in the highest degree of art.

MR. SAVORY.

A COMPENDIUM OF DOMESTIC MEDICINE, AND COMPANION TO THE MEDICINE CHEST; intended as a Source of Easy Reference for Clergymen, and for Families residing at a Distance from Professional Assistance. Sixth Edition. 12mo. cloth, 5*s.*

DR. SCHACHT.

THE MICROSCOPE, AND ITS APPLICATION TO VEGETABLE ANATOMY AND PHYSIOLOGY. Edited by FREDERICK CURREY, M.A. Fcap. 8vo. cloth, 6*s.*

DR. SCORESBY-JACKSON, M.D., F.R.S.E.

MEDICAL CLIMATOLOGY; or, a Topographical and Meteorological Description of the Localities resorted to in Winter and Summer by Invalids of various classes both at Home and Abroad. With an Isothermal Chart. Post 8vo. cloth, 12*s.*

DR. SEMPLE.

ON COUGH: its Causes, Varieties, and Treatment. With some practical Remarks on the Use of the Stethoscope as an aid to Diagnosis. Post 8vo. cloth, 4*s.* 6*d.*

DR. SEYMOUR.

I.

ILLUSTRATIONS OF SOME OF THE PRINCIPAL DISEASES OF THE OVARIA: their Symptoms and Treatment; to which are prefixed Observations on the Structure and Functions of those parts in the Human Being and in Animals. With 14 folio plates, 12*s.*

II.

THE NATURE AND TREATMENT OF DROPSY; considered especially in reference to the Diseases of the Internal Organs of the Body, which most commonly produce it. 8vo. 5*s.*

DR. SHAPTER, M.D., F.R.C.P.

THE CLIMATE OF THE SOUTH OF DEVON, AND ITS INFLUENCE UPON HEALTH. Second Edition, with Maps. 8vo. cloth, 10*s.* 6*d.*

MR. SHAW, M.R.C.S.

THE MEDICAL REMEMBRANCER; OR, BOOK OF EMERGENCIES: in which are concisely pointed out the Immediate Remedies to be adopted in the First Moments of Danger from Drowning, Poisoning, Apoplexy, Burns, and other Accidents; with the Tests for the Principal Poisons, and other useful Information. Fourth Edition. Edited, with Additions, by JONATHAN HUTCHINSON, F.R.C.S. 32mo. cloth, 2*s.* 6*d.*

DR. SHEA, M.D., B.A.

A MANUAL OF ANIMAL PHYSIOLOGY. With an Appendix of Questions for the B.A. London and other Examinations. With Engravings. Foolscap 8vo. cloth, 5*s.* 6*d.*

DR. SIBSON, F.R.S.

MEDICAL ANATOMY. With coloured Plates. Imperial folio. Fasciculi I. to VI. 5*s.* each.

DR. E. H. SIEVEKING.

ON EPILEPSY AND EPILEPTIFORM SEIZURES: their Causes, Pathology, and Treatment. Second Edition. Post 8vo. cloth, 10*s.* 6*d.*

MR. SINCLAIR AND DR. JOHNSTON.

PRACTICAL MIDWIFERY: Comprising an Account of 13,748 Deliveries, which occurred in the Dublin Lying-in Hospital, during a period of Seven Years. 8vo. cloth, 15*s.*

MR. ALFRED SMEE, F.R.S.

GENERAL DEBILITY AND DEFECTIVE NUTRITION; their Causes, Consequences, and Treatment. Second Edition. Fcap. 8vo. cloth, 3*s.* 6*d.*

DR. SMELLIE.

OBSTETRIC PLATES: being a Selection from the more Important and Practical Illustrations contained in the Original Work. With Anatomical and Practical Directions. 8vo. cloth, 5*s.*

MR. HENRY SMITH, F.R.C.S.

I.

ON STRICTURE OF THE URETHRA. 8vo. cloth, 7*s.* 6*d.*

II.

HÆMORRHOIDS AND PROLAPSUS OF THE RECTUM: Their Pathology and Treatment, with especial reference to the use of Nitric Acid. Third Edition. Fcap. 8vo. cloth, 3*s.*

DR. W. TYLER SMITH.

I.

A MANUAL OF OBSTETRICS, THEORETICAL AND PRACTICAL. Illustrated with 186 Engravings. Fcap. 8vo. cloth, 12*s.* 6*d.*

II.

THE PATHOLOGY AND TREATMENT OF LEUCORRHŒA. With Engravings on Wood. 8vo. cloth, 7*s.*

DR. SNOW.

ON CHLOROFORM AND OTHER ANÆSTHETICS: THEIR ACTION AND ADMINISTRATION. Edited, with a Memoir of the Author, by Benjamin W. Richardson, M.D. 8vo. cloth, 10*s.* 6*d.*

DR. STANHOPE TEMPLEMAN SPEER.

PATHOLOGICAL CHEMISTRY, IN ITS APPLICATION TO THE PRACTICE OF MEDICINE. Translated from the French of MM. Becquerel and Rodier. 8vo. cloth, reduced to 8*s.*

DR. STEGGALL.

STUDENTS' BOOKS FOR EXAMINATION.

I.

A MEDICAL MANUAL FOR APOTHECARIES' HALL AND OTHER MEDICAL BOARDS. Twelfth Edition. 12mo. cloth, 10*s.*

II.

A MANUAL FOR THE COLLEGE OF SURGEONS; intended for the Use of Candidates for Examination and Practitioners. Second Edition. 12mo. cloth, 10*s.*

III.

GREGORY'S CONSPECTUS MEDICINÆ THEORETICÆ. The First Part, containing the Original Text, with an Ordo Verborum, and Literal Translation. 12mo. cloth, 10*s.*

IV.

THE FIRST FOUR BOOKS OF CELSUS; containing the Text, Ordo Verborum, and Translation. Second Edition. 12mo. cloth, 8*s.*

V.

FIRST LINES FOR CHEMISTS AND DRUGGISTS PREPARING FOR EXAMINATION AT THE PHARMACEUTICAL SOCIETY. Second Edition. 18mo. cloth, 3*s.* 6*d.*

MR. STOWE, M.R.C.S.

A TOXICOLOGICAL CHART, exhibiting at one view the Symptoms, Treatment, and Mode of Detecting the various Poisons, Mineral, Vegetable, and Animal. To which are added, concise Directions for the Treatment of Suspended Animation. Eleventh Edition. On Sheet, 2*s.*; mounted on Roller, 5*s.*

MR. FRANCIS SUTTON, F.C.S.

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS; or, the Quantitative Estimation of Chemical Substances by Measure. With Engravings. Post 8vo. cloth, 7*s.* 6*d.*

DR. SWAYNE.

OBSTETRIC APHORISMS FOR THE USE OF STUDENTS COMMENCING MIDWIFERY PRACTICE. With Engravings on Wood. Second Edition. Fcap. 8vo. cloth, 3*s*. 6*d*.

MR. TAMPLIN, F.R.C.S.E.

LATERAL CURVATURE OF THE SPINE: its Causes, Nature, and Treatment. 8vo. cloth, 4*s*.

DR. ALEXANDER TAYLOR, F.R.S.E.

THE CLIMATE OF PAU; with a Description of the Watering Places of the Pyrenees, and of the Virtues of their respective Mineral Sources in Disease. Third Edition. Post 8vo. cloth, 7*s*.

DR. ALFRED S. TAYLOR, F.R.S.

I.

A MANUAL OF MEDICAL JURISPRUDENCE. Seventh Edition. Fcap. 8vo. cloth, 12*s*. 6*d*.

II.

ON POISONS, in relation to MEDICAL JURISPRUDENCE AND MEDICINE. Second Edition. Fcap. 8vo. cloth, 12*s*. 6*d*.

MR. TEALE.

ON AMPUTATION BY A LONG AND A SHORT RECTANGULAR FLAP. With Engravings on Wood. 8vo. cloth, 5*s*.

DR. THEOPHILUS THOMPSON, F.R.S.

CLINICAL LECTURES ON PULMONARY CONSUMPTION; with additional Chapters by E. SYMES THOMPSON, M.D. With Plates. 8vo. cloth, 7*s*. 6*d*.

DR. THOMAS.

THE MODERN PRACTICE OF PHYSIC; exhibiting the Symptoms, Causes, Morbid Appearances, and Treatment of the Diseases of all Climates. Eleventh Edition. Revised by ALGERNON FRAMPTON, M.D. 2 vols. 8vo. cloth, 28*s*.

MR. HENRY THOMPSON, F.R.C.S.

I.

STRICTURE OF THE URETHRA; its Pathology and Treatment. The Jacksonian Prize Essay for 1852. With Plates. Second Edition. 8vo. cloth, 10*s*.

II.

THE DISEASES OF THE PROSTATE; their Pathology and Treatment. Comprising a Dissertation "On the Healthy and Morbid Anatomy of the Prostate Gland;" being the Jacksonian Prize Essay for 1860. With Plates. Second Edition. 8vo. cloth, 10*s*.

DR. THUDICHUM.

I.

A TREATISE ON THE PATHOLOGY OF THE URINE, Including a complete Guide to its Analysis. With Plates, 8vo. cloth, 14*s*.

II.

A TREATISE ON GALL STONES: their Chemistry, Pathology, and Treatment. With Coloured Plates. 8vo. cloth, 10*s*.

DR. TILT.

I.

ON UTERINE AND OVARIAN INFLAMMATION, AND ON THE PHYSIOLOGY AND DISEASES OF MENSTRUATION. Third Edition. 8vo. cloth, 12*s.*

II.

THE CHANGE OF LIFE IN HEALTH AND DISEASE: a Practical Treatise on the Nervous and other Affections incidental to Women at the Decline of Life. Second Edition. 8vo. cloth, 6*s.*

DR. GODWIN TIMMS.

CONSUMPTION: its True Nature and Successful Treatment. Crown 8vo. cloth, 10*s.*

DR. ROBERT B. TODD, F.R.S.

I.

CLINICAL LECTURES ON THE PRACTICE OF MEDICINE. *New Edition, in one Volume, Edited by* Dr. Beale, *8vo. cloth,* 18*s.*

II.

ON CERTAIN DISEASES OF THE URINARY ORGANS, AND ON DROPSIES. Fcap. 8vo. cloth, 6*s.*

MR. TOMES, F.R.S.

A MANUAL OF DENTAL SURGERY. With 208 Engravings on Wood. Fcap. 8vo. cloth, 12*s.* 6*d.*

MR. JOSEPH TOYNBEE, F.R.S., F.R.C.S.

THE DISEASES OF THE EAR: THEIR NATURE, DIAGNOSIS, AND TREATMENT. Illustrated with numerous Engravings on Wood. 8vo. cloth, 15*s.*

DR. TURNBULL.

I.

AN INQUIRY INTO THE CURABILITY OF CONSUMPTION, ITS PREVENTION, AND THE PROGRESS OF IMPROVEMENT IN THE TREATMENT. Third Edition. 8vo. cloth, 6*s.*

II.

A PRACTICAL TREATISE ON DISORDERS OF THE STOMACH with FERMENTATION; and on the Causes and Treatment of Indigestion, &c. 8vo. cloth, 6*s.*

DR. TWEEDIE, F.R.S.

CONTINUED FEVERS: THEIR DISTINCTIVE CHARACTERS, PATHOLOGY, AND TREATMENT. With Coloured Plates. 8vo. cloth, 12*s.*

VESTIGES OF THE NATURAL HISTORY OF CREATION.
Eleventh Edition. Illustrated with 106 Engravings on Wood. 8vo. cloth, 7*s.* 6*d.*

BY THE SAME AUTHOR.

EXPLANATIONS: A SEQUEL TO "VESTIGES."
Second Edition. Post 8vo. cloth, 5*s.*

DR. UNDERWOOD.

TREATISE ON THE DISEASES OF CHILDREN. Tenth Edition, with Additions and Corrections by HENRY DAVIES, M.D. 8vo. cloth, 15*s.*

DR. UNGER.

BOTANICAL LETTERS. Translated by Dr. B. PAUL. Numerous Woodcuts. Post 8vo., 2*s.* 6*d.*

MR. WADE, F.R.C.S.

STRICTURE OF THE URETHRA, ITS COMPLICATIONS AND EFFECTS; a Practical Treatise on the Nature and Treatment of those Affections. Fourth Edition. 8vo. cloth, 7*s.* 6*d.*

DR. WALLER.

ELEMENTS OF PRACTICAL MIDWIFERY; or, Companion to the Lying-in Room. Fourth Edition, with Plates. Fcap. cloth, 4*s.* 6*d.*

MR. HAYNES WALTON, F.R.C.S.

SURGICAL DISEASES OF THE EYE. With Engravings on Wood. Second Edition. 8vo. cloth, 14*s.*

DR. WATERS, M.R.C.P.

I.

THE ANATOMY OF THE HUMAN LUNG. The Prize Essay to which the Fothergillian Gold Medal was awarded by the Medical Society of London. Post 8vo. cloth, 6*s.* 6*d.*

II.

RESEARCHES ON THE NATURE, PATHOLOGY, AND TREATMENT OF EMPHYSEMA OF THE LUNGS, AND ITS RELATIONS WITH OTHER DISEASES OF THE CHEST. With Engravings. 8vo. cloth, 5*s.*

DR. EBEN. WATSON, A.M.

ON THE TOPICAL MEDICATION OF THE LARYNX IN CERTAIN DISEASES OF THE RESPIRATORY AND VOCAL ORGANS. 8vo. cloth, 5*s.*

DR. ALLAN WEBB, F.R.C.S.L.

THE SURGEON'S READY RULES FOR OPERATIONS IN SURGERY. Royal 8vo. cloth, 10*s.* 6*d.*

DR. WEBER.

A CLINICAL HAND-BOOK OF AUSCULTATION AND PERCUSSION. Translated by JOHN COCKLE, M.D. 5*s.*

MR. SOELBERG WELLS, M.D., M.R.C.S.

ON LONG, SHORT, AND WEAK SIGHT, and their Treatment by the Scientific Use of Spectacles. With Engravings on Wood and Stone. 8vo. cloth, 5*s.*

MR. T. SPENCER WELLS F.R.C.S.

I.

PRACTICAL OBSERVATIONS ON GOUT AND ITS COMPLICATIONS, and on the Treatment of Joints Stiffened by Gouty Deposits. Foolscap 8vo. cloth, 5*s.*

II.

SCALE OF MEDICINES WITH WHICH MERCHANT VESSELS ARE TO BE FURNISHED, b command of the Privy Council for Trade; With Observations on the Means of Preserving the Health of Seamen, &c. &c. Seventh Thousand. Fcap. 8vo. cloth, 3*s.* 6*d.*

DR. WEST.

LECTURES ON THE DISEASES OF WOMEN. Second Edition. 8vo. cloth, 16*s*.

DR. UVEDALE WEST.

ILLUSTRATIONS OF PUERPERAL DISEASES. Second Edition, enlarged. Post 8vo. cloth, 5*s*.

MR. WHEELER.

HAND-BOOK OF ANATOMY FOR STUDENTS OF THE FINE ARTS. With Engravings on Wood. Fcap. 8vo., 2*s*. 6*d*.

DR. WHITEHEAD, F.R.C.S.

ON THE TRANSMISSION FROM PARENT TO OFFSPRING OF SOME FORMS OF DISEASE, AND OF MORBID TAINTS AND TENDENCIES. Second Edition. 8vo. cloth, 10*s*. 6*d*.

DR. WILDE, M.D., F.R.C.S.

ON THE MALFORMATIONS AND CONGENITAL DISEASES OF THE ORGANS OF SIGHT. With Engravings. 8vo. cloth, 7*s*. 6*d*.

DR. WILLIAMS, F.R.S.

PRINCIPLES OF MEDICINE: An Elementary View of the Causes, Nature, Treatment, Diagnosis, and Prognosis, of Disease. With brief Remarks on Hygienics, or the Preservation of Health. The Third Edition. 8vo. cloth, 15*s*.

THE WIFE'S DOMAIN: the Young Couple—the Mother—the Nurse—the Nursling. Post 8vo. cloth, 3*s*. 6*d*.

DR. JOSEPH WILLIAMS.

INSANITY: its Causes, Prevention, and Cure; including Apoplexy, Epilepsy, and Congestion of the Brain. Second Edition. Post 8vo. cloth, 10*s*. 6*d*.

DR. J. HUME WILLIAMS.

UNSOUNDNESS OF MIND, IN ITS MEDICAL AND LEGAL CONSIDERATIONS. 8vo. cloth, 7*s*. 6*d*.

DR. WILLIAMSON, LATE STAFF-SURGEON.

NOTES ON THE WOUNDED FROM THE MUTINY IN INDIA: with a Description of the Preparations of Gunshot Injuries contained in the Museum at Fort Pitt. With Lithographic Plates. 8vo. cloth, 12*s*.

Printed by W. BLANCHARD & SONS, 62, Millbank Street, Westminster.

Pages 254 and 255 badly stuck together and damaged