

Observations on the animal oeconomy, and on the causes and cure of diseases.

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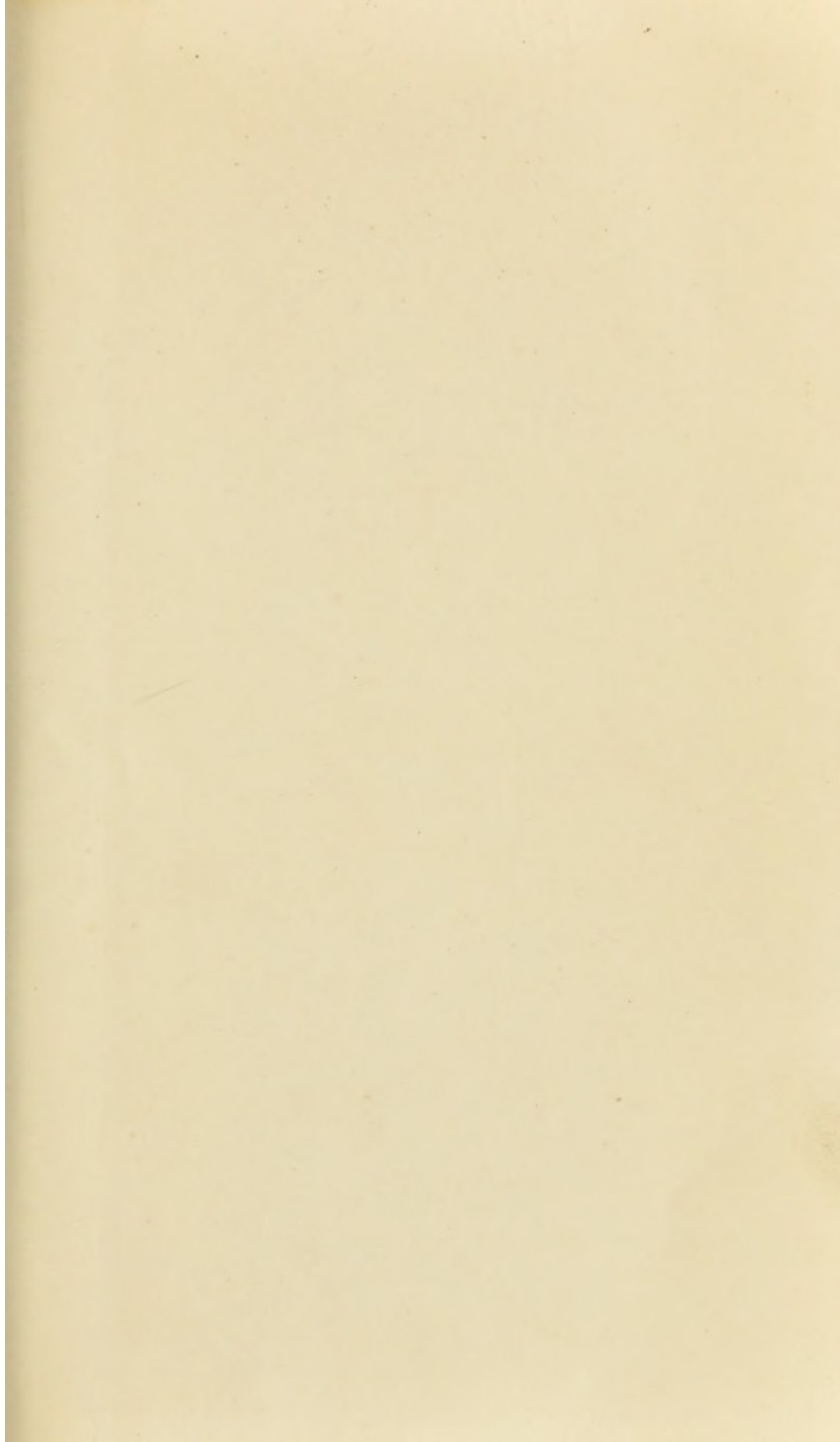
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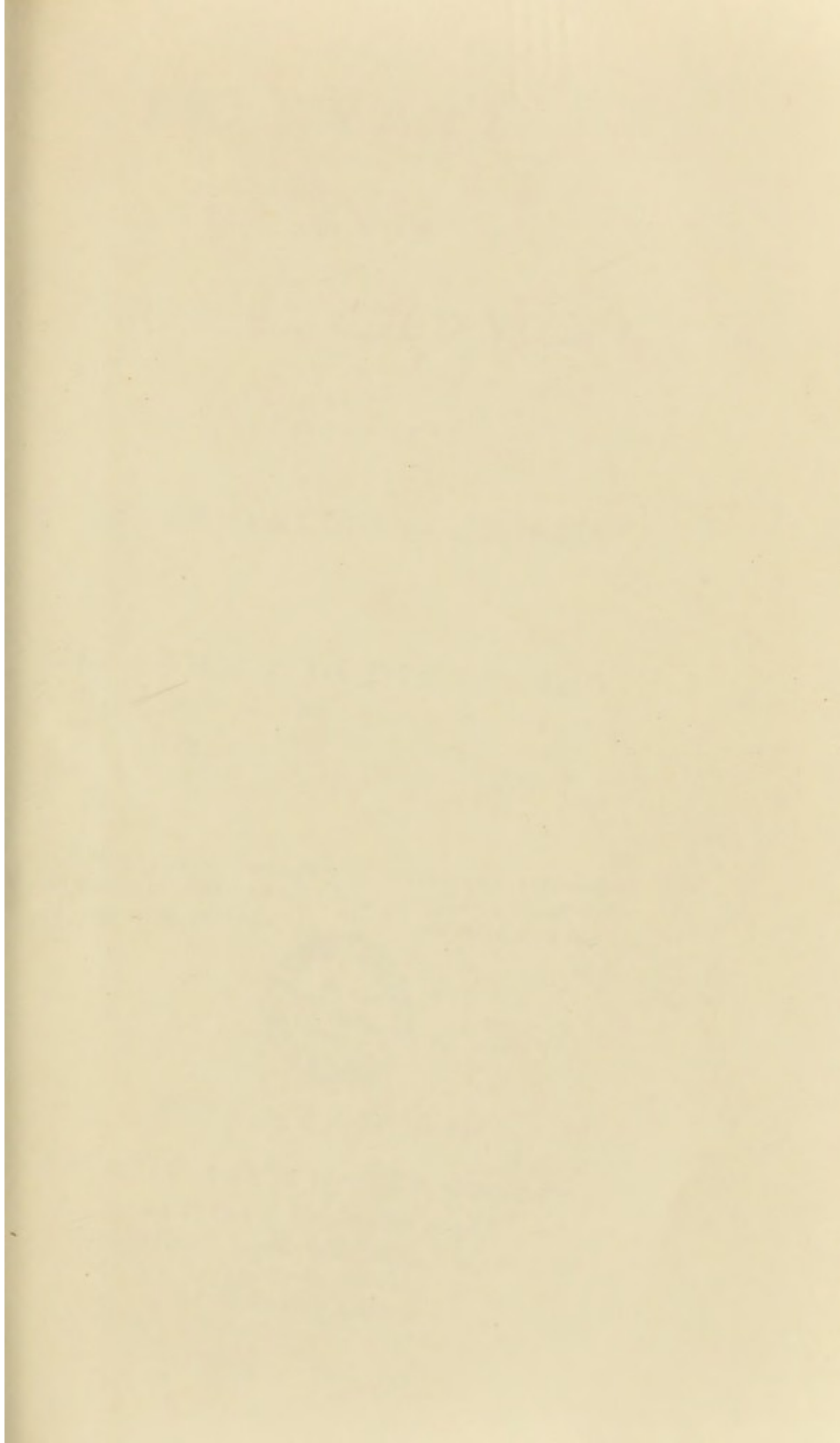
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OBSERVATIONS

ON THE

ANIMAL OECONOMY,

AND ON THE

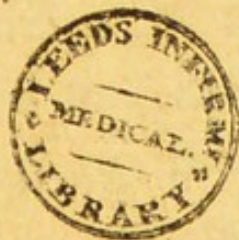
CAUSES AND CURE OF DISEASES.

By JOHN GARDINER, M.D.

PRESIDENT OF THE ROYAL COLLEGE OF
PHYSICIANS, AND FELLOW OF THE
ROYAL SOCIETY OF EDINBURGH.

Multum egerunt qui ante nos fuerunt ; multum etiam adhuc restat operis, multumque restabit ; nec ulli nato post mille secula praecluditur occasio aliquid adhuc adjiciendi.

SENECA, Epist. 64.



EDINBURGH:

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M,DCC,LXXXIV.

OBSEVATIONS

ON THE

NATURAL HISTORY

AND ON THE

CAUSES AND EFFECTS OF DISEASES

BY JOHN GARRISON, M.D.

MEMBER OF THE ROYAL SOCIETY OF
EDINBURGH, AND OF THE
ACADEMY OF MEDICINE, PARIS.

LONDON: PRINTED BY J. JOHNSON, ST. PAUL'S CHURCH-YARD, 1801.



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OF THE ROYAL INFIRMARY

P R E F A C E.

THE knowledge of anatomy, so indispensably necessary to our improvement in medicine, is carried, perhaps, as far as it is capable, or is requisite for the information of the practical physician or surgeon. Our knowledge, however, of the Animal Oeconomy has not kept pace with that of Anatomy. Medical writers have, indeed, by degrees, laid aside the pompous display of mathematical learning; so injudiciously applied in their explanations of the animal functions. They now, with propriety, consider it more as an animated machine, or a machine endowed with sensibility and self-moving powers, whose movements, though regulated by peculiar laws, are apt to be disturbed, and rendered irregular by the action of various stimuli, as well as by the passions and affections of the mind. But, it is much to be

be regreted, that the inquiries of physicians have not been more particularly directed towards the acquisition of a greater intimacy with the internal oeconomy of our system. Our ignorance in this respect has, perhaps, been the greatest impediment to our advancement in the knowledge and cure of diseases. How little do we know of the nature of the living principle? though from it alone every power and distinctive property possessed by us as animals are derived. We are equally ignorant of the laws by which the human system is regulated, of the nature of general and particular sympathies, and of many other important circumstances, such as the different effects of various stimuli on the body, which, when duly considered, will be found not only to be the causes of internal diseases, but the principal means by which the physician is enabled to cure them. It must, indeed, be allowed, that these are subjects of difficult investigation, and in which small progress has hitherto been made. But this slowness
of

of our progress is not owing solely to the intricacy of the subject; because men eminently conspicuous for genius and quickness of apprehension often possess such a luxuriance of fancy as, in some measure, incapacitates them for cool and dispassionate reasoning upon facts, which are the surest means of arriving at truth. The liveliness of their imagination cannot be fettered by the tedious, but sure rules, which lead to truth. They, of course, yield to the strong propensity they have for building systems upon superficial and unstable foundations. But, instead of elucidating their subject, their mode of investigation involves it in additional obscurity. Hence their systems, derived from conjecture, have not the support of facts and experiments. Unfortunately, however, their specious mode of reasoning often misleads the inexperienced student, by pleasing his imagination, instead of storing his mind with useful knowledge. For, that great display of parts and learning we so frequently meet with,

with, in their acute but false manner of reasoning, is apt to deceive, nay, even to captivate the youth of genius, whose disposition often inclines him rather to take delight in such theoretical disquisitions as, from their novelty and ingenuity, are more calculated agreeably to amuse and exercise the mind, than in plain and practical discourses, which, giving little exertion to the mental powers to comprehend, afford less pleasure in the perusal. Years and experience, in minds of a more solid and discerning cast, often remove this flight and pernicious mode of philosophizing. But, as we are much influenced by habit, many men, who are more remarkable for brilliancy of parts than solidity of judgment, continue this manner of reasoning and judging through life. Their publications, of course, though they may, from the specious manner in which they are written, amuse their readers, contribute very little to the improvement of medical knowledge, or of science.

In medical subjects, it must be confessed, it is extremely difficult to follow the method of induction prescribed by Lord Verulam. The small number of data we possess, prevents us from explaining phaenomena in the animal oeconomy, as well as the nature of the causes of several diseases, and, of consequence, their particular operation on the system. From this circumstance, the profession of physic has been branded with the appellation of a conjectural art; and I wish most sincerely, for the benefit of mankind, that physicians could, in some measure, remove the aspersion. I have not the presumption to imagine that it will be in my power to accomplish this desirable effect. All I can hope for, from the following observations relative to the animal oeconomy, and the causes and cure of diseases, is, in particular instances, to lessen the odium, by avoiding, as much as possible, all theoretical speculations, being thoroughly sensible, that it is only from facts and observations, carefully made,

made, and candidly related, that we can ever expect to obtain any satisfactory information on such subjects.

The following dissertations are not meant as a regular treatise on the Animal Oeconomy ; such a task is too extensive for my abilities. In many particulars relating to it I must confess my ignorance. I only touch on such parts of that subject as I think have not been sufficiently attended to by medical writers, and which, when duly considered as they really exist under the various conditions of health and disease, may assist us considerably in our explanations of certain morbid states of the body that are proposed as introductory to an examination into the causes and cure of diseases.

EDINBURGH, Oct. 21. }
1784. }

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ERRATA.

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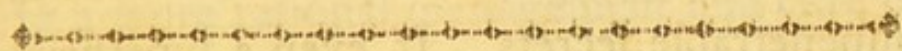
Pag. 132. lin. 8. *For* when heated, *leg.* when the body is
heated.

—— 153. — 1. *For* any air, *leg.* an air.

—— 182. — antepen. *For* and bilious fevers, *leg.* when
bilious, &c.

—— 321. — 1. *For* alkalis, *leg.* alkalies.

OBSERVATIONS
ON THE
ANIMAL OECONOMY.



SECTION I.
OF THE LIVING PRINCIPLE IN ANIMALS.

I. **I**N our researches into the oeconomy
of Nature, it seldom happens that we
can proceed farther than to enumerate a few
facts relative to the subject under considera-
tion. To trace the causes of particular o-
perations often exceeds our limited powers ;
and, in no case, can this observation be

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more

more strongly verified than in our attempts to investigate the qualities and powers of the living principle in animals. Difficulties of this kind have, probably, deterred many ingenious men from entering on a subject so subtle, which, if they had prosecuted with ardour, might have carried their inquiries much farther than I can pretend to reach. With regard to the causes themselves, therefore, I shall pass them over as impenetrable secrets. If even a superficial account of the little we know concerning this intricate subject can afford us the smallest information relative to the internal oeconomy of our system, of which we always have been so ignorant, some additional light may be thrown on the nature of several diseases, and a more satisfactory explanation of some uncommon symptoms attending them, than has hitherto been given, may arise from such disquisitions. Another circumstance merits our attention. In the history of diseases, and in giving the *rationalc* of symptoms, medical writers are under a necessity

necessity of having recourse to certain affections of the nerves, by which, no doubt, the living principle is acted upon. Of course, though there is little reason to alter our language on such occasions, yet I could wish to inculcate a distinction between the instruments of conveyance and the powers themselves. Considerations of this kind lead us to a more distinct view of the true nature of certain disorders, and, of course, to a more rational management and cure of them. I shall, therefore, with much diffidence, offer some observations on this most interesting subject.

2. By the living principle is understood that power which, in an animal, actuates its whole system, or from which is derived sensation, motion, and life; it is the cause of the preservation of the body from dissolution, and is capable of existing for some time under a suspension of all its actions*.

3. Though

* As the qualities and properties of particular bodies are

3. Though the influence of the vital principle extends to every part of the body, yet its principal seat and the great source of all its powers seem to be diffused through the substance of the brain, cerebellum, and spinal marrow, but not limited to any particular part of them.

4. In the human species, the brain, cerebellum, and their appendages, are so much larger in proportion to the body than in any other animals of the same size, that we must conclude them to serve some other purpose in the system, than merely to give origin to the nerves, the sum of whose diameters bears no proportion to the quantity of brain contained in the cranium. It is not, therefore, unreasonable to conclude the brain to be the organ in which the faculties
of

are seldom peculiar to them, but common to others, this makes clear and distinct definitions the most difficult of all compositions: Even what I have here given may admit of some cavil, as applicable, in several respects, to the living principle in vegetables.

of the mind are exercised, and the magazine or chief seat of the living principle, from whose powers all the functions of the body are derived. My learned and ingenious friend Dr Alexander Monro, to whose judgment in physiological subjects I pay the greatest regard, appears to be of the same opinion. In his excellent book on the Structure and Functions of the Nervous System, he expresses himself as follows:

‘ Suppose we make a horizontal section of
 ‘ the brain, where its hemispheres are join-
 ‘ ed together in the corpus callosum, we
 ‘ divide a mass of medullary substance,
 ‘ which is an hundred times, at least, as
 ‘ bulky as all the nerves of the head and
 ‘ spinal marrow conjoined. So that, unless
 ‘ we are to conceive that a hundred me-
 ‘ dullary fibres of the brain concur in form-
 ‘ ing a single nervous fibre, we must con-
 ‘ clude that a great part of the machinery
 ‘ of the brain serves some other purpose.

‘ Besides, it may be observed, that many
 ‘ medullary fibres of the brain appear,
 ‘ from

6 OF THE LIVING

‘ from their direction, better calculated to
‘ connect the different sides and different
‘ parts of the brain to each other, than to
‘ connect the brain to the nerves. Thus,
‘ we observe transverse bundles of fibres in
‘ the corpus callosum, the commissura cere-
‘ bri anterior and posterior, the tuber an-
‘ nulare, and even in the medulla oblon-
‘ gata.

‘ Further, it is obvious, and has been
‘ long and repeatedly observed by anato-
‘ mists, that fishes, and other animals with
‘ very small brains, feel as acutely, and ex-
‘ ercise their muscles as violently, as the o-
‘ ther classes of animals, in which the brain
‘ is proportionably much larger.

‘ In the last place, the human brain so
‘ greatly exceeds, in proportional size, the
‘ brain of the other animals of the same
‘ class, that I have found the brain of a
‘ large ox not to weigh more than one
‘ fourth part of the human brain, whilst
‘ the weight of the ox was, probably, six
‘ times greater than that of the man; or
‘ the

' the brain of the man was, in proportion
 ' to his weight, twenty-four times heavier
 ' than that of the ox; at the same time,
 ' the nerves of the muscles of an ox are, in
 ' their size, proportioned to the bulk of his
 ' muscles; and those of the organs of his
 ' senses, as the eye and nose, are propor-
 ' tioned to the extent of these organs; thus,
 ' the olfactory nerve of an ox is many
 ' times larger than that of a man. Hence
 ' we are led to consider the brain as a me-
 ' dium between the mind and the rest of
 ' the body of the animal, by the interven-
 ' tion of the machinery of which the in-
 ' tellectual powers are influenced, in a way
 ' we neither do, nor, probably, ever shall
 ' be able to comprehend: And that, in
 ' man especially, a small part only of it is
 ' lengthened out, so as, in the common
 ' way of speaking, to give origin to the
 ' nerves*.' The Doctor afterwards shews,
 from

* Observations on the Structure and Functions of
 the Nervous System, p. 24.

from dissections, that the nerves may exist with their full powers, independent of the brain, and concludes, ‘ That a small portion
 ‘ only of the brain, especially of the human,
 ‘ is elongated in order to form the nerves
 ‘ and spinal marrow. That the rest of it,
 ‘ as a medium between the living principle
 ‘ and the other parts of the body, performs
 ‘ offices which are proper to it. That the
 ‘ opposite sides of the encephalon are joined by bundles of fibres, so that we seem,
 ‘ in a certain degree, to perceive the cause
 ‘ of the sufferance of all parts of the nervous system with that of any one part
 ‘ of it, or of the general sympathy of
 ‘ nerves *.’

5. It has been supposed that the cortical or cineritious part of the brain is of a glandular nature ; but for what particular purpose the secretion is there performed, anatomists

* Observations on the Structure and Functions of the Nervous System, p. 26.

tomists and phyfiologists have not hitherto determined ; though it is probable, that, besides the lymph found in the ventricles, which moistens the general contents of the encephalon, there is a particular secretion destined for the growth and nourishment of the brain and nerves, and for affording a proper degree of moisture to them, which secretion does not seem to be confined to the brain and cerebellum, but appears to go on in the spinal marrow, and even in the nerves themselves, from their origin to their termination. This supposition is greatly supported by the number of blood-vessels spread on their coats.

6. I can easily conceive a fluid to be secreted for the purposes just mentioned, but cannot admit the idea of an animal spirit being separated from the blood, and circulated through the brain and nerves for the purposes of motion, sensation, and life. This would be a secretion of the living principle itself, which is an absurdity. The

B living

living principle seems to exist in a collected state through the brain and its appendages. It likewise pervades the medullary substance of the nerves through their whole length ; but its nature is too subtile to be confined in vessels.

7. The medium through which the powers of the living principle are conveyed to all parts of the body, are the nerves originating from the brain, cerebellum, and spinal marrow. The nerves consist of a small portion of the medullary substance of these parts, each appearing to be a bundle of small filaments connected by a cellular membrane. The whole cord is covered, from its leaving the skull or vertebrae, with two membranes which resemble the dura and pia mater, until it terminates in a particular part, or by its division and subdivision into several parts of the body where these *involucra* are supposed to be thrown off, it being thought necessary by most medical writers that the medullary part of each
filament

filament should be laid bare at its termination, for the performance of its office in the oeconomy. But it does not appear to be true with respect to these ultimate fibres of the nerves. That very able and accurate anatomist Dr Alexander Monro gives the most satisfactory reasons for their being covered with a production of the pia mater; which not only gives them a proper degree of strength, but, from the vessels of this delicate covering, they appear to receive their nourishment, and to have those conditions preserved on which their faculties, as conductors of the living principle, seem chiefly to depend.

8. The living principle appears to become more considerable in quantity and power in certain conditions of the brain and nerves; but how this happens must, perhaps, ever remain a secret to us. Researches of this kind, which exceed the limits of our capacity, have bewildered the imagination of physiologists and philosophers,

phers. They should have contented themselves with the knowledge of the fact, without presuming to expiscate the cause, over which Nature appears to have drawn an impenetrable veil.

9. It appears to be a law in the human system, that a certain standard point of heat, from 96 to 98 of Farenheit, should be maintained in it, by which the power of the living principle is chiefly supported.

10. The living principle seems to possess a power of resisting the effects of heat and of cold to a certain degree. But, when the body becomes a few degrees warmer or colder than its natural standard, the principle of life is proportionably weakened; and, if this increase or abatement of heat goes on a little farther, life is totally extinguished*.

11. Hence

* Vide the effects of heat and cold, sect. iii.

11. Hence (parag. 9. 10.) it follows, that a certain degree of heat must be coeval with the living principle, which it endeavours to adjust with great precision, the extent of its powers depending in a great measure on this exact regulation of heat.

12. Though the principle of life must exist from the time of conception, yet the first vital motion observable is the punctum saliens, or beginning of the heart's motion in the chick : And, from the strictest analogy, we may infer that the alternate contraction and dilatation of the heart is the first vital function in the human foetus. As the foetus becomes gradually more perfect in its figure, and in the structure and configuration of its organs, the vital principle proportionably gains strength. From this early motion of the heart in the foetus, it has always been considered as a principal organ in every perfect animal. With it commences the first regular circulation of the blood, on which the growth and nourishment

rishment of the animal, the several secretions, and other operations in the oeconomy, chiefly depend.

13. It is not probable, that, in the foetus, there is any remarkable sympathy between the heart and lungs. But, immediately after birth, when all connection between the mother and child is at an end, and a new circulation takes place through the lungs, the sympathy between these two organs becomes so remarkable, that it appears as if the action of either could not exist separately *. For, unless respiration is brought on, the motion of the heart ceases, and there is a suspension of the vital functions for some time, though the living principle still exists in the body. In which case they

* If, by blowing air into the lungs of animals seemingly dead, respiration can be restored, the action of the heart is thereby recovered. Mr Hook, *Philosoph. Transf.* v. ii. p. 539. Tossach. *Med. Eff.* v. 6. p. 108. Dr Langrish, *Cron. Lect.* p. 61. and 62. Mr J. Hunter, *Phil. Tran.* v. 66. part 2. p. 417.

they are recoverable, by blowing air into the lungs, and the application of other gentle stimuli to the system; and as soon as respiration commences, the motion of the heart is renewed. The same thing happens at any after period, when a stop is put to the motion of the lungs by a person breathing the fumes of burning sulphur, mephitic air, &c. or by being under water so long as to stop respiration, which is always succeeded by a cessation of the motion of the heart. But the heart may again be brought to act, if respiration can be renewed, and not otherwise: For, if the suspension of the vital motions continues till the living principle is extinguished, the powers of action being thus destroyed, the actions themselves must be for ever irrecoverable. This very intimate connection between these two vital motions is, perhaps, the most surprising that exists in the animal body, and which it is impossible to account for, by any mechanism of parts or connection of nerves. Their dependence on the powers

ers of the living principle is in common with the other bodily actions. But this remarkable circumstance is observable with respect to their motions, that, when the powers of life are so far exhausted as to occasion an abolition of all other action, these still, in some degree, for a time, subsist, especially in the more perfect animals, and a cessation of them is always the sign of death. On the other hand, when the powers of life are in their full vigour, if respiration is, by any means, suddenly stopped, and, of course, the motion of the heart, though it does not appear that any mortal injury is done to either organ; yet, from that instant, the powers of life gradually decline, and are, in a short time, abolished, which has every appearance as if the connection between the living principle and the body were kept up by the vital motions alone. But, although the effects of respiration and of the circulation of the blood are most remarkable in maintaining this connection, yet we know, that a certain

tain degree of heat, arising chiefly from the vital motions, is indispensably necessary. Nature appears to diffuse this heat equally through the body by means of the circulation. And there may be other circumstances, which, from their less obvious effects, we are ignorant of, all concurring to produce the same end. But respiration, the circulation, and heat, appear to be the principal bonds by which the union of the principle of life with the body is maintained. It is true, that Nature assumes some latitude in her operations, without injury to the body. But, when either of the vital functions, or the heat of the body, deviate considerably from their natural healthy state, the powers of life are proportionably diminished.

14. The ingenious and accurate anatomist Mr John Hunter of London, considers part of the living principle to be inherent in the blood, which, he says, is founded on the result of many experiments. Of

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this gentleman's abilities and candour, I have the highest opinion. His proofs, in general, are conclusive on other subjects; but, being unfortunately unacquainted with his experiments on this subject, I can only mention such evidence of his doctrine as at present occurs to me.

15. The general debility brought on the system by repeated venesection, the great prostration of strength, and even death, produced by haemorrhages, when the evacuation of blood is considerable and suddenly made, must be considered only as a presumptive proof of part of the living principle being inherent in the blood; because these effects may be otherwise accounted for. But, that blood should circulate in our bodies 100 degrees warm, for so considerable a time as it must continue in circulation before it can be completely renewed, without suffering any material change, which cannot be preserved from corruption, in such a degree of heat, when
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out of the body for a few hours, must be owing to the presence of the living principle. This principle, while it remains unimpaired, preserves all animal substances from dissolution, and explains the question of the learned Sanctorius, (‘*Caro animata cur vivit et non putrescit ut mortua? quia quotidie renovatur*’*), but in a different way, and, as I apprehend, in a more satisfactory manner than appears, by the above aphorism, to have occurred to that ingenious and useful philosopher, from his not attending sufficiently to the powers and properties of the principle of life; for, although we are every day nourished by a succession of fresh chyle, which by the circulation, and other operations in the oecconomy, is, for that purpose, soon changed into blood, yet, the part of the body, in this way renewed, must, in respect of the whole, be exceedingly small, and cannot account for the preservation of the body from putrefaction

* Static. Med. Sect. i. Aphor. LXXX.

turefaction for one day, far less for the period which must elapse before the several parts of the body can be renewed. The same argument holds good, not only with regard to the solids, but to the liquors secreted from the blood. These fluids could not otherwise be preserved in the cellular substance, and other parts, in a state of stagnation for any considerable time, without undergoing such changes as must prove hurtful to the system. Indeed, the influence of this astonishing antiseptic power of the living principle is extended even to the contents of the stomach and bowels, as appears from the production of so bland a liquor as the chyle by the process of digestion, and also from the preservation of the ingesta from putrefaction after a detention in a heat of 100 degrees for twenty-four hours, sometimes for several days. At the same time, it must be allowed, that, when the remains of our food arrives at the beginning of the colon, it then puts on its stercorious form, most probably from a putrefactive

treductive fermentation ; but the foeces never become, in consequence of this, absolutely putrid, whilst they remain in the body, unless in morbid states of the bowels. From this universal diffusion of the living principle, not only through the solids, but fluids of the body, that principle of life which, is coeval with the *animalcula in semine* *, probably arises. A gradual increase
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* The celebrated M. le Count de Buffon has certainly misapplied considerable talents and time in his fruitless endeavours to explain the nature of his living incorruptible organic particles, the manner in which seminal fluids are generated, their effects on each other, on their mixture of the male and female semen *in utero*, the difference in different animals, their capability, under certain circumstances, of propagating the species in which they were formed, exactly similar to the parents, from an internal mould, &c. I never had penetration enough to comprehend this theory. Perhaps it is incomprehensible ; and if so, no other can expect to meet with greater success in their attempts to investigate a process so dark and so mysterious. But we have this to comfort us in our ignorance, that it is highly probable, however we might be entertained or
amused

of the same principle, both in quantity and in power, is acquired during the time of gestation. How this happens, is a question of great difficulty. The living body being replete with this principle, is there a supply of it from the mother during the tender state of the foetus; and does it increase with the gradual perfection of the organs, and with the increase of the strength of the body? This seems to be the case in the progress from childhood to manhood.

16. The living principle which actuates the whole system, by means of the nerves, must itself be acted on, otherwise it loses
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amused with such knowledge, it would not be of the smallest advantage to mankind. It is enough for us to know that animals and vegetables have, from the creation of the world, propagated their species, and will go on to do so while this universe shall continue in its present state. So far our knowledge is of real use; but to perplex ourselves with such idle speculations, must always obstruct the progress of every species of natural knowledge.

its vigour, becomes languid, and is at last extinguished. The nerves are also the medium through which it is acted upon. Were it possible to remove all stimuli from the nerves, or to render them insensible to every stimulus, the living principle would necessarily lose its strength, and its weakness would be in proportion to the extent of the nerves rendered insensible, or the time they continued in that state. This insensibility of the nerves may be brought about by opium, the fumes of burning charcoal, intense cold, or other means. These, by degrees, lessen the sensibility of the nerves, and suspend the animal actions; lethargy takes place, and the only remaining signs of life are the vital motions of the heart and lungs; which, by the continued action of the opium, the fumes of burning charcoal, or intense cold, &c. are at last suspended. From the commencement of these effects upon the nerves, until a total suspension of all action takes place, the living

living principle gradually becomes weaker, and is at last extinguished.

17. But it does not appear that the principle of life is destroyed along with the vital functions. On the contrary, it remains in the body some time after the heart and lungs have ceased to act; and, although it declines in strength every moment after that period, yet, while it remains in the body, it is capable of being stimulated to a renewal of these actions, as happens sometimes to people who have apparently breathed their last, but have been made to move in bed, and cry out, on being roused by a sudden noise. But this appears more evidently in the cases of persons seemingly drowned. For, if the suspension of the vital motions has only subsisted for so short a time, that the principle of life remaining in the body is still capable of being stimulated into a renewal of these actions, then there is some chance of recovery. But, if the motion of
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the heart and lungs has ceased for a considerable time, and the living principle has become so languid as to be incapable of being stimulated again into action, then every function depending on its powers must be for ever lost.

18. The effects of the palsy on the human body are somewhat similar to those just mentioned. The causes, indeed, are different; for, in proportion to the extent of the nerves affected, and the degree of insensibility brought on them, the memory, comprehension, and judgment fail, the animal actions lose their strength; and, when this disease advances so far as to produce an apoplexy, the only remaining actions in the body are the vital, which, for the most part, are carried on for some time, with an appearance of great vigour, but, from the languid state of the living principle, their powers are soon exhausted.

19. During the growth of the body, the sensibility of the nerves, and their faculty of conducting the powers of the living principle to their termination, are greater than when the body has acquired its full dimensions. In like manner, the animal actions are performed with more ease and freedom, and can be repeated oftener without fatigue. This state of the body is, in general, accompanied with a frolicsome cheerfulness of mind, whilst the strength and vigour of the mental faculties are increasing by slow degrees. Nor do they arrive at the full extent of their powers till some time after the growth of the body has ceased. During all this time the body is acquiring more firmness and steadiness in its actions, though it is losing in proportion that promptitude for motion it possessed while in a growing state. In this enjoyment of the full powers of mind and body we continue for some years. But the body gradually loses that agility and spring which it formerly enjoyed. We become slower
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in our motions, and less fit for those exercises which afforded so much pleasure in our youthful days. This inaptitude of the nerves for conveying the powers of the living principle increases as age advances. By slow degrees we arrive at the shuffling step of old men. Sight and hearing fail, and the nerves become, at last, incapable of receiving such forcible impressions as to preserve the vigour of the living principle. Dotage and disease succeed, and are accompanied with every mark of a decreasing sensibility of the nerves, and a failure of the strength of the living principle, until its powers are, at last, totally extinguished. This is, in some degree, similar to what is observed when a slight, but general, disposition to palsy takes place in the system, which gradually increases until it ends in the extinction of the powers of life.

Having thus taken a short view of the effects produced by the nerves losing their accustomed sensibility to stimuli, which
prevents

prevents a proper degree of action on the living principle, and produces a proportionable declension of its powers, we shall proceed to examine the effects of healthful stimuli applied to the system.

20. In entering upon this subject, it is necessary to remark a very singular circumstance, that the gastric fluid, which most likely undergoes some considerable change after it is secreted by the glands of the stomach, for the purpose of digestion, is capable of readily dissolving dead flesh, but exerts not the least solvent power on flesh so long as it is endowed with life, for worms are bred and nourished in the stomach and bowels; nor has it the smallest effect in this way on the coats of the stomach in the living animal, but the worms are no sooner dead than their dissolution commences; and that excellent anatomist Mr John Hunter, has clearly demonstrated by dissections, that the coats of the stomach itself are not exempted, after the complete death

death of the animal, from the dissolvent powers of this gastric menstruum. This menstruum appears to be of various strengths, in different people. For although Mr Hunter, and others, have unquestionably shown that the coats of the stomach are dissolved, after death, by the gastric juice, yet this remarkable phaenomenon by no means constantly happens, or, at least, so early after death as has been sometimes observed. There is even reason to believe, that, in healthy people, who have a quick digestion, the solvent powers of this singular fluid are much greater than in valitudinarian habits. Such people, from the unusual weakness of this menstruum, are neither so often nor so strongly affected with the sensation of hunger; or, in other words, while the morbid secretion of the gastric fluids continues, they complain of want of appetite and of indigestion on the smallest excess of diet.

21. Though hunger probably proceeds from the action of the gastric juices on the nerves of the stomach, it must be considered as a healthful stimulus. It is our monitor, and sometimes a severe one, to take aliment, which is so necessary for our subsistence. Nothing, however, exhausts the spirits, or debilitates the body more than a long continued action of this stimulus, especially when accompanied with fatiguing exercise of the body.

22. A due proportion of aliment removes the disagreeable sensation of hunger, and that faintness and languor with which it is always accompanied. Proper food likewise gives a stimulus of an opposite kind to the nerves of the stomach, by which they acquire additional strength and firmness; and, as the whole system sympathises with the stomach, the same effects are extended to every part of the body, and enable us to renew our labours with fresh vigour. This stimulus continues while the food remains
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in the stomach, but, soon after the stomach becomes empty, the same appetite returns. The time of digestion is various, according to the strength of the digestive powers, and the quantity and quality of the food. During the time of digestion in the stomach, and even while the aliment is undergoing a farther change in the bowels, the above stimulus assists in maintaining the powers of action, which are so apt to decline on suffering hunger for any length of time.

23. In health, when the body has been refreshed by a proper quantity of aliment and rest, there is a certain accumulation of the powers of action in the brain and its appendages, which answers the exigences of the system. The person having thus received an additional vigour, which, from the continued exercise of the body or mind, gradually decreases, he, at last, becomes languid, and less fit for the performance of these exercises; a general debility and weariness prevails over the body, which
increase

increase and are succeeded by that suspension of the animal actions we call sleep. When sleep is continued for a certain time, the powers of action recover their former strength, and the person awakes with the same capability of exercise and study, as at the commencement of the former day.

24. When these exercises are carried on with moderation, the powers of action are strengthened. Every one knows that additional strength is given to the body and mind by due exercise, that debility is induced by a sedentary life, and that by inactivity the mind becomes languid and loses its vigour. But, if these exercises, particularly those of the body, are carried on beyond what the powers of action in the system can bear with ease, the body becomes weak and languid, the powers of action are greatly impaired, and, as sometimes happens, are totally exhausted, and death ensues. But disease is the more common consequence of those

those violent exercises when frequently repeated.

25. From the two preceding paragraphs, it appears, that the powers of the living principle, which are preserved and improved by moderate exercise, are diminished, and even exhausted, by too violent exertions. But, if exercise is not so intense as to lay the foundation of disease, or to extinguish the powers of life, they may be again recovered by rest and diet. Hence it is evident, that the powers of the living principle may be employed with ease, and with pleasure, while they are considerable in quantity. Then our actions are free, quick, and alert. But, as soon as this accumulation of the powers of action is diminished in the brain and its appendages, they are conducted by the nerves with less freedom. A languor of course takes place, and it is accompanied with that disagreeable sensation, known by the name of weariness or fatigue. This languor is removed by

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rest, or a suspension of the animal actions in sleep. During sleep, the vital motions are carried on with vigour, as if they were labouring to restore the diminished powers of the living principle.

26. The readiness with which the powers of action are conducted, by particular nerves, is greatly assisted by habit. The gait and motions of an infant beginning to walk, are awkward and infirm; not so much from a deficiency of the powers of action, as from a want of that practice, in the use of particular muscles, which he gradually acquires, and which gives stability to his motions. In the first lessons of a person learning to dance, every step and movement of his body is so awkward and slow, that it is impossible for him to connect the steps of the dance with the time of the music. By degrees, the learner acquires a greater facility in his movements, soon dances gracefully, and, at last, acquires that dexterity in the use of those muscles employed

ployed in the performance of the several steps which compose the dance, that the musicians have only to play a tune, the time of which corresponds with any of the dances the scholar has been taught, to put him in motion like a machine. This motion, it is true, may be stopped by the intervention of the mind, otherwise it proceeds till the dance is ended, or the music ceases. What a disagreeable noise does every person make when he begins to learn the practice of music? How slow, and how wretchedly out of time, are his first lessons played? The reason is obvious. The mind must be employed in recollecting the precise manner in which every note is performed. But, in process of time, after a long and diligent practice, the motion of the fingers in performing the notes appears to be synchronous with the idea he has of the several sounds to be made in the composition of the tune, which he runs over in his mind, whilst the fingers are employed in playing it with the utmost exactness, both as to
time

time and tone, moving, in many pieces of music, so nimbly, and with such accuracy and ease, as if they thought for themselves. The art of balancing, the dexterity of workmen in certain mechanical employments, &c. all admit of a similar explanation.

27. It may not be improper to take some further notice of the effects of habitual and daily exercises of the body. Exercise increases the strength, by conferring on the muscular fibres greater powers of action than is enjoyed by those who lead a sedentary life. Considerable additions of strength, with a robustness of constitution, acquired by hard labour, are, perhaps, always attended with a diminution of mental capacity ; because the daily expence of the powers of action is chiefly employed in muscular motion ; by which means the energy of the brain is so diminished, that it is incapable of exercising the mental faculties. But the principal reason is, that the mind is unaccustomed to exercise itself in
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the serious contemplation of other subjects than those of labour, subsistence, and rest; and, from this inactivity of the mind, and the consequent want of ideas to assist their judgment, the capacity of such people must, to the end of life, be extremely limited.

28. The original difference of capacities is often remarkably great. But the improvement of them in infancy, youth, and manhood, depends on the degree of exercise given to the mental faculties during these periods. The boy who has always maintained the place of Captain or Dux in the several classes of English, Latin, and Greek, from a real superiority of capacity, when sent from school to a mechanical employment, will, probably, from his natural advantages, support, through life, the character of an intelligent sensible man, as well as that of an ingenious artist. But his mind not being instructed to that degree it was capable of, the farther improvement
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of it will go on slowly, whilst others, inferior to him in parts, by being bred to some learned profession, and from a daily application of their minds to study, not only obtain, in a few years, a tolerable knowledge of their profession, but of philosophy, arts, sciences, history, &c. Even in such studies as they may have hitherto been totally unacquainted with, they will receive their information with greater ease than their school-fellow, whose capacity was superior, but not equally cultivated. But men, prosecuting their studies, and improving their minds on so extensive a plan, are necessarily led into a sedentary life. During the active time of youth, the effects of this mode of living are not so conspicuous as in the more sedate period of manhood, when the love of study and of ease increases, and gradually brings on that debility of body, which lays the foundation of chronic diseases.

29. Although the principle of life, with regard to quantity and power, varies in different persons, yet, we find, from experience, that, in some, a moderate share of it maintains health equally well, and for as long a period as others who possess it in a more eminent degree. For it frequently happens with these last, from the keenness of their passions, and the greater activity of their mind, exerted on other objects, that they are subjected to more expence of the powers of action; and, of course, the marks of old age advance as fast in them as in those who never possessed so large a share of the powers of life, but whose dispositions and passions were of a milder nature, accompanied with more chearfulness and serenity of mind, and whose bodily exercises conduced to the preservation of health.

30. The passions of the mind, when raised high, or continued for a considerable time, debilitate the system and diminish the
powers

powers of life. Excess of joy or of fear has sometimes occasioned instant death; not from an immediate extinction of the living principle, which remains in the body for a certain time after a suspension of all action, but from the excess of excitement of it in the brain, which, in some irritable habits, totally extinguishes the animal and vital motions *.

31.

* The fatal effects of fear, when carried to excess, on some delicate females, are so generally known, as to render it almost unnecessary to cite authorities in confirmation of that fact. It may, therefore, be sufficient to mention some instances of the dreadful effects of this affection, from the most unquestionable evidence of several gentlemen who lived in Holland for many years, and were present at the arrival of the alarming news of the taking of Bergen-op-zoom, in the year 1747. Such was the general consternation, that many women were known to die of fright soon after this intelligence was communicated to them. This is no uncommon incident in that country, where the women, especially those of the lower class, are so much enervated by moisture, low diet, and drinking immense quantities

31. When a high spirited benevolent man loses his beloved friend, or is, with his family, by unexpected accidents, reduced from easy circumstances to poverty, or apprehends that his honour is injured, and, in consequence of such misfortunes, a settled grief takes possession of his mind, it seldom fails to reduce the strength of his system, the powers of life being gradually wasted in melancholy contemplations. In

F this

tities of strong tea, on the abrupt intimation of melancholy news, which is vulgarly called dying of the *scream*, perhaps, from the sudden scream they usually give immediately on being so disagreeably surprised. However, sudden death, from an excess of joy, though equally certain, is more uncommon. There are, however, many proofs of it on record. But I shall only mention what Livy relates concerning the effects of sudden and excessive joy on two women, upon seeing their sons return unhurt after the famous battle of Thracymen :
 ‘ Unam in ipsa porta, sospiti filio repente oblatam, in
 ‘ conspectu ejus expirasse ferunt ; alteram, cui mors filii
 ‘ falso nunciata erat, moestam sedentem domi, ad pri-
 ‘ mum conspectum redeuntis filii, gaudio nimio exani-
 ‘ matam ;’ *Lib. xxii. cap. 7.*

this disordered state of the mind, the several functions of the body are performed with languor and fatigue ; disease succeeds, which it is not in the power of the physician to remedy, unless the morbid affection of the mind can be removed or obliterated ; for, if the mental affection cannot be cured, the disordered state of the body increases with the diminished powers of life, until death relieves the unhappy sufferer from misery.

32. When old men are unfortunately addicted to venereal pleasures, they consult their passions rather than their abilities. It may be said of them what Virgil mentions of the bees when they sting, *animasque in vulnera ponunt*. It is true, they seldom die in action ; yet, from the repeated shocks given to their system, palsies, and similar disorders, which indicate a considerable diminution of the powers of the living principle, are frequently the consequence.

33. The effects of the other passions, when intemperately exercised, are similar to those already mentioned; for, it is evident from parag. 29. 30. 31. and 32. that a certain degree of strength must be maintained in the system for the right performance of the functions. This admits of some latitude, and varies in different persons, according to their constitution and manner of life, (Vid. parag. 29.) Hence, when the powers of action are considerably diminished by a long and frequent exercise of intense passion, there remains not a sufficiency of them for performing the functions with that degree of vigour which is necessary to health. Besides, during the continuance of any violent passion, there is such an unequal distribution of the powers of action, as produces the most considerable changes in the system.

34. The powers of the living principle are conveyed in an uninterrupted manner to every part of the body. This is the
cause

cause of that uniform continuance of life, sensation, and aptitude for motion in all its parts. The whole muscular fibres are replete with this principle, and are so tenacious of it, that it remains for some time after the death of the animal, or their separation from the body. This time varies according to the nature of the animal. Man, and such quadrupeds as have their respiratory organs similar to those of the human species, their circulation quick, their blood warm, and their brain large in proportion to the size of the spinal marrow, retain it only for a short space after the vital motions have ceased. But animals of the amphibious kind, whose lungs, from a particular construction, admit of respiration being stopped for a considerable time, whose circulation is slower, whose blood is colder, and whose spinal marrow is large in proportion to the size of their brain, retain the principle of life in their muscular substance for a considerable time after decollation; and, even when the animal has been cut in
pieces,

pieces, every separate part showing evident signs of life and irritability, which can only be derived from the partial presence of the living principle. Every person conversant in experiments of this kind knows, that the muscles, and particularly the heart, of frogs, vipers, eels, turtles, and other amphibia, when stimulated with a sharp instrument, or an acrid substance, contract and palpitate for some time after they have been separated from their bodies.

What is here mentioned explains the general deception of those who believe the tendinous substance under the tongue of every dog to be a worm, because of a very small, though perceptible, motion it has immediately after it is cut out. This foolish practice is improperly called *worming*, for nothing unnatural is taken from the animal.

35. Some years ago, I cut out the heart and part of the large vessels of a turtle, with a view to examine the structure of these

these parts, and the circulation of the blood in that animal. Having wiped off the blood and other moisture, the heart was wrapped up in a handkerchief; but engagements in the way of my profession obliged me to postpone my curiosity till about six or seven hours after it was cut out. When I examined it, there appeared not the least signs of life. It was much shrivelled and dried. But, by putting it into water, nearly milk warm, it plumped up, and some of its parts acquired a tremulous motion. Laying it on the table, and pricking it with a large needle, it palpitated several times. The palpitation renewed as often as the needle was pushed into its substance, until it became cold, when it seemed to be insensible to every stimulus. But, after warming it again in the water, it recovered its irritability, and repeated its palpitations on the application of the needle. Though no movement could be excited in it by any stimulus when cold, yet it moved several times after being macerated in warm water.

water. This evidently shows the necessity of heat and moisture for maintaining the full powers of the living principle.

36. Previous to death, in certain fevers and chronic diseases, the principle of life is gradually exhausted in every part. Coldness of the extremities, and a defect of circulation in them, succeed a general debility of the body. Respiration and the motion of the heart are accelerated; but they decline by degrees in strength and regularity. Soon after, these motions become slower and irregular, and, at last, totally cease. It not unfrequently happens, during the last efforts of nature for the continuance of life, that slight convulsive motions of the muscles, particularly of the eyes and face, precede death. This effect probably arises from their vicinity to the principal seat of the living powers. But the more remote muscles are not affected; for, from the want of a sufficiency of life, they are incapable of being acted upon.

In

In such cases, after death, the muscles are found to be in a relaxed state, being soft and flexible. But, in those who die sudden and violent deaths, from wounds of the brain, spinal marrow, or from large evacuations of blood, all the muscular fibres having that quantity of the principle of life natural to a healthy state, they, of course, contract, and the muscles, for some time after death, are more tense and firm, to which the fulness of the small vessels and cellular substance may also contribute.

37. To these facts and observations on the nature and properties of the living principle in animals, many more might be added, were I not afraid of having been already too tedious on a subject, the intricacy of which prevents me from prosecuting it with satisfaction to myself. But, as bad solutions, when their faults are detected, sometimes give rise to others more satisfactory, I hope, that what I have advanced

vanced may stimulate the industry of some more ingenious and fortunate inquirer into the laws of the animal oeconomy, and the powers and operations of the living principle.

38. Every thing that relates to the nerves being closely connected with the operations of the living principle, I shall, in the following section offer some observations on them, and on the nature of sympathy. On which subject, the learned and ingenious Count de Buffon has expressed himself as follows: ‘ La correspondance qu’ont cer-
 ‘ taines parties du corps humain avec d’au-
 ‘ tres fort éloignées et fort différentes, et
 ‘ qui est ici si marquée, pourroit s’observer
 ‘ bien plus généralement; mais on ne fait
 ‘ pas assez d’attention aux effets lorsqu’on
 ‘ ne soupçonne pas quelles en peuvent être
 ‘ les causes: c’est sans doute par cette raison
 ‘ qu’on n’a jamais songé à examiner avec
 ‘ soin ces correspondances dans le corps hu-
 ‘ main, sur lesquelles cependant roule une
 G ‘ grande

‘ grande partie du jeu de la machine ani-
‘ male : Il y a dans les femmes une grande
‘ correspondance entre la matrice, les ma-
‘ melles, et la tête ; combien n’en trouve-
‘ roit-on pas d’autres, si les grands Méde-
‘ cins tournoient leurs vues de ce côté-là ?
‘ il me paroît que cela feroit peut-être plus
‘ utile que la nomenclature de l’anatomie.
‘ Ne doit-on pas être bien persuadé que
‘ nous ne connoîtons jamais les premiers
‘ principes de nos mouvemens ? Les vrais
‘ ressorts de notre organisation ne sont pas
‘ ces muscles, ces veines, ces artères, ces
‘ nerfs, que l’on décrit avec tant d’exacti-
‘ tude et de soin ; il réside, comme nous
‘ l’avons dit, des forces intérieures dans les
‘ corps organisés, qui ne suivent point du
‘ tout les loix de la mécanique grossière que
‘ nous avons imaginée, et à laquelle nous
‘ voudrions tout réduire : Au lieu de cher-
‘ cher à connoître ces forces par leurs ef-
‘ fets, on a tâché d’en écarter jusqu’ à
‘ l’idée, on a voulu les bannir de la Philo-
‘ sophie ; elles ont reparu cependant et avec
‘ plus

' plus d'éclat que jamais dans la gravita-
 ' tion, dans les affinités chimiques, dans les
 ' phenomenes de l'électricité, &c. Mais
 ' malgré leur évidence et leur universalité,
 ' comme elles agissent à l'intérieur, comme
 ' nous ne pouvons les atteindre que par le
 ' raisonnement, comme en un mot elles
 ' échappent à nos yeux, nous avons peine
 ' à les admettre ; nous voulons toujours
 ' juger par l'extérieur ; nous nous imagi-
 ' nons que cet extérieur est tout ; il semble
 ' qu'il ne nous soit pas permis de pénétrer
 ' au-delà, et nous négligeons tout ce qui
 ' pourroit nous y conduire.

' Les Anciens, dont le génie étoit moins
 ' limité et la philosophie plus étendue, s'é-
 ' tonnoient moins que nous des faits qu'ils
 ' ne pouvoient expliquer, ils voyoient
 ' mieux la Nature telle qu'elle est, une sym-
 ' pathie, une correspondance singulière
 ' n'étoit pour eux qu'un phénomène, et
 ' c'est pour nous un paradox dès que nous
 ' ne pouvons le rapporter à nos prétendues
 ' loix du mouvement ; ils savoient que la
 ' Nature

‘ Nature opère par des moyens inconnus la
 ‘ plus grande partie de ses effets, ils étoient
 ‘ bien persuadés que nous ne pouvons pas
 ‘ faire l’énumération de ces moyens et de
 ‘ ces ressources de la Nature, qu’il est par
 ‘ conséquent impossible à l’esprit humain
 ‘ de vouloir la limiter en la réduisant à un
 ‘ certain nombre de principes d’actions et
 ‘ de moyens d’opérations ; il leur suffisoit
 ‘ au contraire d’avoir remarqué un certain
 ‘ nombre d’effets relatifs et du même ordre,
 ‘ pour constituer une cause.

‘ Qu’avec les Anciens on appelle sym-
 ‘ pathie cette correspondance singulière des
 ‘ différentes parties du corps, ou qu’avec
 ‘ les Modernes on la considère comme un
 ‘ rapport inconnu dans l’action des nerfs,
 ‘ cette sympathie ou ce rapport existe dans
 ‘ toute l’économie animale, et l’on ne fau-
 ‘ roit trop s’appliquer à en observer les ef-
 ‘ fets, si l’on veut perfectionner la théorie
 ‘ de la Médecine ; mais ce n’est pas ici le
 ‘ lieu de m’étendre sur ce sujet important *.

SECTION

* Tom. ii. pag. 485.

SECTION II.

OF THE NERVES, OF SYMPATHY, AND OF
STIMULI.

39. **F**ROM the foregoing section it appears, that the nerves, being so many elongations of the medullary substance of the brain, are conductors of part of the living principle to all the organs of the body, for the purposes of life, sensation, and action; that it is by means of the nerves the living principle is acted upon; that they are also the medium through which all sensations are communicated to the sensorium, and in so rapid a manner, that they seem simultaneous with the impressions made on the nerves, or rather, they convey an idea as if the sensorium were extended to every sensible part of the body. At the same time, we are but little acquainted with the circumstances on which
this

this conducting power of the nerves depend. We know when a nerve is cut through, or compressed by a ligature, tumour, or otherwise, that the parts below the place where the injury is received, lose their sensibility and aptitude for motion, either altogether, or in proportion to the dependence they had on such nerve for that portion of the principle of life conveyed by it, for the maintenance of their several functions, as if the powers of the animal were incapable of pushing this vital fluid across the smallest interval of space. This is a most intricate subject; for, as I have just now mentioned, we are ignorant of the conditions which the nerves possess or lose in their healthy or unhealthy state, by which they are fitted, or rendered unfit, for their offices in the oeconomy. We know them to be variously affected by different stimuli; but in what manner stimuli operate on the nerves, so as to alter those conditions which preserve the strength or produce a debility in the nerves, remains still

a secret in physiology. The little information we can receive concerning this interesting part of the animal oeconomy, must be chiefly drawn from an accurate attention to the real nature of the stimuli themselves; or rather to their effects on the system, and as to their particular mode of operating, we may despair of ever coming to any distinct notion of it, nor would such knowledge be of much consequence to us. For, although it is of real use to know that wine, camphire, and volatile alkaline spirits, act as cordials, opium as a sedative, and that mercury will raise a salivation; yet the knowledge of the precise manner in which they produce their effects on the body is a matter of speculation which must always be involved in doubt. Nor does our ignorance in that particular preclude us from the use of cordials, opiates, or mercurials, in such disorders of the body as experience has shown them to be useful.

40. From that intimate connection of the several parts of the brain and cerebellum, observed in parag. 4. and of the nerves with each other, after they leave the skull and vertebrae, by means of the ganglia and plexus, from which there is such an extensive interchange of nervous filaments, that no nerve, at its termination, can be said to consist of the identical fibres which composed it at its origin, but of those of many other nerves, interwoven with some of its original filaments, the rest being expended in the above interchange of small branches with other nerves as it passes along to that part of the body where its functions are to be exercised; and, from that unity of substance in the nerves with the brain, (parag. 7.) probably arises that general sympathy known to exist between all parts of the body, or of the whole system with a diseased part, occasioning considerable changes in the functions during the continuance of acute and chronic disorders, independent of similar effects from the cause of the disease

disease acting on the system. Hence it appears, that no part of the body can be morbidly affected for any considerable time, without the rest of the system suffering in some degree.

41. In bodies naturally strong and in health, the nerves are capable of bearing certain stimuli for some time, without injury to the rest of the system, which, in persons more delicate, or who have become so from disease, would produce pain, or other disagreeable effects. Nay, it seldom or ever happens, that all the parts of the system are equally capable of resisting the effects of stimuli. Hence, certain parts, sometimes at a considerable distance from the application of the stimulus, suffer in a remarkable manner, while the rest seem to be no otherwise affected than as usually happens from general sympathy, (parag. 40.) And the late ingenious Dr Whyte, on this subject, makes the following practical observations: ‘ I think it most probable,

‘ through the whole nervous system, they
 ‘ were affected with a disagreeable sensation
 ‘ as often as the ligaments and tendons of
 ‘ the ankle and foot were overstretched;
 ‘ which, however, produced no uneasiness
 ‘ or sympathetic motion in the other parts
 ‘ of the body, because they were endued
 ‘ with no morbid delicacy or uncommon
 ‘ sensibility.

‘ As a further proof of this, I knew a
 ‘ woman who had so delicate a stomach,
 ‘ that, when this organ was more than u-
 ‘ sually indisposed, was apt to fall a reach-
 ‘ ing as often as she made the necessary ef-
 ‘ forts to pass water; and I have had feve-
 ‘ ral persons affected, in consequence of a
 ‘ virulent gonorrhoea, with a gleet, and a
 ‘ tenderness, and some degree of soreness in
 ‘ the urethra, who, as often as they drank
 ‘ two or three glasses of wine, immediately
 ‘ felt an uncommon uneasiness in that part.
 ‘ This extraordinary sympathy, however,
 ‘ between the stomach and urethra, ceased
 ‘ as soon as the latter became quite sound.’

‘ Since

‘ Since we observe that only those whose
 ‘ nervous system is remarkably delicate, are
 ‘ affected with general and violent convul-
 ‘ sive motions or spasms from the passions
 ‘ of the mind, disorders in the *primae viae*,
 ‘ and other causes; have we not reason to
 ‘ conclude, when, in consequence of an ir-
 ‘ ritation of any one part, an uncommon
 ‘ sympathetic motion is produced in a di-
 ‘ stant organ with which it has less connec-
 ‘ tion, either by the nerves or blood-ves-
 ‘ sels, than with many other parts which
 ‘ are nowise disturbed; that such sympa-
 ‘ thetic motion is owing to a peculiar deli-
 ‘ cacy or mobility of that organ; and that,
 ‘ were the other moving organs of the body
 ‘ equally delicate and sensible, universal, or,
 ‘ at least, more general convulsions, or
 ‘ spasms, would have been the conse-
 ‘ quence *?’ From this morbid irritability
 in certain parts, it appears, that a variety
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 in

* On nervous diseases, Edinburgh 1765, pag. 79.

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in those persons in whom such preternatural irritability exists, notwithstanding some physiologists have endeavoured to account for them, and other anomalous sympathies, from the connection of the intercostals with the 5th, 6th, and 8th pairs, and with almost all the nerves which proceed from the spinal marrow. But their theories, however ingenious, were ill founded, not being sufficiently supported either by facts or experience. Not that I would absolutely deny that sympathies arise from the connection of nerves; for, in this way, they may sometimes happen, but not so often as is commonly alledged.

42. In a few instances they seem to be owing to certain laws established in the system, by which distant parts are brought to consent with the seat of the disease or part where the stimulus is applied, as if nature, on such occasions, called for assistance to relieve her from something hurtful to the body; as sickness and vomiting arise from

from the irritation of a stone in the ductus communis, cholidochus, kidney, ureter, or bladder. A simularity of texture and constitution of nerves at their termination is often the cause of particular sympathies, as an eye, kidney, testicle, or mamma *, with those

* When a woman is suckling her child, if both breasts happen to be full, she applies the infant to one; that instant the child commences sucking, the milk of the other breast runs out, which obliges her, after a short period, to move the child from one breast to the other, until both are somewhat emptied, when that oscillatory motion of the tubuli lactiferi raised by the action of sucking, and communicated to the opposite breast by sympathy, from a simularity of texture and constitution of the nerves in both breasts at their termination, ceases to have sufficient force to propel the milk to the nipple. For a similar reason, if a woman nursing her child shall, from any accident, be unfortunately seized with an inflammation and suppuration in one of her breasts, after the matter has been let out, the discharge from the sore gradually lessens for ten or twelve days, when it is succeeded by another inflammation and suppuration, which, running through the same course as the former, a third takes place, and so on,

those of the opposite side. Sympathies frequently arise from vicinity of parts, as a tenesmus during the continuance of a severe strangury, which last complaint is sometimes brought on from acrid humours irritating the sphincter ani. But the greatest number of anomalous complaints of the spasmodic kind, in parts distant from the original seat of the disease, is inexplicable by any thing I have said or can say on this subject; for as to the cause why a blow on the head should occasion a vomiting of bile; violent vomiting and purging, cramps in the thighs and legs; the dry belly ach, a palsy of the lower extremities; a wound in the foot or hand, a locked jaw; I know not;

on, the poor woman continues, for the most part, to be tormented with one suppuration after another until the child is weaned, or she gives over nursing. Because every time the child is put to the sound breast an increased oscillatory motion is brought on the whole of the vessels of the other, which being in a preternatural degree irritable, keeps up that tendency to inflammation which I have so frequently observed in practice.

not; and must also confess my ignorance of the cause of many other dangerous sympathetic affections in the course of diseases, on the supposition of a connection of nerves. But, notwithstanding these limits to our inquiries into the causes, we ought not to neglect the facts themselves, an acquaintance with which is so necessary for acquiring a knowledge of the nature of many symptoms, and even of the diseases from which they are derived. Not that I consider it as necessary to enumerate the great variety of sympathies occurring in the course of disorders, since they are, in general, known to practitioners. I cannot, however, omit taking notice of a few of the most remarkable, and which merit our particular attention.

43. In the *first* place, I shall mention that widely extended sympathy which is so often observed between the stomach and every other part of the body. *Secondly*, The sympathy of the stomach and bowels with

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the

the head, *et vice versa*. *Thirdly*, The sympathy of the stomach with the kidneys, uterus, &c. *Fourthly*, That particular sympathy of the vital motions of the lungs and heart with the stomach and bowels. *Fifthly*, The sympathy of the uterus with the mammae. And, *sixthly*, The sympathy of the heart with the lungs in a most eminent degree, (parag. 13.) From all which it appears, that the stomach is the principal seat of many of the most remarkable sympathetic affections which happen in valitudinary states of the body. Every disorder accompanied with severe pain affects the stomach, whilst this viscus affects, not only in its diseased state, every part of the system, but at other times the effects of healthful stimuli applied to it are instantly communicated to the rest of the body, as when we take food, wine, and medicine. There are other sympathies beside those mentioned, as that of the internal membrane of the bronchi with the skin, on the application of cold to the surface of the body in the production

duction of a catarrh, and that of the skin with the stomach and bowels, *et vice versa*, at the commencement and during the continuance of fevers, which shall be more particularly taken notice of when we come to treat of these disorders.

44. Such stimuli as by their action support the living principle, (parag. 16. 17. and 22.), or by preserving or restoring certain conditions to the nerves, and which are necessary to the maintenance of their powers as conductors, may be called healthy, because they give strength and vigour to the whole system.

45. Other stimuli, by acting in such a manner on the nerves as to alter them from a natural to a morbid state, or by so diminishing or destroying their power of conducting, as to prevent wholly, or in part, the usual action on the living principle, (parag. 16. and 17.) must be deemed unhealthy, because they lessen the active powers

ers of the body. Of this kind are not only those which are in some degree noxious to the human system, but even salutary stimuli, when they are too freely applied. This is the case with all of our best and most active remedies and applications; and no illustration is necessary to show that any person may be over dosed, or that a variety of salutary or noxious effects may arise from the use of aromatics, Jesuits bark, camphire, opium, wine, &c. given in moderate or in immoderate quantities.

46. Although, from habit, certain stimuli can be borne by particular people with impunity, or little injury, yet, in general, their effects being always in proportion to their strength and duration, and to the powers of the system to which they are applied, (parag. 41.) it must sometimes happen, that particular persons resist certain stimuli, whilst others are sensibly affected by them, the ultimate effects of which are not always observable during their application,

tion, nor often for some considerable time after they have been removed. For, allowing the nerves to be morbidly affected by the application of stimuli, this must produce a corresponding alteration in their mode of action, which is not always rectified on a removal of the stimulus; because a disease being brought on the nerves, a certain space must elapse before they can return to their former healthy state, during which time many of the functions being disturbed, a proportionable disorder in the system must be the consequence.

47. Such is the nature of certain stimuli, that, without sickness, pain, or, so far as we can perceive, the smallest degree of irritation on any part of the body, they are, nevertheless, capable, by their continued action, of bringing about the most considerable changes in the system, either with regard to the production of diseases or restoration of health. Putrid marsh miasma, the remote cause of certain fevers, is an instance
of

of the gradual and almost imperceptible alteration in several of the functions, previous to their bringing on the accession of fevers. Peruvian bark is an instance of cures being accomplished without our perceiving any sensible operation from its action on the nerves; at the same time, however, it is evident, that it acts on them in a most powerful manner, by producing those salutary changes on the functions morbidly affected. This circumstance of unconsciousness seems to attend the operation of stimuli in general, whether they be of the morbid, salutary, or natural kind, when their action is inferior to that which is necessary to produce pain or an uneasy sensation. The secretions of the liver, pancreas, kidneys, and other glands, may be so altered, as to lay the foundation of dangerous diseases, though we are not sensible of any affection in those parts previous to the event.

48. The action of medicines, in general, if not given in such quantity as sensibly to disturb the system, is only known to us from their good or bad effects, and not from any irritation, or particular sensation during their operation. This unconsciousness is universal with regard to what may be called unconscious stimuli, the action of which seem to be produced by an affection of the nerves, arising from the application of some active matter, which excites them to motion, or alters their mode of action, so as gradually to produce some change in the system, but without irritation, pain, or consciousness. The organs of sense may be considered as an exception to this general doctrine. But these must be regarded as particularly formed for the reception of impressions peculiar to each. These impressions are extremely different from those stimuli which produce their effects in all involuntary motions without our knowledge. They are the result of a law wisely established by nature for that purpose. The
great

great benefit of such a law must be apparent, from the necessary consequences of a perpetual irritation on every part of the body, by the action of the natural stimuli which excite the alternate contraction and dilatation of the heart and arteries, and consequently produce the circulation of the blood, the secretion of various liquors from it, the absorption of others to be mixed with the general mass, and similar operations in the oeconomy. All these operations are happily carried on without consciousness: And though, in a healthy state, they proceed with great regularity, they are subject to considerable changes from stimuli of a different kind, internally or externally applied. These changes appear to be the original causes of most diseases. The natural stimulus of the blood, and of the various liquors secreted from it, are almost uniformly the same on the containing vessels, whilst we continue in a healthy state. By its acting on the nervous fibrils of every part, the operations of the oeconomy are

continued

continued without consciousness, except sometimes from an over distension, which must be considered rather as a mechanical pressure than as the proper stimulus of the fluid.

49. Though the sense of feeling is most acute at the points of the fingers, yet the skin, in general, possesses, in a less degree, that faculty by which we can discern the nature of particular impressions, and hence it is our faithful monitor against external injuries. From the number and sensibility of the nerves of the skin, it is more liable than any other part of the body to be affected by the vicissitudes of heat and cold, by moisture, mechanical impressions, and by all the variety of acrid matter capable of irritating its nerves or destroying its substance. Of all these different stimuli, when the nerves are remarkably affected, distinct perceptions are communicated to the mind.

50. The nerves of the stomach and bowels are subjected to a greater variety of imperceptible stimuli than those of any other part of the body. Men, whose senses, if that of feeling be excepted, are less acute than those of most of the brute creation, are chiefly directed in the choice of their food by experience, which is, indeed, greatly assisted by sight, smell, and taste. But the stomach itself possesses not the faculty of distinguishing the qualities of the different articles of food. When the gastric juices act on the nerves of an empty stomach, the sensation of hunger is felt; but the stimulating effects of the gastric fluids being considerably weakened by a mixture of food and drink, and being farther changed by the process of digestion, that disagreeable sensation, and all the consequences of it (parag. 22.) cease. The nature of the other stimuli, however, are known rather by their effects on the system than by any particular sensation excited in the coats of the stomach. In languid states
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of the body, the cordial qualities of wine, ardent spirits, opium, and a few other substances, are, by their specific stimuli, felt immediately after they are swallowed, and their effects are so quickly communicated to the rest of the system, that, as soon as they are taken, we are sensible of a most agreeable sensation proceeding from the stomach and praecordia, over which a warmth of the most pleasant and invigorating kind is diffused and communicated to the rest of the body. But most other stimuli, unless they arise to such a degree as to occasion sickness or pain, are very little felt by the stomach, though they have often considerable effects on the system. This singular affection of the nerves of the stomach, from the great variety of the articles of diet, and sometimes of medicine, without any particular perception of the nature of each, appears to be the consequence of a law established in the oeconomy, which, like all other laws of nature, carries the signature of infinite wisdom and benevolence. For,

as every part of the body sympathies in so remarkable a manner with the stomach, (parag. 42.) strong affections of the nerves of that viscus would necessarily disorder the body at every meal, and, instead of abolishing the debilitating sensation of hunger, we should be subjected to various complaints arising from sympathy. However sensible we are of the particular tastes of vinegar, pepper, mustard, salt, and of many other acrid substances, yet we cannot distinguish their qualities by any sensation on the coats of the stomach, except that of an agreeable warmth, when moderately used, or of sickness and vomiting, when taken in too large quantities; which is the usual effect of an excess of stimulus applied to the internal surface of this viscus, the proper seat of sickness: This disagreeable sensation is peculiar to the stomach. For, an excess of stimulus in the intestines is only capable of raising pain; and if sickness shall at any time follow severe pain in the bowels, it is always in consequence of the stomach suffering,

fering, from sympathy, with the part first affected. The stomach, on the other hand, is less susceptible of pain than the bowels. In particular cases, however, it suffers most severely by sympathy. This pain in the stomach is always of a particular kind. It affects the vital motions more than those of any other part, and, of course, oftener produces a deliquium animi.

51. In the same manner as the effects of healthful stimuli (parag. 44.) are communicated to the rest of the body, so are those of an unhealthy or morbid kind, (parag. 45.) conveyed to the system in general, with the same unconsciousness of any particular action on the stomach, as has been already mentioned, though their effects are often considerable. This sometimes happens when a person loses his colour, his spirits, his strength, and, in some cases, his appetite; but, as he suffers neither sickness nor pain, he does not suspect his indisposition to proceed from his stomach, until the
 morbid

morbid colluvies is collected in such a quantity as to excite vomiting, which, when properly promoted, and the bowels soon after cleared by a laxative, commonly restores him to health. At other times, certain parts of the body suffer in a particular manner; for many people know that their stomachs are disordered, from the coming on of headaches, or dimness of sight; and, as I have elsewhere observed, fits of the gravel, stone, and gout, and many hypochondrical and hysterical complaints, are not only increased, but sometimes brought on by the same cause. A few radishes, a raw turnip, a glass or two of stale ale, and other things of difficult digestion, or which disagree with the stomach, will give an asthma to many people in a few minutes. And there are numerous cases of this disease in a chronic state, where these unfortunate people, from an extraordinary sensibility of the nerves of the stomach and bowels, cannot even bear the common healthful stimulus from the digestion of their food, without

out being considerably disordered. They frequently have a return of their asthma about two or three hours after dinner, and sometimes sooner. In the instance of a gentleman well known to most of the physicians here, the accession of the fit was remarkably regular at five or six o'clock every evening for upwards of twenty-five years. I observe in many patients labouring under this disorder, that, when they escape their usual fit after dinner, they are commonly seized with an insuperable drowsiness for about an hour; which is not an unusual effect of digestion in particular constitutions. But affections of this kind always indicate a preternatural mobility in the nerves of the stomach, which may sometimes be accidentally brought on a person not subject to it, from a disordered stomach, over fatigue, &c. This singular and curious fact in the animal oeconomy, of distant parts being strongly affected by stimuli applied to the stomach and bowels, where, for the most part, no particular sensation

sation or commotion is perceived, is a most remarkable circumstance in the constitution of their nerves. For stimuli applied to other parts, whatever effects they may have on the system, are constantly felt first in the place where they are applied, which is not always the case with those acting on the stomach and bowels. On the contrary, their most evident effects are often in places remote from these viscera, whose nerves, at the same time, are not only more readily subjected to the powers of stimuli, but, when affected by them, bring on a greater number of general and particular sympathies than when applied to any other part of the body. It, indeed, appears as if, from the instant that stimuli are applied, the whole system were engaged in resisting their powers; but that such parts as, from a natural or morbid delicacy, or from a singularity in the constitution of their nerves, are more ready to be affected by particular stimuli than others, were the first

first to yield, and there the most considerable effects are to be observed.

52. In delicate constitutions, certain stimuli are capable of producing a suspension of the animal actions, and, in a great measure, of those of the heart and lungs, which are often so considerably diminished as scarcely to be perceived, but are renewed on a removal or abatement of the stimulus, provided its action is not continued so long as to occasion a suspension of the vital motions, and to reduce the powers of life so low as to render them incapable of being again stimulated into action. Cases of fainting, for a longer or shorter time, occur in irritable habits from slight causes, as wind, acrid matter in the primæ viæ, pain suddenly raised in any part of the body, stoppage of the menses, difficult menstruation, spasmodic affections in hypochondriac and hysteric dispositions, &c. But they are not attended with that danger to life which so often accompanies a total or

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partial

partial suspension of the vital functions from breathing the fumes of burning brimstone, charcoal, mephitic air, or from a stop being put to respiration by remaining under water for some time. In these cases, there is an evident injury done to the lungs, which greatly increases the danger of the extinction of the powers of life. But, in the former, the suspension of the animal or debilitated state of the vital motions in fainting, appear to arise from sympathy, and are in general easily taken off by a removal or abatement of the stimulus in the part primarily affected. For, during the continuance of the fainting fit, the nerves are, to a considerable degree, insensible; and no violence having been done to the vital organs, they are readily brought to act in their usual way, from their natural stimuli, the application of cold water to the hands and face, volatile alkali to the nose, moderate agitation of the body, &c. This sympathy of the whole system with a part of it, cannot possibly arise from any particular connection

connection of nerves, but must owe its existence to that unity of substance in the brain and nerves, by which all the parts of the system are so closely connected with each other, (parag. 4. and 40.) that if any part is affected the rest must suffer more or less. The action of corroborants, astringents, antispasmodics, and other remedies, evidently show this. It is true that there are particular parts, as the stomach and bowels, which, from a singularity of disposition in their nerves, are more capable of producing a general sympathy.

53. It sometimes happens in irritable female habits, especially during the first three or four months of pregnancy, that the smell of a rose, hyacinth, wall-flower, a few violets, or such other substances as afford rather a delicate and refreshing, than a strong odour, so affects the nerves of the nose as to disorder the whole system, in so remarkable a manner as to bring on, not only a suspension of the animal actions, but also
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to affect the vital motions; which cannot otherwise be produced than by the general sympathy of the system with those nerves*.

54. A blow on the pit of the stomach is often succeeded immediately by a severe fainting, and, frequently, by a suspension of the vital motions, the person remaining for some time apparently dead, or it may occasion the complete death of the body, according to the violence with which the blow has been given. When this last event

* An unmarried Lady, of a healthy constitution, with whom I have been acquainted many years, has such a peculiarity in the constitution of her nerves, that although she can, in general, bear strong odours as well as most people, yet cannot suffer a rose to be in her bosom, or to hold it in her hand a few minutes, without becoming faint, and having an inclination to vomit. Conserve of roses, rose water, and similar articles made from roses, have more powerful effects upon her, and usually excite vomiting. Going into a room where any of her companions are washing with rose-water, never fails to produce this effect; nor does she recover of her indisposition in less than two hours.

vent takes place, it seldom happens, on dissection, that we can discover any alteration from the natural and healthy state of this viscus, as might lead us to conclude it to be a sufficient cause of death. In the first cases of fainting, (parag. 51. and 52.) it most probably arises from a sympathy of the system with the nerves affected; for, in other instances, we know, that severe and instantaneous pain causes a suspension of the animal actions for some time.

I remember a Lady who fainted from her hand being inadvertently squeezed too hard. But such an accident must more readily occur from a blow on so sensible a part as the stomach, which, if given with great force, may act so strongly on the whole system as to suspend all its actions. And, if this suspension shall continue for any considerable time, the living principle being thereby extinguished, death must be the infallible consequence. I have often reasoned in the same way on that state of insensibility the body is instantly thrown
into,

into, for a longer or shorter time, by a blow on the head, without fracturing the skull, rupturing a vessel, or, from the most accurate examination, doing any apparent injury to the brain; and this effect was followed either by the recovery or death of the person, according to the violence of the blow, or strength of the body to resist its effects.

55. Indeed, every species of pain, suddenly and unexpectedly excited, has more violent effects on the system, and is always attended with greater danger to life, than the same degree of it slowly and gradually inflicted. We are then, as it were, summoned to resist its severity. For, it is in this way that the horrid executions on the wheel, and other barbarous methods of putting malefactors to death, which disgrace those countries where such execrable scenes are exhibited, show the immense degree of pain the human body is capable of bearing, when brought on gradually, and
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when the mind is prepared to repel its effects. But, even under these circumstances, this power has its limits; for there are many instances of those unhappy people dying under their excruciating torments before any injury was done to the brain, spinal marrow, or vital organs.

56. In parag. 29. to 33. I have mentioned the general effects of the passions of the mind in the production of diseases; and in the two preceding paragraphs, as well as in every case where pain exists, we have the clearest evidence that the mind is affected in proportion to the severity of the pain. This may be raised so high, as not only to suspend all the powers of the body, but even those of the mind, when death is the usual consequence. But this influence of the affections of the mind on the body, *et vice versa*, are seldom taken notice of as general or particular sympathies, though they are, perhaps, the most uniform and constant that exist in the human system.

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This must be apparent to every man who shall take the most superficial view of the consequences of violent affections of the mind, or morbid states of the body. The former never fails to bring on bodily diseases; and it is universally known that the latter are, for the most part, the original causes of various disorders of the mind.

57. In chronic diseases, accompanied with a preternatural irritability in the nerves, and a variety of different complaints, arising from a morbid mobility of particular parts, as in hysterical and hypochondriac patients, in persons afflicted with the chronic asthma, or with a fit of the gout, tooth-ach, or rheumatism, I have known these several disorders suspended for a time, when the mind has been under the influence of fear, surprise, or roused to a fixed attention to some interesting object. I have frequently observed in practice, delicate hysterical women, who, for many months, had seldom enjoyed one day's health, suddenly relieved

relieved from every complaint when a favourite child was attacked with a disease in which danger was apprehended, and they continued, in appearance, to be in perfect health during the whole course of the illness, and exhibited an unusual alertness in discharging their duty as nurses and as parents. But, when they understood that the danger of the disease was over, their former complaints gradually returned, to their great surprise ; for, from so complete a suspension of their complaints as they had lately enjoyed, and for so considerable a time, they believed themselves to have been perfectly cured. A gentleman of great courage and honour, who had become valetudinary, and subject to the asthma, by long service in India, as an officer in the land forces, told me, that, during their encampment, he was attacked with a severe fit of that disorder, which usually lasted ten or twelve days : That, upon the third or fourth day of his illness, when he could only breathe in an erect posture, and with-

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out motion, imagining that it was not in his power to move six yards to save his life, the alarm guns were fired for the whole line to turn out, because a party of the Mahrattoes had broke into the camp; and, fearing certain death if he remained in his tent, he sprung out with an alacrity that astonished his attendants, instantly mounted his horse, and drew his sword with great ease, which, the day before, he could not move from its scabbard, though he used his whole strength in the attempt. From the instant of the alarm and surprise, the debility left him, together with the asthma; nor did the disorder return till its usual period.

58. From the above instances, and others of a similar nature, where the ordinary course of a disease, or the disease itself, is suspended for a time, we have reason to believe, that, in disorders of the body, as well as in those of the mind, there is an irregular and an unequal distribution of the powers

ers of action, which seems to be rectified by a sudden and continued exertion of the powers of the mind. This exertion gives a greater stability to the nerves as conductors. Their condition is immediately changed from a morbid to a more vigorous state: The whole system acquires such a degree of strength as enables it to resist, in a surprising manner, the ordinary action of the cause of the disease. But, when this extraordinary excitement of the mind begins to languish, or ceases altogether, the cause of the disorder still existing in the body, its effect will be in proportion to the debility which has taken place in the system, on the return of its former valetudinary condition. In some cases, the disease recommences with the debility, whilst in others, there is no return for a considerable time, (parag. 41. 42.) These facts show the necessity and great use of constantly employing the mind, either by business or amusement, in the cure of certain diseases accompanied

accompanied with a preternatural irritability of particular parts.

59. As a solution of opium taken into the stomach, injected into the bowels, or applied to any part of the body, so as to have its full effect on the nerves, never fails, in proportion to the quantity used, to lessen or destroy the sensibility, and the powers of the nerves to which it is applied; and as these effects are speedily communicated, in a less degree, to the rest of the system; in like manner, when any part of the body, from its diseased state, comes to be endued with such a preternatural degree of irritability, as to be, from the slightest causes, almost in constant pain, and this for a number of days or weeks together, it has always the effect to render the rest of the nerves irritable to a morbid degree, or, to use a term in music, to bring the rest of the nerves to be more in unison with those of the diseased part than they were before. This effect of long continued
 pain,

pain, in rendering the system more irritable, is not, perhaps, so observable as the effects of opium in a contrary way. This drug, soon after its application, has its full force in lessening the sensibility of the nerves, or in destroying their power, if used in a sufficient quantity. But pain must either be long continued, or frequently repeated, or be in an extreme degree, before the system in general can be affected. Besides, as the habitual use of opium impairs the mental faculties, pain renders the mind more irritable than usual. Every one knows the irritability of a person under a severe fit of the gout; and we are disposed to apologize for an unusual peevishness and impatience in our friends on account of such indispositions as are constantly accompanied with an increased irritability of the system.

60. From this view of the action of stimuli, and the general sympathy of the system with any part of it morbidly affected,
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we have an easy explanation of the operations of poisons. Under these are comprehended, not only such substances as are, in very small quantities, deleterious to the body, but some of our best remedies, which, when given in large doses, may have all the effects of a strong poison.

61. If we want to moderate the feverity of pain, or to take off a particular spasmodic affection, in any part of the body, a dose of laudanum or opium is prescribed, suitable to the age, constitution, or habit of the patient in the use of this medicine. In a few minutes after its application to the nerves of the stomach, they become less sensible. The same diminished sensibility is soon communicated to the whole nerves, and the pain in the diseased part is proportionably abated, or entirely removed. But if we proceed in our application of the opium to the nerves of the stomach, as far as not only to suspend the animal actions in sleep, but even those of the heart and lungs,

lungs, such a quantity must put a period to the existence of the animal.

62. We sometimes meet with a patient who, from a singularity of constitution, disagrees with opium in whatever form it is given. This effect is not peculiar to opium. It extends to other substances which usually sit light on the stomach. In such people, a moderate dose of laudanum excites vomiting, headachs, and other general disorders of the body, which only happen to others when over-dosed. In such cases, and where the effects of an opiate are necessary for the removal of pain, or some spasmodic complaints, a proper dose of laudanum, mixed with a few ounces of water, should be injected into the rectum. The nerves of the rectum bear the stimulus of opium much better than those of the stomach. Hence the nerves of the rectum require double the quantity of opium requisite to produce the same effect on those of the stomach. But, when this unusual
irritability

irritability of the system is removed, the stomach acquires the faculty of bearing opium with greater ease.

63. When, with a view to the good of mankind, we examine the nature and qualities of this poison, and its manner of operating on the body, we are under the disagreeable necessity of killing dogs, and other animals. In cases of this kind, small doses, repeated at proper intervals, prevent the opium from being thrown up by vomiting, which the immediate action of a large quantity is apt to excite. This is the reason why some persons have escaped the fatal consequences of a large dose of laudanum, given by mistake, or taken by design, which otherwise must have ended in the destruction of the powers of life.

64. These circumstances of pain, sickness, and vomiting, which attend the exhibition even of small doses of opium in particular constitutions, or of large doses in those

those who have been accustomed to use it, have suggested to some the idea of a double action of the opium, namely, those of stimulant and sedative. But, when its operation and various effects are attended to, they will appear to arise either from a peculiarity of constitution, a greater or less irritability of the nerves, or from a larger or smaller degree of the same stimulus. When the stomach has become too irritable, as happens after the operation of a vomit, or after the action of a quantity of acrid indigestible colluvies, a glass of brandy will excite vomiting, which might prove a cordial to the same person at any other time. There are few men whose system possesses such strength as to resist the fatal effects of a pint of new distilled strong spirits, suddenly thrown upon an empty stomach. Most people, so bold as to hazard such an experiment, would fall down in an instant as if shot through the head, and, if not relieved by vomiting, would die soon after. This evidently shows, that the pow-

er of the nerves of the stomach may be quickly destroyed by a cordial stimulus when raised to excess, and that these effects are, by sympathy, communicated in a few minutes to the rest of the system, and produce a suspension of all action.

65. Though the laurocerasus be one of the most deadly poisons, from a stimulus *sui generis*, which, when highly concentrated by a strong impregnation of an essential oil in water distilled from its leaves, yet we know that a weak impregnation of its poisonous qualities may be used with impunity. Its leaves are boiled in milk for puddings, and otherwise employed in cookery, when the flavour and taste of bitter almonds are desired in the composition. These several articles are taken in diet without any bad consequence ; for it is only the excess of this stimulus which proves a poison, and not that small degree of it necessary to give a flavour to a dish. It ought, however, to be banished from every species
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of cookery, on account of the possibility of accidents to children and delicate constitutions: For, when taken in such a quantity as to act on the stomach as a poison, its effects are often so quickly communicated to the rest of the system, as to prevent such means from being used as might either assist in throwing it up, or in abating the violence of its peculiar stimulus on the nerves. In many instances, persons have fallen down and expired soon after it had been taken.

66. But when we examine the body after death, such is the nature of its stimulus, and likewise of most vegetable poisons, that we learn little or nothing of their manner of operating on the body. When undoubted information is received, that the deceased had taken a deleterious simple, or composition, in such quantity as is known to prove a poison to the human body; that, immediately after it was swallowed, such symptoms arose as are usually the consequence

sequence of the poison exhibited ; that these symptoms increased in violence, and continued until they produced death ; on such occasions, there can be little doubt as to the cause ; and, if part of the poison is found in the stomach and bowels, the evidence amounts to a demonstration. But, without these circumstances, in our judicial declarations, we can prove nothing from any appearance in the body on dissection : For the suffusion of blood, sometimes observed in different parts of the body, particularly about the face, neck, and breast, from the small vessels of the skin, is no more than what happens in almost every case of sudden death, and even takes place sometimes on a stop being put to the circulation, on the demise of people after chronic diseases. Neither do those slight degrees of redness, from the blood stagnating in the small vessels of certain parts of the coats of the stomach and bowels, after death, prove that any thing is unnatural or characteristic of particular poisons. All
must

must be referred to the particular operation of the poison on the nerves of the stomach, by which their power of conducting the principle of life is destroyed. Its effects are, by general sympathy, quickly communicated to the rest of the system, and produce a suspension of all action, but without making the smallest apparent alteration on the structure of the nerves or other parts.

67. What has been said in this section, on the subject of stimuli, is a sufficient refutation of the mechanical reasoning of certain authors, in their explanations of the effects of medicines and poisons on the body. For mechanical violence having a distinct and determinate operation, will vary only in its effects according to the force with which it is impelled; whereas those substances capable of producing salutary or noxious effects on the body, are known to effectuate these by inducing certain changes on the state of the nerves, which action we call stimulus. These stimuli, however,

ever, according to the nature of the substance by which they are excited, appear to be extremely different from one another, each acting in a manner peculiar to itself, or with what is called a specific stimulus : Of course, the affections of the nerves, from their application, and their consequent effects on the system, must likewise be different. It is only in this way of considering the subject, that we can have any tolerable view of the reasons why certain diseases differ from one another according to the nature of the cause acting on the body ; which, from their action on the system, produce various effects, according to the nature of the stimulus peculiar to each.

68. It is commonly imagined, by anatomists and physiologists, that every nerve, or filament of a nerve, is divested, at its termination, not only of that membrane we call a prolongation of the dura mater, but also that of the pia mater. It is necessary, say they, that each filament should be laid
bare

bare for the right performance of its office
 in the oeconomy. That the dura mater,
 which does not appear to serve any other
 purpose than to give a proper degree of
 strength and firmness to the nerves, in their
 passage from the brain and spinal marrow,
 is thrown off, will not be disputed; but I
 have, in Par. 7. given my reasons for sup-
 posing, with that able and accurate anato-
 mist Dr Monro, that every filament of a
 nerve retains, at its termination, a delicate
 covering of the pia mater, by whose ves-
 sels the cineritious and medullary part of
 the nerve is nourished, and those condi-
 tions preserved, on which depends their fa-
 culty of conveying the powers of action
 and of receiving impressions, in which they
 are variously assisted by different contri-
 vances suited to the function of the part
 where they terminate. In this way they
 are rendered capable of receiving impres-
 sions from particular stimuli which would
 not affect the rest of the body: For it is
 by a particular structure and organization
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that the nerves, originally the same in the brain, are adapted to different purposes in the system. This gives what may be called a variety of constitution to the nerves. They differ from one another according to the structure, and sometimes the mechanism, of the parts in which they terminate. Their powers are also various. In many parts they are endowed with a sensibility *sui generis*, and different from those of the rest of the body.

69. It is the most astonishing and inimitable mechanism of the eye, and of the ear, which enables the one to receive the images of objects on the retina, and the other to perceive the different modulations of the air, by its action on the delicate nervous expansion in the cavities of the internal ear. This is evident, when the sight or hearing is impaired or destroyed by an injury done to any essential part of the eye or ear; for they cannot convey to the mind a just representation of the figure and colour

colour of objects, or of the variety of sounds, when any remarkable disorder takes place in the mechanical apparatus of these animated machines. In the brain, the nerves of the eye and ear seem not to differ from each other, except in magnitude, or to possess any peculiar property which should fit the optic nerve for vision, more than the *portio mollis* of the ear; for, in many instances, we find that the same nerves are divided and subdivided for different purposes in the system. For example, from the numerous divisions of the fifth pair, branches are sent to the eye, ear, nose, tongue, teeth, lachrymal glands, to the sublingual and other glands of the mouth, and in general to the skin of the face. These several branches of the same nerve answer the different purposes of muscular motion, sensation, glandular secretion, and nutrition; at least, they assist considerably in these two last offices. The ninth pair, after giving some branches to the muscles of the *os hyoides*, forms the or-

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gans

gans of taste in the papillae rotundae of the tongue, in which its ultimate filaments terminate. To preserve the sensibility of these filaments, they are always kept moist by a constant secretion of saliva; for, when they become dry, as in some fevers, the sense of taste is in a great measure lost or perverted. Indeed, all the nerves of the body must be kept warm and moist for the preservation of their powers. The care bestowed by the author of nature, in this respect, on the organ of smelling, is truly amazing. The numerous excretory ducts, from the glands on the membrane lining the cavity of the nose, would not have been sufficient for this purpose. A great deal of moisture is carried off by the constant passage of the air in respiration: Hence the ducts from the lachrymal sack, frontal sinuses, second bone of the upper jaw, os sphenoides, and cells of the os spongiosum, all open on the inside of the nose. This organ has likewise a greater number of blood-vessels bestowed on its membranes than is to be found

found in any other part of the body. The great warmth afforded by these vessels prevents the olfactory nerve, spread over the os cribriforme and lamina of the os spongiosum, from being too much cooled by the constant application of the air, and evaporation of the secreted liquors. It is this evaporation of the moisture, with which the nose of the dog is constantly bedewed, that produces so great a degree of cold, at all seasons, in his nose, notwithstanding the immense number of blood-vessels spread through its membranes.

70. Were we to take a view of the rest of the nerves terminating in the papillae piramidales of the skin, on the internal surface of the bronchi and substance of the lungs, heart, diaphragm, pleura, inner coats of the stomach and bowels, of those going to the glands of the liver, pancreas, kidneys, testicles, uterus, bladder, parts of generation, &c. we should not be able to discover the smallest difference amongst them, except,

except, perhaps, in their manner of terminating, or rather in their acquiring a variety of powers and irritability, according to the particular organization of the parts.

This variety of irritability in different parts of the body is, to me, the most probable cause of the mobility in certain parts of the system from particular stimuli, whilst the other parts generally appear to be unaffected, unless in the way of general sympathy. It is from this circumstance we must account for the action of morbid stimuli, and of particular medicines, on certain parts of the body, which are so frequently observed in the progress and cure of diseases.

SECTION

SECTION III.

OF THE EFFECTS OF HEAT AND OF COLD.

71. **T**HOUGH it is not my intention, in this section, to proceed farther than some observations on the effects of heat and of cold on the human body, yet, as an author of considerable abilities has lately favoured the public with a treatise on animal heat, where the subject is prosecuted in the way of experiment, with great judgment and capacity as well as candour, I could wish to take a general view of the theory of this ingenious gentleman.

72. He sets out with a fact, generally known and proved by experiments, that all bodies hold, in their composition, a certain portion of fire as a principle; but that
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the quantity varies in different bodies, according to the other principles of which they are composed, their proportions to one another, their mode of union, or, in other words, according to the nature of the substance; and this fire, in a latent or quiescent state, it not being measurable by the thermometer, is called by the name of absolute heat.

73. That, when equal quantities of different substances have a given quantity of heat thrown into them, their temperature by the thermometer will appear different. For the same quantity of heat, which raises one body a certain number of degrees, will raise another to a greater or less number; and this is called the capacity of the body for containing absolute heat.

74. The Doctor next proceeds on a supposition which he endeavours to support by a number of experiments, that, when phlogiston is added to a body, it lessens its capacity

capacity for containing absolute heat, and when abstracted from it, its capacity for heat is thereby increased. Heat, therefore, and phlogiston appear to be two opposite principles in nature. By the action of heat upon bodies, the force of their attraction to phlogiston is diminished, and by the action of phlogiston, a part of the absolute heat, which exists in all bodies as an elementary principle, is expelled.

75. From the Doctor's view of the origin of animal heat, it seems to depend on a process similar to a chemical elective attraction. The air is received into the lungs containing a great quantity of absolute heat. The blood is returned from different parts of our body highly impregnated with phlogiston. The attraction of the air to the phlogiston, assisted by the heat in the lungs, is greater than that of the blood. This principle will, therefore, leave the blood to combine with the air. By the addition of the phlogiston, the air is obliged to deposite

a part of its absolute heat; and, as the capacity of the blood for receiving heat is at the same moment increased by the separation of the phlogiston, it will instantly unite with that portion of heat which had been detached from the air. But the blood, in the course of the circulation, absorbing phlogiston, and thereby having its capacity for containing absolute heat diminished, part of it, in proportion to the quantity of phlogiston absorbed, breaks out in the form of sensible moving heat, and is the principal source of animal heat.

76. This is, at least, a more plausible theory on this subject, supported by experiments, and corroborated by many phenomena in the animal oeconomy, than has hitherto been given by former writers. But, notwithstanding my partiality to this theory, arising from the great probability of its truth, yet I cannot altogether give my assent to the Doctor's way of reasoning with regard to the manner in which the
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animal heat is supported. For, allowing it to be true, that, when phlogiston is abstracted from any body, its capacity for containing absolute heat is thereby increased, I cannot perceive how the absolute heat absorbed by the blood from the air inspired, should become the source of the animal heat in the course of the circulation, at least, in the manner in which it is supposed to be done by Dr Crawford; for, in the double exchange of phlogiston from the blood for fire from the air in respiration, no increase of heat is raised in the lungs, because it is supposed, that, as the capacity of the air is diminished on receiving the phlogiston, that of the blood on parting with it is proportionably increased for containing absolute heat. But why does not the same way of reasoning apply to the absorption of phlogiston by the blood in the course of the circulation; or, as he has chiefly placed it in the vasa minima, for the fluid or substance which parts with its phlogiston, ought instantly to have its capacity for containing

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taining absolute heat enlarged, and, of course, should receive it as a principle in its composition, from that portion of the blood which has absorbed its phlogiston, and has thereby its capacity for containing absolute heat proportionably diminished? Let us rather suppose, that such a double exchange of principles, as is mentioned above, takes place in respiration, that part of the fire extricated from the air is expended in converting that quantity of moisture into vapour which is known to accompany respiration, the rest is absorbed by the blood, which, in the course of the circulation, being necessarily kept in that degree of heat peculiar to the animal, and having several fluids secreted from it, different in their nature from one another, and some of them in considerable quantities, &c. it is reasonable to suppose, that such a change from the state it possessed in the large arteries, gradually takes place, as lessens its capacity for containing absolute heat, and, of course, there will be a gradual

dual extrication of part of that fire it held as a principle in active measurable heat. This is confirmed by the Doctor's experiments, which shew that the capacity of the arterial blood for containing absolute heat, is to that of the venous as 115 to 100; consequently, the same degree of heat which would raise the venous blood 115, would raise the arterial only 100, the difference being absorbed by the latter, in the form of absolute heat.

77. In a very ingenious paper of Dr Crawford's, written with a design to inquire into the origin of that power animals possess of preserving nearly an equal temperature, when placed in intense degrees of cold, he proceeds on this supposition, that, admitting the sensible heat of animals to depend on the separation of absolute heat from the blood, by means of its union with the phlogistic principle in the minute vessels, he is of opinion that there is a certain temperature at which that fluid is no longer capable

pable of combining with phlogiston, and, of course, it must cease to give off heat. He is confirmed in this idea from observing, that, when dogs are kept in air or water heated above their temperature, for a considerable time, their venous blood becomes gradually paler and paler in its colour, till at length it acquires nearly that of the arterial, from which he concludes it to be less impregnated with phlogiston than formerly. From this hypothesis he imagines, that, in proportion to the degree of heat the blood receives, *ab extra*, above that of the animal heat, it will become less and less impregnated with phlogiston, and even goes so far as to alledge, that, when heated to a certain degree, it neither will absorb phlogiston in the course of the circulation, nor give it off in the lungs in respiration. Hence he concludes, that, when animals are placed in a temperature above their own, there will be a gradual decrease of the quantity of phlogiston absorbed from the blood by the air in respiration; and the quantity of
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fire deposited in the blood by the air will be proportionably diminished, till at last a stop is put altogether to that process of a double exchange of fire for phlogiston in respiration, and, of course, to the source of animal heat.

78. The experiments made by Dr Crawford with living and dead frogs, and afterwards with dogs, in air and in water, heated considerably above their temperature, shew evidently, that living animals possess a power, to a certain degree, of preserving their natural temperature for some time when exposed to a heated medium. But I am sorry that I cannot agree with the opinion of this ingenious gentleman, with regard to the manner in which this power is said to be produced, which he imagines is owing to the attraction of the blood for phlogiston being diminished in proportion to the degree of heat in which the animal is placed, and the time of its application. I have supposed, with some probability, in
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parag. 76. that the absorption of phlogiston in the small vessels does not take place, but that the blood itself, for reasons therein mentioned, in the course of the circulation, is gradually undergoing some change, by which its capacity for holding absolute heat is diminished. But, supposing this conjecture of mine to be a mistake, and that the arterial blood does, in the ordinary temperature of the body, absorb phlogiston during the course of the circulation, still I am not satisfied that the increase of a few degrees of heat should lessen or destroy this power. For I do not imagine that the venous blood becoming paler, and nearer to the colour of the arterial, when the body is exposed to a high degree of heat in the air, or is immersed in water, 120 or 130 degrees warm, for some time, is owing to its being less impregnated with phlogiston than before the experiment was made, and the blood was in a cooler state; this is a mere conjecture, and what cannot fairly be concluded from the experiment; but this

this we are certain of, that it has acquired a larger portion of both absolute and measurable heat, which may be the true cause of the small change brought on the colour of the venous blood under such circumstances; which opinion I embrace the more readily, from observing that the blood in the lungs becomes suddenly paler, from an absorption of fire as a principle from the air, and is a strong proof of Dr Crawford's discovery with regard to the double exchange in the lungs, as narrated above, in respiration. Neither does it appear that the quantity of phlogiston absorbed by the air from the blood in the lungs is at all diminished; for, from the increased velocity of the blood, respiration is more quickly performed; and it is highly probable, that, in equal spaces of time, a larger quantity of atmospherical air is converted into fixed air, and likewise a more considerable portion of fire is absorbed by the blood from the air, which, in its heated state, must, like all other fluids, contain more absolute heat than

than it can do in a lower temperature. At the same time, it must be observed, that this increase of fire from the heated air is much diminished by a more copious evaporation of moisture from the lungs. But I do not imagine that this can ever be so considerable as to sink the temperature of the blood in the lungs so low as the Doctor's calculation of 30 degrees, when the whole of the fire separated from the air in respiration is expended in the formation of vapour, which I do not imagine can ever be the case.

79. As I have taken the liberty to differ from Dr Crawford, with regard to the mode in which that power in animals is produced, whereby they are enabled to maintain nearly the same temperature under different degrees of heat, it is reasonable to expect I should proceed to give my own opinion relative to the manner in which this power is exerted in the animal body. This I shall endeavour to do in the following

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ing pages, though not, perhaps, with that success I could wish, in the prosecution of so important a subject.

80. From the commencement of animal life, there is, from certain operations in the oeconomy, a constant generation of heat, whilst from others, and our living in a medium below the temperature of our bodies, there is a continual consumption of heat.

81. This cannot strictly be understood to take place till after birth; for, in the primordia of animals, and, for some considerable time after conception, if the operations in the oeconomy capable of producing heat can be said to exist, they must be carried on in so languid a manner as to be altogether inadequate to the end of supporting the powers of life. By these powers, every action in the oeconomy of the foetus, as well as in that of the adult, is produced; all tending, by the assistance of peculiar laws, to the growth and perfection of the

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animal. But this want of power in the organs of the foetus, for the generation of heat, is supplied by the mother for a certain time, or until its organs has acquired a degree of strength sufficient for the due performance of their several functions. About this time the birth of the animal, respiration, and a new circulation through the lungs, take place. With the commencement of respiration, heat begins to be generated in the body, or, at least, in greater quantity than before. For it is highly probable, that the foetus, whilst in utero, depends chiefly, if not solely, on the mother for the heat it possesses, otherwise such an accumulation of it would arise as might be incompatible with the existence of life. The process of incubation is, I apprehend, sufficient to establish this observation.

82. In the rudiments of the chick, there are little or no powers capable of generating heat. It remains in the same state as when the egg was excluded, till the process of

of incubation commences, when it receives heat from the mother. This heat excites the principle of life into action. A more vigorous circulation takes place; the gradual extension and growth of the parts commence. The organs begin to unfold, to acquire strength, and, in short, this mysterious process of the growth and formation of the foetus goes on by the assistance of the heat communicated to it by the mother. During the time of incubation, the living principle every day increases in quantity and power with the perfection of the animal, and the capacity of its organs for performing its functions and generating heat, which last does, probably, not happen till the time of its exclusion from the shell. After which, the chick does not depend entirely on the mother for the production of that heat, which must always accompany and support the powers of the principle of life. Respiration has commenced, the motion of the heart, the circulation, and other operations, are carried on with

with greater vigour than formerly, and are capable, in a great measure, of generating a degree of heat equal to that of the parent. But the mother, by a wonderful instinct, as if conscious of the tender state of her children, and of the impossibility of their being kept sufficiently warm by their own powers, gathers them under her wings to cherish that vital warmth which she appears to judge them incapable of supporting, and without which they would necessarily perish. In the human species, reason and experience produce the same end. We employ the heat of the fire, warm clothes, or we lay the infant in bed with the mother. But if, during incubation, the hen leaves her nest so long as to cool the eggs a few degrees, from that period the powers of life are proportionably diminished, and a stop is put to the growth of the chick; both of which, if the eggs have not been cooled too far, are recoverable on the return of the hen, and that genial heat they receive from her body. The mother is so
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solicitous to preserve this heat, that she seldom leaves her nest above five or six minutes in the day, to take a slender repast, and when she discovers the motion of the chickens in the eggs, she then sits so close, that even the sight of food, though ever so much pressed by hunger, can scarcely prevail with her to stir from the eggs for three or four days, or until they are completely hatched. But if she abandons her nest altogether, or is killed by accident, then, as the eggs cool, the powers of life gradually decline, till they are at last totally abolished by the death of the chickens.

83. This generation and consumption of heat are so wonderfully balanced in the human species, while in health, notwithstanding the great variation in the temperature of the air, the differences of climate, seasons, situations, and vicissitudes of the weather, that an opinion has been entertained, that the living body possesses a power of resisting, for a certain time, any addition of
heat

heat to that healthful standard established by nature, or any diminution of it, when the body is placed in a temperature considerably above or below its own. In support of this idea many interesting experiments have been made *, and by so great a number of gentlemen of abilities and candour, as must render it extremely difficult to take a different view of the operation of air heated above our temperature, from what has already been given by so many respectable characters. But, notwithstanding their high credit with the public, I cannot implicitly assent to the conclusions drawn from their experiments, that the living body possesses a power of resisting the effects of heat, or of destroying it, when placed in an air heated greatly above its own temperature. It must be allowed, that the principle of life possesses, in various ways, most amazing powers; but that it should be endowed with a property of obstructing

* Phil. Transf. vol. 65. pag. 111. 463. &c.

obstructing the ordinary effects of heat, or of destroying it, is a faculty of so singular a kind, that I doubt much if it can possibly exist in nature. Neither does it appear, from the experiments instituted in proof of this opinion, that any such power was exercised, at least, in the manner in which it has been said. Nor is there any necessity for having recourse to such ambiguous assertions, calculated more to raise our astonishment than to give us the smallest information relative to the manner in which this wonderful effect is produced in the living body, which, I apprehend, will admit of as satisfactory an explanation as can be given of most of the operations in the animal oeconomy.

84. The exercise of the full powers of the living principle appears to depend on a certain degree of heat in the animal, which nature seems to have fixed in the human species at 96, 97, or 98 degrees of Fahrenheit. It varies a degree or two in different

different constitutions; but seldom rises above 98, except in morbid states of the body. This standard point of heat nature endeavours to adjust with great precision, because every deviation from it is constantly accompanied with a proportionable decline of the powers of life. To accomplish this balance of heat and cold, and, of course, to prevent any remarkable change in our temperature, various actions are, by turns, excited in the body for the production of heat or cold, and for that degree of either which best corresponds with the exact regulation of the standard heat. For the actions excited in support of this indispensable law in the oeconomy, will always be carried on with a degree of vigour proportioned to the strength of the stimulus applied, or the precise manner in which our system is affected by the excess of heat or of cold.

85. In a temperate air, an expression which will admit of some latitude with regard

gard to the difference of constitutions, and the inhabitants of different climates, these operations are carried on with so much ease, that we do not perceive the smallest fatigue from their continued action. On the contrary, our strength and spirits are good, and we enjoy an alacrity of mind and body which does not accompany the extremes of heat or of cold; because, in the one case, the refrigerating power of the air, a gentle perspiration, and the evaporation from the lungs in respiration, are sufficient for carrying off that surplus of heat which would otherwise accumulate in the body. But, in an air extremely hot or cold, a certain degree of violence is exerted on the body, and the system is excited to such actions as correspond with the nature of the stimulus, which may be so violent as even to exhaust the whole powers of life in a very little time. It is only in this way we can take any tolerable view of the manner in which the living principle occasionally exercises this wonderful power of resisting,

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or rather obviating the effects of such degrees of heat or cold in the air as are considerably above or below that temperature, which serves as a balance to the powers of generating heat, when this process is not excited by any violent stimulus, but is carried on with ease, and without fatigue, by the natural stimuli of the system. Although, therefore, we may say, with those learned gentlemen, that the living body is endowed with a power of obviating, for a certain time, the effects of heat, when placed in a temperature considerably above its own, yet we cannot assent to the opinion that it possesses a power of resisting that known property of heat by which the excess of it, in every heated substance, is diffused through the surrounding bodies. But I imagine the fairest method of deciding this case, would be to take a view of the effects of the external application of heat to the body, as was practised in these experiments; and, in this way, we shall have an opportunity

opportunity of making some remarks on the principal facts which attended them.

86. The application of heat to the body never fails to quicken the pulse, and to increase the perspiration, in proportion to the degree of it applied, whether the body be exposed to a dry or moist air, but especially to the latter, which so remarkably relaxes the solids, and particularly the secretory vessels of the skin.

87. By the heart and arteries being thus stimulated to a more frequent and vigorous repetition of their motions, there is an unusual production of heat in the fluids, from an increase of the powers by which it is generated, the quantity of heat extricated from the blood corresponding in a remarkable manner with the velocity and force of the circulation. For, whether the circulation be accelerated by exercise, or the external application of heat, there is a proportionable production and increase of it ;
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and, were it permitted to accumulate, would soon rise considerably above the animal heat. The consequence of this accumulation would be an extinction of the powers of life, and of the functions depending on them; for life can only exist for a short space, when heated to any remarkable degree above its natural standard. But the same infinite wisdom which created and animated our machine, has instituted certain laws or regulations in the oeconomy, for its preservation, as appears most evident when the vascular system is stimulated in the manner above mentioned. For, from the increased motion of the blood, and the relaxing effects of heat, a sweat is produced, proportioned to the cause exciting it, which contributes considerably towards carrying off the surplus of heat. But, as Nature, while the body is in health, diminishes not her powers in fruitless exertions, no sweat is excited till the body is heated some degrees above its usual temperature, or is raised to what may be called the sweating point.

point. And as life could not exist any considerable time under a farther accumulation of heat, this addition to the ordinary quantity, proves a stimulus to the system, sufficient for the production of sweat, which is the principal means employed by Nature to carry off the superabundant quantity. In this way, an exact balance is nearly kept up between the generation and consumption of heat; for the refrigerating effects of perspiration must be more considerable than is commonly imagined, since it appears from the calculation and authority of two very able and accurate men in philosophical experiments *, that 800 degrees of heat are necessary for turning water into vapour in distillation, supposing the whole to be in an active state.

88. When any substance is exposed to such high degrees of heat as were used in the

* Dr Black Prof. chem. univ. Edin. and Dr Irvin Prof. chem. univ. Glas.

the above experiments, this heat must flow into the substance with a velocity proportioned to the conducting power of the medium and the capacity of the body for receiving it ; consequently, any substance of so loose and spongy a texture as the human body, must receive heat, conducted by so rare a fluid as air, in a very slow manner, especially if the person be surrounded with woollen clothes, which are very bad conductors of heat. Besides, we ought to consider the great bulk of the human body, which, when placed in air heated even to the boiling point of water, must, supposing it to be a mass of inanimate matter, require a considerable time before it can be heated throughout only a few degrees above its natural temperature ; but, as an animated body, from the instant of the application of this uncommon warmth to its surface, Nature is employed in counteracting the effects of the heat, by the refrigerating process of sweating, and the consequent

quent expenditure of heat in the formation of vapour.

89. We may estimate the volatility of fluids by their power of attracting the element of fire as a principle, in the formation of them into vapour. How soon does the mercury in the thermometer cool by the ball being kept wet with caustic spirit of sal ammoniac, or vitriolic aether? And the degree of cold that may be produced in this way has been sufficiently shown by the learned and ingenious Dr Cullen*. It is true that water, which I consider as somewhat similar to the matter of perspiration, is much less volatile than the fluids just mentioned. As it attracts the heat from the air, but more particularly from the body with which it is in contact, more slowly, it is longer in acquiring the form of vapour. Notwithstanding its effects in cooling the bodies from which it is evaporated is considerable, witness the
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* Physical and Literary Essays, vol. 2. p. 145.

ice found in the morning on linens hung out to dry during the night, with the temperature of the air at 40° , the practice in cooling wine in warm countries, by hanging up their bottles in wet clothes to the sun, to expedite the evaporation, the cooling of the wine going on in proportion to the quickness with which its heat is abstracted by the vapour. We may also take notice of the manufactures of ice in certain districts of India, where the thermometer was never known to sink so low as the freezing point*. I should not have insisted so much on the effects of evaporation, had I not considered it as a material circumstance in examining the effects of heated air on the human body, which, sooner or later, according to the degree of heat it possesses, produces, in the manner above mentioned, a sweat, and consequent evaporation from every part of the body. Not that the whole of the matter perspired is turned into vapour; it is only such a portion.

* *Philos. Transf.* vol. 65. p. 252.

tion of it as can readily absorb the necessary quantity of heat from the body and external air, which will be in proportion to the degree of heat they possess, the rest running in drops off the body, or is absorbed by the clothes, part of which is afterwards evaporated from them : And as every body must become colder, from whose surface an evaporation is constantly kept up, whatever the degree of heat in the air may be, I can see no reason why the living body should be an exception ; for, were it not on account of the source of internal heat with which it is endowed, it would no doubt be subjected to the general effect of evaporation, which is to rob all bodies of a quantity of heat proportioned to the degree with which this process is carried on.

90. When the air is of that particular temperature, which, with the assistance of other operations in the oeconomy, is just sufficient for carrying off such a quantity

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of the heat generated in the body, that the remainder shall exactly support the animal heat, we say such an air is mild, or it is temperate; because we are not sensible of any troublesome degree of heat or of cold. This precise temperature varies in different people, according to the climate, age, and constitution of the individual; but at whatever point of the thermometer this temperature may be, if it rises or falls a few degrees only, we then complain of heat or of cold, and employ various ways of obviating their disagreeable effects. Though the heat be much below the temperature of our bodies, we feel it warm, partly from that facility with which experience teaches us readily to compare one degree of heat with another, but chiefly from an instantaneous retention of part of the heat generated, which used to be carried off by the cooler air. From the moment this commences, our pulse begins to quicken, a more free perspiration succeeds; and, if a further accumulation takes place, a sweat is brought on,

on, proportioned to the stimulus, from the excess of heat. In such a situation, in rooms accidentally over-heated by fires, or by a croud of people, though we often bear the heat for some time without much inconvenience, yet if we remain long in it, or if it increases, it never fails to bring on more or less of debility and languor, as was evidently the case with those gentlemen formerly mentioned, who submitted themselves to such high degrees of heat. They mention this circumstance, as well as a shaking of their hands, and other symptoms, all tending to prove, that, during the time they remained in these heated rooms, there was an unusual exertion of the powers of life in obviating the effects of heat, in the manner already explained; which also shows that these powers are limited, and may be totally exhausted by an over exertion of them, occasioned by an excess of stimulus.

91. Notwithstanding the means used by nature for the exact regulation of the animal heat, we find, that, when the body is exposed to such an high temperature of the air, as shall, in eight or ten minutes, quicken the pulse to double its usual number, so violent and rapid a circulation must produce such a degree of heat as cannot be altogether expended in the manner above mentioned ; of course, there will be an accumulation of part of the heat generated. This, according to the accounts given us by those ingenious gentlemen Doctors Blagden and Dobson, raised the thermometer several degrees above the ordinary heat of the body ; for, in the case of the delicate young man, narrated by Dr Dobson *, after being exposed to a heat of 224° , his body raised the thermometer to 102° . But these few degrees above 97 or 98° by no means indicate the full quantity of heat accumulated. They only show the measure of sensible

* Philosoph. Transf. vol. 65. p. 463.

fenfible heat acquired by the blood, but not the quantity of fire abforbed by it as a principle, under which form, like all other principles, it lofes the obvious qualities it poffeffed in a feparate ftate ; of courfe, it gives no addition of heat to the blood, and is therefore faid to be in a latent or quiefcent ftate. But, to eftimate the quantity under this form, correfponding to the rife of a certain number of degrees of meafurable heat in the blood, would require a feries of nice and accurate experiments, which my time at prefent will not permit me to enter upon. Neither am I very folicitous on this head, as it may be fufficient, for a further illuftration of my fubject, to obferve, with that very accurate philofopher Dr Black, in his excellent courfe of Lectures on Chemistry, that the fluidity of all bodies depends on a certain portion of the elementary fire, which they hold as a principle in their compofition, and confequently is not meafurable by the thermometer ; that the quantity varies widely in different fluids, but

but in the same fluid is, in a great measure, in proportion to the heat it contains in an active state, though not exactly so; for, as I have elsewhere observed, no fluid that I have ever yet tried, appears to rise in its temperature, when placed in a sand heat or water bath, with a precise regularity. The increase of the sensible heat, indicated by the thermometer in equal times, varies a little almost in every observation. This irregularity in heating is greater in some fluids than in others; and I likewise suppose, that the same irregularity takes place with respect to the quantity of fire it receives as a principle. Thus, water at 50° does not contain so much heat in a latent state as that whose temperature is raised to 70° ; and so on until we bring it to boil, at which point it has received the largest quantity of heat, as a principle, it is capable of retaining. It then begins to rise more copiously in the form of vapour, which carries off any addition of heat that may be thrown into it after it arrives at the boiling

boiling point of 212° . But, when this water is removed from the fire, and placed on the ground, as it imparts its excess of heat to the air and surrounding bodies, and of course every instant becomes colder, it also gives out a proportionable quantity of its latent heat, which, by immediately assuming the form of active measurable heat, in some degree keeps up the temperature of the water, by supplying the place of part of the sensible heat carried off.

92. From these facts, it is easy to perceive the reason why the same quantity of different fluids, contained in similar vessels, and exposed to the same degree of heat or cold, rise or fall in their temperature, with very different celerities. Water heats and cools much more slowly than mercury. But these and many other phenomena relative to the history of fire, not being so immediately connected with our subject, I shall only farther observe, that the rapid circulation brought on by the stimulus of an

an excess of heat in the above experiments not subsiding to its usual standard in less than two hours, and the persons on whom the experiments were made not feeling any disagreeable sensation from the cold, on exposing themselves to the air cooled some degrees below the freezing point, must be entirely owing to the accumulation of heat, both in a sensible and latent state; and, as the air is but a slow conductor, especially when our bodies are covered with woollen clothes, we must suppose that the excess of heat is very gradually carried off. Besides, as it escapes slowly, the latent heat, for the reasons already mentioned, breaking out in an active state, must somewhat retard the cooling of the body, which is further impeded by the briskness of the circulation. For, although its velocity is observed on such occasions sensibly to decrease every two or three minutes; yet, in proportion to its deviation from the usual standard of the person, in point of quickness, there will be a proportional generation of heat in the blood

blood above its natural quantity, in so far as this may depend on the state of circulation for its production.

93. The frequent colds which have been caught by people who have been over-heated by exercise, remaining for a considerable time in warm rooms, drinking freely of warm punch, or other exhilarating liquors, and afterwards exposed themselves to the air in cold weather, have very properly created a general precaution against the bad effects of cold air on such occasions. Most people are, from experience, satisfied that, if they could be speedily moved, without losing much of the heat they have acquired, to their houses, where they might have an opportunity of cooling gradually to their natural standard, the danger of a catarrh would be obviated. This end they endeavour to accomplish by an addition of warm clothes, getting into carriages, sedan chairs, or by walking briskly home, where warm pediluvia, &c. are also of use; by

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which means, the heat of their bodies being in a great measure preserved, they are more ready to escape with impunity. For, by whatever means the pulse is quickened, and the body heated beyond what is natural to the constitution, during the time they remain in this state, there is a proportional exertion of the powers of life above what is commonly expended in cooler conditions of the body ; the consequence of which is, that the excess of heat being carried off, more or less of languor succeeds, until the strength is recovered by rest or some cordial drink. For, after the body has been kept unusually warm for some time, if cooled suddenly, the circulation and heat are apt to fall below what may be called par. In such a situation, our system not being so capable, as at other times, of resisting the effects of cold air ; such a morbid affection of the body takes place, as usually precedes the accession of a catarrh. Hence we may conclude that method to be the best, for the prevention of colds in persons over-heated, which

which shall most effectually provide against their cooling too suddenly, and, at the same time, maintain a proper degree of strength in the circulation until the body recovers its diminished powers, and returns to the state it possessed before it was over-heated. But, when the heat is so greatly increased as to raise the pulse nearly to double its usual number of beats in a minute, as was the case with those persons who subjected themselves for some time to such high degrees of heat, there can be little or no danger of a catarrh in walking home, even to a considerable distance, in the severest frost; especially if unaccompanied with much wind, or a fall of snow. But, in so still an air as commonly attends intense frost, there is little hazard of so great an excess of heat being soon carried off; and as every considerable deviation from the standard heat is always attended with more or less uneasiness, the cool air, when one is so much over-heated as those gentlemen were, must rather

rather be agreeable and refreshing than otherwise.

94. From this view of the effects of heat applied to the body, or accumulated in it, by an accelerated circulation, it is easy to comprehend the reason why, in fevers, when the heat of the body is much increased, the powers of life are thereby greatly diminished. The heat at this time has undoubtedly a greater effect than usual, from the general debility of the body, occasioned by the long continued action of the cause of the disease, &c.

95. In support of the same law in the system, by which a certain quantity of heat must be maintained, and no more, the living body is endowed with a power also of resisting the effects of cold to a certain degree. We can live a considerable time in an air cooled greatly below the freezing point, without injury to the body, or the smallest decrease of its standard heat.

96. When the papers containing experiments and observations in heated rooms were presented to the Royal Society, in which it was supposed that the living body possessed a power of resisting heat, or of destroying it, when placed in an air greatly above its own temperature, Mr John Hunter of London, whose literary pursuits have contributed so considerably to the advancement of natural knowledge, recollected some experiments made by himself in the year 1766, with a view to determine the question, whether an animal could retain life after it was frozen, as had been confidently, but falsely, asserted with regard to fishes and snakes; and, recalling to his remembrance certain circumstances attending these experiments, he imagined that he discovered an opposite power in animals, by which they are capable of resisting any external cold applied to them while alive, by generating within themselves a degree of heat sufficient to counteract the effects of cold. The dormice, carp, and other

ther animals, subjected by him to the severe cold of a freezing mixture, maintained, for a considerable time, a quantity of heat sufficient for the continuance of life. They were at last frozen. But these experiments were always attended with the complete death of the animals. The great variety of temperature which the more imperfect animals are capable of bearing must contribute considerably towards the strong retention of life they possess in very low degrees of heat. On which occasions, when they find their powers begin to fail, and their torpid state to advance by the gradual approach of the winter's cold, they, from instinct, crawl into holes in the earth, crevices of rocks, hollow trees, or coil themselves up under dried leaves, by which they are sheltered from the severity of the frost. But, even in this weak state, when their powers are greatly diminished, they generate in themselves a quantity of heat, which although small, yet being constant, appears to be sufficient for arresting, as it were, the principle

principle of life, and counteracting the effects of the external cold, until the returning warmth of the spring gradually removes their torpidity, and increases their vital and animal powers. This is, no doubt, the effect of the slow application of cold to the bodies of all animals subjected to torpidity in the winter. But, when a severe cold is suddenly applied, as in the above experiments, the great force of the stimulus on the system excites, for some time, the most violent agitations, which increase the internal heat of all animals; for, such as passively submit to the cold are sooner frozen than those who struggle against its action with a steady and vehement action of their bodies. But, at last, when much weakened by the continued exertion of their powers, their motions become more and more languid, the internal generation of heat lessens with the diminution of their strength, and the quantity of heat conducted from them being still considerable, and in proportion to the cold of the freezing mixture and the remaining

remaining heat in their bodies, that genial warmth, which must always accompany the exertions of the principle of life, continuing to decrease, both are in the end completely exhausted. This, I imagine, is nearly the truth with regard to the operation of cold on animal bodies, which is farther illustrated by what I formerly remarked concerning the powers of the living body in resisting the effects of heat. But I am far from supposing that the subject is exhausted; for, the laws of the animal oeconomy being so little known, it is highly probable, that the firm and steady retention of life, in animals exposed to intense cold, may partly be owing to some other cause with which we are still unacquainted.

97. With regard to the operation of cold on the more perfect animals, and especially on the human species, all of them have the power of resisting, to a certain degree, the effects of cold. When the human body is acted

acted upon by any air cooled several degrees below the freezing point, it still preserves its temperature. In this, it is assisted by a diminished perspiration, which increases the internal heat, and by the stimulating property of the cold when accompanied with exercise. However, when a person is long exposed, without motion, to such a degree of cold, the natural warmth of the extremities of the nose, the ears, &c. will be diminished, and the powers of life and action in them keeping pace with this diminution, the cold, at last, arrives at that point which must terminate in the extinction of life in those parts. But, as the great source of life, sensation, and motion, originates from the brain, cerebellum, and spinal marrow, the complete death of the body will not happen until these are likewise cooled below the natural standard. Or, what I rather suppose must take place on such occasions, as the natural warmth of the extremities and other parts decreases, the great principle of life, inherent in the brain, cerebellum, and

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spinal

spinal marrow, will be proportionably weakened, and this diminution of strength will go on nearly in a reciprocal ratio of the extent of the body so cooled, (parag. 18. and 19.) until the principle of life is totally abolished. This probably happens before the brain, cerebellum, and spinal marrow, are cooled much below their natural temperature. After which, the body having lost, with the vital principle, all power of resisting the effects of cold, it will as soon as any other dead matter of equal warmth, bulk, and solidity, assume the temperature of the circumambient air.

98. It may be farther remarked, that when the body of an animal, or a part of it, is cooled considerably below its standard heat, at that instant a gradual decline of the powers of the principle of life commences, and proceeds till they are totally extinguished. But, if we seize the opportunity before the complete death of the body, or any of its parts, and at a time when the living principle

principle is still capable of being stimulated into action, we may, by the gradual and slow restoration of its natural heat, recover the parts, apparently dead, to their former healthy condition. In such cases, the powers of life and the heat of the body seem to keep pace with each other. The former may be slowly recovered by a gradual admission of heat. But, if this balance be suddenly destroyed by an indiscreet application of a disproportionable quantity of heat, the living principle will be so strongly excited into action, as to exhaust its powers, and may occasion death before that mysterious operation in the oeconomy can take place, by which it increases in quantity and in power, as happens when the heat thrown in is more exactly proportioned to the diminished powers of the living principle. It is also evident, from the same facts, that a certain degree of heat not only cherishes and supports the powers of the living principle, but is likewise a chief cause of
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of that union which subsists between it and the body.

99. From the preceding paragraphs will appear the necessity of regulating the heat of the body, in the cure of certain diseases, to that standard established by nature, and which so invariably accompanies a state of health, by such means as may best suit the degree of strength possessed by the living principle. In feeble states of the body, a certain balance must be kept up between the strength of the actions of life, and the languid condition of the living principle; for, if these vital motions are, on such occasions, excited with violence by strong stimuli suddenly applied, this balance is destroyed, the powers of life are exhausted by these vehement motions, and death ensues. But, if the actions of the lungs, heart, &c. are brought on slowly, and by such gentle means as best correspond with the low state of the living principle, they will, in certain cases, gradually gather strength,

strength, until vigour is restored to the system.

100. Notwithstanding what has been said concerning this heat, which nature seems so strongly inclined to regulate with precision, yet we find, that the African, from habit, can bear with ease, nay even with indulgence, such a degree of heat as the Greenlander would be ready to sink under: But the Greenlander, from the same cause, can endure, without the smallest inconvenience, such intense cold as would chill and benumb the inhabitant of the torrid zone, so as to endanger his existence. Indeed, people who move from their native soil to distant climates, are more liable to the disagreeable effects of the excess of heat and of cold, and to the diseases that result from them, than the natives. On such occasions, the exercise given to the living principle, in maintaining the standard point of heat, is always attended with an uneasy sensation in the body,

dy, and a strong desire to remove it as far as in our power. It is generally observed, that, when either of these two stimuli act remarkably on our system during the night, our rest is disturbed: For every one knows, that, if a person in winter goes to bed with his legs and feet cooled but a few degrees below the animal heat, he cannot possibly get into a sound sleep, until, from the confinement of the heat of his body by the bed-clothes, his natural warmth returns. And if, in summer, or at any other time, whilst we are in bed, such a degree of heat shall arise in our body, as excites the powers of life in any remarkable manner to resist its effects, it then, for the most part, proves such a disagreeable stimulus as to deprive us of rest, until, by exposing part of our body to the air, or getting out of bed, this accumulation of heat is taken off*.

101.

* On the 26th June 1782, I was called out, at one o'clock in the morning, to visit a gentleman's child about

101. In warm climates, we endeavour, by cool air, cool drink, acid fruits, and a variety of contrivances, to reduce the temperature of the air, or of our bodies, such as light thin dresses of linen, cotton, and silk, open and opposite windows and doors, jalousies, piazzas, &c. In such situations, violent exercise and high living are dangerous and hurtful to the constitution. In the cold and frozen regions of the north, we are prompted and even necessitated, for the same end of regulating our internal heat,

about seven weeks old, supposed to be dying of a spasmodic asthma; but, knowing that the thermometer stood at 76° , and observing the child's night-dress and situation to be a great deal too warm, I judged the heat alone to be the cause of his debilitated state, and of the considerable difficulty in breathing he then suffered. Nor was I wrong in my conjecture; for, by dressing the child in a lighter manner, and exposing him to a cooler air, with a sheet only as a covering when in bed, the wheezing, panting, and asthma gradually went off, and never returned. On such occasions, after the children had, in some degree, recovered from their debilitated state, I have found the washing them with cold water of great use in speedily restoring their powers.

heat, to have recourse to warm dresses of woollen cloth and furs, to sleep between feather beds, and the houses in these regions are kept constantly warm by fires or flues. A more free use of animal diet and strong liquors is indulged in with impunity; and exercises in the field and otherwise are not only useful but necessary for all ranks of people. But if, in both cases, the principle of life is under the necessity of exerting its powers in support of this law in the system, by which a fixed uniform point of heat is endeavoured to be kept up in it, then we must conclude that climate to be best suited, not only for the preservation of health, but for raising and supporting the mental faculties in the utmost extent of their powers, where the quantity of heat generated, and that of its consumption, shall, by a certain temperature of the air, be so balanced as to give the least exercise to the living principle in resisting the increase or diminution of heat, to which there

there must be a tendency in warmer or colder situations.

102. This fact is illustrated in the most satisfactory manner, by the learned and ingenious Dr Robertson, in his excellent history of America, where, in taking a view of the effects of climate on the human body, he, with his usual judgment and sagacity, observes, ‘ In contemplating the inhabitants of a country so widely extended as America, great attention should be paid to the diversity of climates under which they are placed. The provinces of America are of such different temperament, that this alone is sufficient to constitute a distinction between their inhabitants. In every part of the earth where man exists, the power of climate operates with decisive influence upon his condition and character. In those countries which approach near to the extremes of heat or cold, this influence is so conspicuous as to strike every eye. Whether we consider

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‘ man

‘ man merely as an animal, or as a being
 ‘ endowed with rational powers, which fit
 ‘ him for activity and speculation, we shall
 ‘ find that he has uniformly attained the
 ‘ greatest perfection, of which his nature is
 ‘ capable, in the temperate regions of the
 ‘ globe. There his constitution is most vi-
 ‘ gorous, his organs most acute, and his
 ‘ form most beautiful. There, too, he pos-
 ‘ sesses a superior extent of capacity, great-
 ‘ er fertility of imagination, more enterpri-
 ‘ sing courage, and a sensibility of heart
 ‘ which gives birth to passions not only ar-
 ‘ dent but persevering. In this favourite
 ‘ situation he has displayed the utmost ef-
 ‘ fects of his genius, in literature, in poli-
 ‘ cy, in commerce, war, and in all the arts
 ‘ which improve and embellish life.

‘ This powerful operation of climate is
 ‘ felt most sensibly by rude nations, and
 ‘ produces greater effects than in societies
 ‘ more highly polished. The talents of
 ‘ civilized men are continually exerted in
 ‘ rendering their condition more comfort-
 ‘ able ;

'able ; and, by their ingenuity and inven-
 'tions, they can in a great measure supply
 'the defects, and guard against the incon-
 'venience, of any climate. But the im-
 'provident savage is affected by every cir-
 'cumstance peculiar to his situation. He
 'takes no precaution either to mitigate or
 'improve it. Like a plant, or an animal,
 'he is formed by the climate under which
 'he is placed, and feels the full force of
 'its influence *.' In the succeeding pages,
 this elegant writer goes on to remark, that
 although moral and political causes, with
 certain habits and customs derived from
 them, have wonderful effects in forming
 the dispositions and characters of indivi-
 duals, as well as of nations ; yet that the
 influence of climate is more universal on
 the inhabitants of rude nations, unac-
 quainted or unpractised in the arts of ob-
 viating its effects, which, in many situations,
 may be in a great measure effected. He
 divides

* Vol. I. p. 414.

divides the natives of America into two distinct classes; the one inhabits the temperate, the other the torrid zones, on both sides of the line. He says, that the human species in the former appears manifestly more perfect: That the natives are more robust, more intelligent, more active, and more courageous. They possess, in the most eminent degree, that force of mind and love of independence, which are regarded as the chief virtues of man in his savage state. These natives accordingly, though surrounded for several centuries past by polished and hostile nations, have hitherto maintained in a great degree their freedom and independence: But the other class, from the debility of their mind and body, their inactivity, want of courage, and of that independence which characterises those living in the more temperate climates, have become so dependent as to be in some measure in a state of slavery to those nations, who, for the sake of mines and commerce,

merce, have taken possession of their territories.

103. In this section we have hitherto been contemplating that wonderful law in our system by which a certain degree of heat is, at all times and seasons, endeavoured to be maintained in the body. On this equality of heat, the free exercise of the powers of action in every part, and to the utmost extent in which they are capable of being exerted, seem chiefly to depend. We have also observed, that, in the various vicissitudes of situation, with regard to the operation of heat or of cold upon the body, this constant and uniform regulation of the animal heat is carried on by the powers of the principle of life. That the expence of this vital principle in exciting such actions as may best counteract the effects of heat or of cold on the body, must always correspond with their excess, their time of application, and the habit of the person to a particular temperature. But, in all cases
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where the exact balance between the generation and consumption of heat is not carried on, there must be a proportionable debility brought on the system, from the waste of our powers in support of the above regulation, which may have other effects on the health of the person than those mentioned in this section. For debility is always attended with such a proportional increased irritability as induced the learned M. de Haller to consider these words as synonymous, unless the debility arises from a paralytic affection; and we may reasonably suppose other alterations to take place in the oeconomy, from a penury of the powers of action, which must vary in different people, according as they may be exposed, for any considerable time, to an excess of heat or of cold. From this last circumstance, they must be subjected to such complaints as are the consequence of a diminished perspiration and languid circulation in the extreme vessels, which conditions in the body being conjoined to our
 living

living on putrid or salt provisions, and breathing a foul and confined air, I consider as the most active causes in the production of the true scurvy.

104. On the other hand, when debility arises from the long application of an excess of heat, as happens to Europeans for some time after their arrival in any of the countries between the tropics, or until nature has, by degrees, accommodated herself to the heat of the climate, such changes must take place in the system as will expose the person to those diseases which are known to arise from an excess of heat and an accelerated circulation. These have an evident tendency to relax the solids, to produce a redundant quantity of bile, and to increase the putrescency of our fluids, with such other alterations in the system as are capable of producing bilious and other fevers, as shall afterwards be more particularly observed.

SECTION

SECTION IV.

OF FEVERS IN GENERAL.

105. **A**S fevers, and their consequences, constitute by much the greatest part of the diseases of mankind, every attempt towards a farther investigation of the nature and cause of them, when prosecuted with any degree of success, must be of the utmost importance. This subject has employed the pens of so many ingenious and learned men, from the age of Hippocrates to the present time, that, to offer any thing farther on this head may have the appearance of a disapprobation of their theories and doctrines concerning the cause of fever. This charge is the greatest difficulty I have to encounter. On which account I shall
proceed

proceed with the utmost caution on this subject, which is so much involved in obscurity. For physicians have not given that attention to the internal oeconomy of our system which the importance of the subject required. Hence our progress in this branch of knowledge, so necessary for comprehending the operation of the causes of diseases on the body, has by no means kept pace with the other improvements in medicine. We remain, at this day, in great ignorance of the animal oeconomy, partly owing to the difficulty of the subject, but chiefly to those ingenious hypotheses and subtile theories of authors, which are so apt to please and bewilder the imagination. If we would add any thing to the little we know of this interesting subject, it must be by a faithful record of facts and observations. This, fortunately for the present publication, does not require so much genius as accuracy and candour in the relation of facts. Conscious of my inability to discuss these particulars as the importance

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of them demand, I have, upon the whole, abridged my reflections, and omitted some facts of a doubtful nature, until farther experiments and observations shall confirm their existence in the oeconomy. But to compensate, in some measure, this penury of principles, the history of the diseases themselves, and of some particular cases, may serve as so many experiments towards an investigation of the real nature and cause of them. In this way we hope for some success in our attempt to explain the general causes of fevers, which may be comprehended under the following heads: 1. Excess of cold. 2. Excess of heat. 3. Marsh miasma. This last is often conjoined with the two former, but more especially with excess of heat, in the production of fevers. 4. Human contagion. 5. Specific contagion. The three last have their virulence heightened in proportion to the degree of heat and moisture which have accompanied their production, or subsisted during their action on the body.

106. The remote or predisposing, and the occasional causes of fevers, have been amply treated of by almost every author who has written on fevers, and by several of them in a most satisfactory manner. But, with regard to the proximate cause, or the nature of that particular stimulus, by which the accession of a fever is brought on, these authors have not been so explicit. Many who have eminently distinguished themselves, as well for their extensive practice, as for their genius and learning, have spoken of an explanation of the proximate cause of fever as a thing rather to be wished for than expected from the present state of our knowledge with respect to the internal oeconomy of the system. The late Sir John Pringle, whose abilities as a philosopher and physician gained him considerable reputation, when treating of this subject in his observations on the diseases of the army, says, ‘ Thus far we have endeavoured to trace the remote, the predisposing, and the occasional causes of
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‘ these fevers, and it were to be wished, that,
‘ with the same probability, we could ex-
‘ plain the *causa proxima*, or immediate
‘ cause, that is, could show how these viti-
‘ ated humours act upon the vital principle,
‘ so as to excite a fever of a remitting or
‘ intermitting form, accompanied with such
‘ symptoms as mentioned above. But, in
‘ these researches, as so much depends on
‘ the action of parts which have laws pe-
‘ culiar to themselves, and are imperfectly
‘ known, it seems better not to form an hy-
‘ potheses at present, but to wait till far-
‘ ther discoveries be made in the animal
‘ oeconomy*.’ It is, no doubt, by a more
particular intimacy with these laws, or, at
least, with as many of them as can, from
faithful observations, be made evident, that
we can ever expect to arrive at any real
improvement in the knowledge of our in-
ternal oeconomy, and of the manner in
which the causes of diseases act on the sy-
stem.

* Quarto edit. London, 1765, pag. 186.

tem. This is the plan which I shall endeavour to prosecute, and what I wish to recommend in the strongest manner to those who may have more abilities and time for such inquiries.

107. Many are the ingenious theories which have been successively published, from the most early ages of physic, to this day, relative to the proximate cause of fever. Each of them has had its votaries, who have supported its credit for some time, but has, at last, been obliged to give way to others more novel and more suited to the prevailing doctrine, or the state of medicine. This has been uniformly the fate of almost every hypothesis explanatory of this point in ancient or modern authors, principally from the neglect of a regular inquiry into the nature and properties of the living principle, of the power of the nerves in conducting it, and of various sympathies arising in the body, from the application of different stimuli, especially
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to the skin, stomach, and bowels, where their operation, in many cases, is so gradual and so slow as not to be easily perceived until some considerable change is brought on the system. This is, perhaps, the method which ought to have been adopted for obtaining a regular progressive improvement in the knowledge of diseases and their causes. But the philosophy of the ancients was so exceedingly limited with regard to the animal oeconomy, that they had not data sufficient for the prosecution of such a plan. And the moderns, notwithstanding their superior advantages, have, in general, either neglected it altogether, or proceeded so feebly as to afford us very little benefit from their labours. It is true, since the time of Doctors Stahl and Hoffman, the study of the human body as an animated machine, has been more cultivated than formerly, and, of course, the effects of the passions and affections of the mind on the body, and of various stimuli applied to its nerves, are now better under-

understood. But, notwithstanding this favourable turn to our medical philosophy, we have not made such advances as might have been expected. It is an evident defect in this species of knowledge which leads the practical physician unavoidably into empiricism*. For, in many instances,
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* Here I must not be understood to annex any disrespectful idea to the word *empyric*, notwithstanding a number of low, illiterate, and, I may say, dangerous men, who vend their nostrums to patients they never see, and for diseases they know nothing of, have acquired that name. It is only the ingenious and learned men of experience and observation whom I mean to honour with that appellation, from whom the practice of physic, in the cure of diseases, has received much more improvement than has been afforded us by the dogmatic sect. As the dogmatists had Hippocrates the father of physic for their founder, they were followed by the most respectable of the Grecian and Arabian physicians, from whom, till about the fifteenth, or, I may say, the sixteenth century, was learnt all that was known relative to the structure of the human body, the animal oeconomy, the nature of diseases, their remote and proximate causes, the qualities of simple and
compound

not being able to discover the true cause of the disease, he is obliged to be directed by his experience to such remedies and applications as he has found to be successful in the

compound medicines, and the manner of their application in the cure of morbid states of the body; but with very little improvement from the time of their founder or his commentator Galen. During which period of about two thousand years, there were a set of men not altogether ignorant of the doctrine of the ancient physicians, but who applied themselves more particularly in searching after remedies for the cure of diseases, without troubling themselves much as to the nature and causes of them, and with such success as gained them sometimes reputation for the efficacy of their medicines. These being once established, they came to be adopted by the dogmatists themselves, in whose hands, I must own, they were employed with greater advantage. But, at the head of our modern empirics, we must certainly place Paracelsus, whose history being well known, I shall only mention his thorough contempt of Hippocrates, Galen, and their followers; his introducing into practice chemical preparations, without paying much regard to the original causes of disorders, it being a saying with such men, *non interesse quid*

the restoration of health in similar cases, using sometimes medicines whose operation on the system are exceedingly obscure, and not knowing by what properties they

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quid morbum faciat, sed quid tollat, in opposition to the maxim of the dogmatists, *Cognitio causae morbum tollet*.

The medical professors in universities, and most other practical physicians, pretend to be dogmatics, or wish to be thought so; but, from what I have been able to observe in their writings, and from repeated conversations with many learned men amongst them, they appear to me, in practice, to belong more to the empiric than the other sect. Nor can it well be otherwise; for, in such diseases, whose causes cannot be distinctly traced, or whose operation on the system is but obscurely understood, they are often obliged to prescribe rather according to the symptoms than to the original cause of the disorder, or, in their uncertainty as to the precise nature of the disease, to order such means of recovery as they have from experience found to be successful in similar cases.

From this short view of the practice of physicians in general, it must be next to impossible for even the most eminent in their profession, strictly to maintain the character of a dogmatist. For, notwithstanding their education,

contribute to the cure, they are dignified with the appellation of specific, a word we are supposed sometimes to use to conceal our ignorance, with respect to the qualities of some remedies, as we have been at other times accused of shielding ourselves under the word *nervous*, when we are ignorant of the nature of the disorder. I could wish, no doubt, to have it in my power to wipe off this odium thrown on our profession, but

education and studies being carried on according to the regular plan of that sect, as the only method by which they can acquire those principles in physic capable of directing them to the most successful treatment of their patients; yet, there are many instances in which, not only from the obscure nature of the disease, but sometimes their ignorance of the precise operation of the medicine given in the cure of it, they are under the necessity of proceeding on the empirical practice. This, on account of their superior knowledge of the animal body, and diseases in general, will always be conducted with greater safety and success than by the mere empiric, who endeavours to compensate for his ignorance in these respects, by a boldness in his practice which is frequently attended with danger.

but should be still more solicitous, for the benefit of mankind, to be able to explain some circumstances relative to fevers, and their cure, which are at present involved in some obscurity, and, particularly, with regard to their proximate cause.

108. If the history of fevers admitted of it, I would incline to give the first place to the most simple, than to those least complicated, and afterwards proceed to the consideration of such as are more complex, with regard to their causes. But we can go only a little way on this plan, unless we were to take in those fevers which arise from specific contagion, as the small-pox, measles, chincough, &c. the consideration of which I choose to reserve for another part of this work. This way of denominating fevers as simple, complicated, or complex, is uncommon. But the propriety of it, after we have taken a farther view of their causes, will not, I imagine, be disputed. Thus, a catarrh arising solely from an application
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of cold to the body, as shall be shown in Sect. V. is, perhaps, the most simple of all febrile diseases. A catarrhal fever, which originates from the same cause, acting more powerfully on the system, as will appear in Sect. VI. is a more formidable disease, but is of a simple nature with respect to the cause producing it. But the bilious fever, as will afterwards appear, is compounded of the catarrhal fever with the cholera, or, at least, with that morbid secretion of bile, which will be shown in Sect. VII. to precede the attack of that disease, and to be the effect of the heat of the summer or of the climate. On which account, though the cholera is not, strictly speaking, a febrile disorder, I propose to treat of it, previous to the consideration of what is called the autumnal fevers, with which it is so intimately connected.

109. Another cause of fevers, and, perhaps, the most universal, is the marsh miasma, which is capable of producing fevers
of

of various degrees of malignancy, according to its strength, or accidental conjunction with other causes. Authors, for the most part, speak doubtfully as to the precise nature of this miasma. But, from its origin, and effects on our system, there can remain little doubt as to this point. The greatest quantity of it arises from fen-ny and marshy grounds, more or less impregnated with putrid exhalations from an immense quantity of corrupting vegetable and animal substances. Its activity in producing fevers is heightened by all such circumstances as increase putrefaction, and promote the evaporation of it, as heat and moisture. Of course, the most unhealthy situations must be in the neighbourhood of such swamps, where the air is fraught with putrid vapours, and the warmer the summer or climate, the greater is the danger. When such grounds are, at particular seasons of the year, covered with water, this prevents the putrid miasma from rising in any considerable quantity, and, of course, the

the diseases are fewer and less violent. But when, from the great evaporation occasioned by a hot summer, the ground is uncovered, leaving it in a swampy state, then aquatic plants, insects, and reptiles dying and corrupting, produce vapours of a most malignant nature. Something similar to this is observed in the East and West Indies, and in Africa, where, as in other countries, the driest and best ventilated situations are the most healthy, and during those months of the year when little or no rains fall, and they are refreshed with gentle breezes from the sea, nay, even in the rainy months, sickness, in general, is not remarkable. But, soon after the rain ceases, a considerable evaporation takes place everywhere, but especially in the low grounds, which become marshy at that season of the year, and bilious fevers of the remittent and intermittent kind, diarrhoeas and dysenteries, are frequent, and often dangerous.

110. Although authors appear universally to agree that marsh miasma is the most general cause of fevers, and give the most undeniable proofs of its effects, yet we are not to conclude marshes and fenny places to be the sole sources of this miasma. In such places, no doubt, it is in the greatest quantity and most active. For, I am confident that more or less of it must arise from every place where there is heat and moisture, though it cannot properly be denominated marshy, this miasma decreasing in its power, in proportion to the diminution of the heat and moisture to which the ground from whence it arises is exposed. Hence we have little to apprehend from the putrid miasma raised by the heat of the sun, from what may be called the arable lands in this country, unless in seasons remarkably hot and moist, because it seldom has sufficient power of itself to produce fevers, but acts in conjunction with other causes.

III. The most active cause of fevers hitherto mentioned is human contagion, which is capable of producing fevers of the most dangerous kind, and always adds to the malignancy of other co-operating causes. In camps, human contagion arises chiefly from the privies. But it is found to have still greater effects on our system in crowded hospitals and jails, where it attains its highest degree of virulence, from the excrementitious effluvia of the sick, and persons dying of putrid distempers. It has been repeatedly observed, and is now known to be a fact, that this malignant vapour becomes more suddenly contagious and powerful in its effects, some time after it has been thrown off from the body, or from excrementitious matter accidentally collected in the apartments of the sick, especially when it is imbibed by blankets, or woollen or cotton cloths, which retain it for a considerable time in a most contagious state. This seems to arise not only from an accumulation of it in the woollen, cotton, &c.
used

used by the sick, but probably from its acquiring a greater degree of putrefaction by heat and moisture; which last circumstance often occurs from the bed-clothes being packed up for the wash-house, but, from hurry, inattention, or some other accident, have been neglected to be sent there*. Sir John Pringle gives a remarkable proof of the truth of this observation; for, of twenty-three journeymen taken ill of the hospital fever, from being employed by a tradesman of Ghent in refitting some infected tents, only six recovered; which shows the high degree of pestilential malignancy this infectious matter sometimes acquires.

112. But, as we have remarked in parag. 110. that swamps and fenny grounds are not the only sources of marsh miasma, in like manner, we may here observe, that jails, hospitals, and ships crowded with men, are not the sole places from which human

A a contagion

* Vid. Dr Lind's Essay on Fevers and Infection, London, 1763, p. 38.

contagion may derive its origin; for it is to be found in private families, especially of the lower sort, in populous towns and villages, where, from the particular situation of their houses, there cannot be a free circulation of air. But it is especially to be ascribed to a total neglect of cleanliness in their persons and houses, which is so frequent an attendant of poverty. This obliges them to live in a foul and unwholesome air, and notwithstanding the power of habit, subjects them to fevers, particularly in the summer months. Hence the reason why such people rear up so few children, in proportion to the number born, is obvious. A smaller quantity of the same unwholesome human effluvia must exist in every large city and town, and, from this, most probably, arises the chief difference between the town and country air: For, although the former is not, in the generality of houses, sufficient of itself to prove the causes of diseases, yet, when they

they are brought about by other means, it always adds to their malignancy.

113. The marsh miasma has been shown to be of a putrid nature, (parag. 109.) and the human contagion of jails and hospitals appear evidently to be so; but may also contain the specific contagion of the diseases with which the sick were afflicted, and it is from this last circumstance chiefly, that they differ from each other: For, when the marsh miasma has acquired a degree of noxious power equal to the human contagion in jails and hospitals, the diseases arising from it are nearly the same, as has been remarked by many medical practitioners of character and accurate observation. I know, from several conversations with the late Sir John Pringle, on the subject of fevers, that he was of this opinion; and I observe in his medical annotations in manuscript, bequeathed to the Royal College of Physicians in Edinburgh, several observations confirming this fact. He particularly

larly mentions a conversation he had in June 1764, with Count Carburi in Academ. Tourin. Medicin. Primar. Profes. when in London, at which time Sir John having given to the Count a detail of our jail and hospital fevers, with their chief symptoms, Count Carburi told him, that they exactly corresponded with those of the malignant fever in his country, and did not doubt, notwithstanding his patients in the hospital breathed a tolerably good air, and though he had never seen any fevers in jails, that their malignant fevers might arise from some degree of putrefaction in the atmosphere, in a climate so much warmer than ours*. And, in another place of the same Med. Annot. Sir John says, that, in August 1770, upon conversing with Dr Mackenzie, who lived eight years at Smyrna, and these last thirty at Constantinople, I found, ' that the common endemic pestilential fever of Constantinople, is the same with ' our

* Vol. vii. p. 209.

‘ our jail or hospital fever, and they call the
 ‘ same distemper, when raised to a greater
 ‘ height, the plague, that is, when to the
 ‘ ordinary symptoms were joined bubos
 ‘ and carbuncles *.’

114. From this view of the nature and origin of marsh miasma, and human contagion, it will appear, that, with the concurrence or absence of particular circumstances, tending to increase or diminish their noxious power, they must, in different times and places, exist with various degrees of strength. Sometimes they are scarcely capable, without the conjunction of other causes, of producing fever. Whilst, at other times, they may be of so noxious a nature, as to affect the most robust in a few minutes after they have been received, with the usual symptoms of their malignant tendency. And we can frequently observe intermediate degrees of their malignity,

* Vol. viii. p. 72.

lignity, both with regard to the power of the noxious effluvia, and also to the force of the system, from habit, to resist their effects, (parag. 46. and 47.) For marsh miasma is not, in all seasons, possessed of the same degree of virulence; and it is not for some time after jails and hospitals have been crowded, that the contagious vapour attains its highest degree of malignancy; during which period, and afterwards, persons in jail, and patients in the hospital, with the nurses, and other attendants of the sick, are taken ill, one after another, in proportion to the strength of their system to resist the effects of the putrid contagion, whilst several of them escape the fever for a considerable time, and some altogether, as if, from the habit of living in this foul air, it lost, in some degree, that power of infection it appears to possess over strangers, or those newly admitted.

115. The manner in which contagion in general comes, at first, to affect our system,

has

has not yet been clearly ascertained, though authors have mentioned four different ways by which the matter of infection may enter the body, and prove the causes of diseases: *1st*, By the pores of the skin: *2dly*, By respiration: *3dly*, By inoculation: And, *4thly*, By the saliva swallowed and taken into the stomach.

116. As to the first, by the pores of the skin, I never could in my own, or from the practice of others, find sufficient certainty of its taking place: For, in the very few instances that might be alledged in proof of this hypothesis, they must, from the contact of a morbid with a sound body, be referred to the head of inoculation, and not to that of a general absorption of malignant vapours by the skin, which I hold to be extremely improbable. Nor is there, as far as I know, any direct evidence of it.

117. That of respiration is more plausible, from an opinion that universally prevails,

vails, of contagious matter entering the circulation in this way, and proving the source of diseases. But this is by no means made evident from observation, or the history of diseases; for, if the absorbents on the internal surface of the bronchi and vesicles of the lungs are an inlet to the causes of putrid or other diseases, it is most surprising that this viscus is not always affected in these disorders, which it certainly is not. It is true, that the matter of infection may enter the trachea and its branches with the air inspired; but it is immediately returned in respiration. Besides, the constant emission of moisture from the internal surface of the vesicles of the bronchi, and the exhalation of this moisture with the air in respiration, are most unfavourable circumstances to the entry of infection by the lungs. In this way, nature appears to have provided against such accidents, otherwise it would have been almost impossible for any person to breathe in an infected air without receiving the infection, the contrary

trary of which we experience every day in hospitals, and other apartments of the sick. I know, that a morbid affection of the lungs may be brought on by a person lying in bed with another under a phthisis pulmonalis, and that the same disease may terminate in open sores in the lungs; but this must be considered more as a species of inoculation, than as a cause acting on the system at large, and producing these effects. Neither can the topical inflammations of the lungs we sometimes meet with in the course of diseases, be accounted for in this way, because they can, in general, be distinctly traced from other sources, such as cold, &c. Another circumstance which throws great discredit on this opinion, is the exquisite irritability of the internal membrane of the bronchi, and vesicles of the lungs, which cannot bear the application of any acrid substance, without giving evident signs of its functions being more or less disturbed; and some particular vapours, as the fumes of burning charcoal, burning

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brimstone,

brimstone, mephitic air, &c. act so powerfully, as in a short time to put a stop to respiration, and, of course, to the vital motions, which, if long continued, as has been observed in parag. 13. may end in death.

118. We have always had the clearest demonstration of contagious diseases being communicated by inoculation. In those not accompanied with fever, as the venereal disorder, the itch, and some other diseases of the skin, it appears to be the general and uniform manner in which they are propagated from one to another. But, in the infectious fevers from marsh miasma, human, or specific contagion, though we know that most of them may be produced in this way, and that the universal practice of inoculation for the small pox, and, in some few instances, for the measles, sets this matter beyond the possibility of doubt, with respect to these diseases; yet, it is equally certain, that this is by no means the manner in which these distempers are communicated

municated in what is called the natural way. For inoculation produces immediately a mere topical disorder, which gradually increases, but does not, till after six, eight, or ten days, and sometimes for a longer space from the operation, affect the system in general. Besides these particular circumstances attending this manner of producing the disorder, the symptoms, on the accession of the fever through the progress of the eruption and maturation of the pustles, are milder; and, with respect to danger, it is next to none, when compared with the fatal consequences of the distemper caught in the ordinary manner; at which time, the cause of the small pox, and of the other fevers just mentioned, must act in some other way on our system, which I shall presently endeavour to illustrate, and, at the same time, take under consideration such circumstances accompanying the inoculated and natural small pox, and likewise those fevers arising from
marsh

marsh miasma, or human contagion, as may tend to illustrate the subject.

119. The fourth manner in which the causes of certain malignant fevers, arising from marsh miasma, human, or specific contagion, are supposed to get into our habit, is by the noxious effluvia taken in with the air in respiration, mixing with the saliva, and, by deglutition, conveyed into the stomach, where, by certain changes brought on the gastric fluids, and their particular stimulus on the nerves of the stomach and bowels, they prove the cause of fevers, differing from one another, according to the nature of the infectious exhalation. This I have always thought to be the most probable way that infections are received by us, and of their acting on our system in the production of fevers.

120. As I am of opinion that all putrid substances and specific contagion are capable of acting as a ferment on the saliva and contents of the primae viae, I have, in the
preceding

preceding paragraph, mentioned certain morbid changes brought on the gastric fluids after the infectious matter has been swallowed, and, previous to the accession of the fever. This change, I suspect, takes place previous to the accession of those fevers called nervous, putrid, or malignant, but especially in the fevers known to arise from specific contagion, as the chincough, measles, and small pox. And, when we take a view of the general appearance of the small pox caught in this way, and compare its malignancy, and often fatal consequences, with the mild sort of the same disorder given by inoculation, which is so seldom attended with danger, we are naturally led to inquire into the cause of this difference between them, which, if our premises are just, I humbly apprehend, will admit of some explanation. But, before we can enter on this subject, it will be necessary, not only to consider the progress of inoculation, but also such circumstances as attend both the inoculated and the natural small pox, as are known to alleviate

alleviate the disease, or increase its malignancy.

121. When we inoculate, the minutest quantity of the variolous matter lodged in the skin by the point of a lancet or needle, gradually increases in quantity from its infecting the fluids extravasated by the puncture, or secreted in the neighbourhood of it, and afterwards the infection is carried on to some distance beyond the puncture. All which time the patient is very little affected, complaining only of some degree of heat and itchiness in the part. The infection appears to spread from its acting as a ferment *. But the system, in general, is

* Sir John Pringle was informed by Mr Sutton, that, when a person is inoculated for the small pox, who never had the distemper before, and has received the infection, if, the day after the inoculation, the point of a needle, pin, or lancet, be put into the puncture made for the inoculation, such needle, pin, or lancet, will be capable of giving the small pox to another who has not formerly had the disease. This is a clear proof that the variolous matter acts as a ferment, that there is a local

is not apparently affected by it, until the matter has so increased in quantity, and, perhaps, in its activity, as to appear fluid under the cuticle, when it has probably attained its highest degree of infectious power, at which time there is an absorption of it, and, upon getting into the circulation, it communicates the infection to the general mass of fluids. This absorption is evident from the patient complaining, some time before the accession of the fever, of pain and some degree of swelling in the lymphatic glands of the axilla, when the inoculation has been performed in the arm. This symptom is not uniformly a consequence of the absorption of the variolous matter. But, when it does happen, it shows distinctly that the absorption has taken place.

122.

local generation of the small pox matter, and that the disease is topical for some time; *Med. Annot. vol. viii. p. 548.*

122. There are some circumstances attending the accession and progress of the small pox which merit attention, because the violence and danger of this disease appear to keep pace with the power in which they exist; and, first, of the effects of the topical application of the variolous matter in the part to which it was first applied, and from whence the disorder derives its origin. This is a circumstance not sufficiently attended to. But, I am persuaded, it is of the utmost consequence with regard to the future magnitude of the disease; for the whole system, as in similar cases, must be more or less disordered by sympathy from the part first affected, which never can be so considerable from any external part of the body after inoculation, as when it proceeds from the stomach and bowels, where stimuli of every kind affect the system in general more powerfully than when applied to any other part of the body. The fever which precedes the eruption, and continues through the course of the disorder,

disorder, and its consequences, heat, thirst, debility, restlessness, &c. depending, in a great measure, though not altogether, on the degree of this febrile stimulus; for, I suspect, that, from the commencement of the action of the variolous matter on our fluids as a ferment, there is a tendency to fever from a general acrimony introduced into the blood, which gradually increases with the generation of the small pox matter, but is, in some degree, abated on its being thrown out of the circulation on the surface of the body, where it rises in pustules under the cuticle.

123. It is not improbable, that the variolous ferment, acting on the gastric fluids previous to the accession of the fever, and for some time afterwards, may be another reason why the disease runs on to a greater height and danger when it is caught in this way, than when given by inoculation, the specific contagion being carried into the circulation from the primae viae, where

it has acted as a ferment, in greater quantity than from two or three variolous pustules on the surface of the skin.

124. Every practitioner knows, that, when persons are seized with the small pox, either in the natural way or by inoculation, some have few or no pustules, and the disorder goes off without creating much disturbance in the system, whilst others have an immense load of a malignant sort: But this difference does not appear to arise from any particular acrimony in the blood previous to the infection, or to any peculiarity of constitution with which we are acquainted; for scrophulous children, and others with tettery sores and blotches on their skin, or in some other way weakly and delicate, have sometimes a very mild small-pox: We every day see others, apparently in good health, and with an excellent constitution, die in consequence of the malignancy of the disease. This difference may perhaps arise from some peculiarity

cularity in their system, which subjects them to be affected in a much stronger manner than others by the particular stimulus of the small-pox matter: It may originate from a greater or less propensity in the blood itself to be affected with this particular ferment; from the degree of infectious power the small-pox matter may possess; or from a greater or less degree of strength in the digestive powers: For, when the matter of infection is of a mild sort, and the digestive powers are considerable, the nature of it may be so altered by those powers, as to prevent the ordinary effects of the infection on the body, which might take place in weaker conditions of the stomach and bowels. From this observation will appear a probable reason, why the causes of diseases do not operate uniformly on all persons; and why some escape the infection of certain diseases at one time, and are caught with it at another period, when the primae viae and system are less capable of resisting its force, Hence
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the quantity of variolous matter, generated in the course of the disease, may be various in different persons ; or all the above circumstances may have their separate share in producing that variety of malignancy we every day meet with in this distemper.

125. The quantity of the small-pox matter generated chiefly at the commencement, and partly through the course of the disease, depends more on the degree of heat in which the patient is kept, on the accession of the fever and afterwards, than on any other circumstance with which we are acquainted. This gives the inoculated patients a greater advantage over those who are caught with the distemper in the natural way. In the one case, the patient being apprised of the nature of the approaching disorder, is put under a proper regulation of diet, and, when attacked with the fever, he is directed to keep as much out of bed as possible, to get sometimes into the open air, to drink cold water, or
subacid

subacid cold drink, and in general to keep himself cool, which is known to depress the fever and mitigate the severity of the symptoms. But, in the ordinary way of receiving the infection, the person, on the attack of the small-pox fever, not knowing the nature of it, and rather suspecting it to arise from cold, or some other cause, he takes to his bed, which he is in some measure necessitated to do, on account of the violence of the ordinary symptoms, and a considerable prostration of strength, when, from a large fire in the room, an addition of bed-clothes, and warm drink, with a view to bring on a sweat, all the symptoms are aggravated, the fever is increased, and the heat of the body becomes at last insupportable, which greatly augments the power of the variolous matter as a ferment, and of course both quickens and increases the generation of it in our circulating fluids; and this is commonly attended with a proportionable degree of virulence in the matter generated. From these circumstances

ces the danger and fatality of this dreadful distemper originate, and they ought to admonish us in all fevers, and especially those of a putrid tendency, to keep the body as cool as possible: For, besides these effects of an excess of heat, it is always attended with a debility corresponding to the degree of heat kept up above the standard in a healthy state *.

126.

* About the end of May 1751, when in the 4th regiment, then quartered at Glasgow, where the small-pox was at that time a frequent and fatal distemper, five companies of that regiment were ordered to march to Lanark, where in a few days the service being performed for which they were sent, they began their march for Strathphillen in the Highlands, to work on the military roads. Soon after we left Glasgow, twelve or fourteen of the soldiers children were seized with the small-pox fever. The weather turning out remarkably cold, with a constant rain during our march, and the children being carried on horseback in open panniers, with little more than a single blanket to defend them from the cold and rain, I was under some apprehension of bad consequences from a situation so much exposed;

126. Having thus, in a cursory manner, mentioned such circumstances, relative to the

exposed; notwithstanding I had for some years received the most salutary proofs of the advantage of patients being kept remarkably cool in this disorder. But my fears on that occasion were ill founded; for the whole of the children had a mild and distinct sort, more like the inoculated than natural small-pox; and they soon recovered. From this period I took every opportunity of promulgating amongst my medical acquaintance not only this piece of intelligence, but also a number of other instances which occurred afterwards, and showed, in the clearest manner, the beneficial effects of keeping persons under the small-pox as cool as possible. In particular, I had some conversations with my learned and ingenious friends the late Sir John Pringle of London, and Doctors Whytt and Stevenson of Edinburgh, all of whom were perfectly satisfied of the utility of this practice, which was confirmed by their own experience. But the timidity and caution of the dogmatist, by which is commonly understood the regular bred physician, was ill suited to the introduction of a general practice. The boldness and intrepidity of an empiric was necessary, whose address with the public, from positive assurances of success, is better calculated to gain their favour, than the qualified probabilities of the dogmatist.

These

the inoculated and natural small-pox, as, I imagine, not only tend to explain the nature of this disorder, but likewise to throw some additional probability on the supposition of this and other infectious and malignant fevers being commonly caught by swallowing the noxious miasma, from which they take their origin, with the saliva, I ought not to omit that oppression, which is generally felt on the accession of these fevers, about the praecordia, great sickness,

These qualifications we fortunately met with in Mr Sutton, to whom the world in general lies under many obligations ; notwithstanding some of his followers in this country have perhaps carried this practice to an extreme. For, although we may go great lengths in cooling the body, when the fever is high and the eruption considerable, yet in children, where the fever is moderate and the pustules are few, there is not the least necessity of exposing them naked at open windows to frost and snow ; because, with a certain degree of chillness, the powers of the system are weakened, and the body becomes more irritable, which I have often supposed to be the cause of those convulsions with which children are sometimes seized when in such a situation.

sickness, often a vomiting of phlegm and bilious matter, with an alleviation of symptoms, sometimes a diarrhoea, severe head-ach, pain in the loins, and a general debility of body and mind. I know these symptoms are supposed to arise from sympathy with the system, in some other way acted on by the cause of the disease, though the precise manner in which this is supposed to be done is by no means distinctly pointed out by any one who has written on this subject. I am therefore rather inclined to become a convert to observation and facts, than to any theory, however ingenious; for I cannot comprehend how the system comes to be affected by the action of the cause of the disease in the mysterious manner in which this is said to take place, but can easily perceive how this may be affected from its action on the primæ viæ. I shall therefore proceed to give such farther evidence of it, as I humbly apprehend will amount to as clear a proof

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of its truth, as the nature of such a subject will admit.

127. This opinion, that the infectious effluvia of malignant fevers mixes with the saliva, and afterwards gets into the stomach, has been embraced by several physicians of character. Dr Turner, physician to the military hospitals in the West Indies, in a letter to Sir John Pringle, says, ‘ That he escaped the infection of the hospital fever by chewing tobacco during the time he was on his visits to the men in the hospital, imagining that all putrid and contagious effluvia entered and infected by the saliva, which he took great care not to swallow whilst he visited the sick*.’ Notwithstanding the credit I incline to give to this supposition, yet, as it amounts to no more than a negative proof, I shall not insist on its being a direct evidence, till the fact be corroborated by more conclusive circumstances.

* Med. Annot. vol. 5. p. 472.

circumstances. The ingenious Dr Lind of Haflar, who, from the discharge of his duty in that hospital, independent of his other practice, must be equal to most of his contemporaries in experience and knowledge of fevers, and whose testimony, with regard to the facts relating to them, is so much to be relied on, shows, in several parts of his writings, his belief, that the contagion of fevers in general is taken in with the saliva. Of which knowledge he has availed himself in numberless instances, on the first attack of the symptoms from infection, by giving an emetic, encouraging perspiration through the night, and ordering next day a laxative medicine to clear the bowels of the infectious poison. By which means the fever was in most cases prevented, even by the emetic alone, as will appear more particularly afterwards. And, in his excellent treatise on the means of preserving the health of seamen, when treating of the hospital, or apartments of the sick, he says, 'swallowing the spittle in infected places

‘ is juſtly deemed a means of ſooner acquiring the taint, upon which account neither the nurſes, nor any one elſe, ſhould be ſuffered to eat in the hoſpital*.’ This obſervation is made after adviſing ſuch as are obliged to viſit the ſick, to keep conſtantly chewing ſomething, that they may be obliged to ſpit frequently. He farther remarks, ‘ It is uſual with ſome, for preventing their ſwallowing ſpittle, to put tobacco in their mouths when attending about the diſeaſed ; but thoſe who are in conſtant uſe of chewing that plant, are apt to let down part of its juice with their ſaliva. I would adviſe ſuch perſons to uſe a ſlice of the calamus aromaticus, dipt in vinegar, and ſpit often†.’ And in his eſſay on the diſeaſes incident to Europeans in hot climates, published in 1768, when on the ſubject of cutting down wood and other laborious employments on ſhore, he repeats the ſame advice, by cautioning perſons
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* Page 111. ſecond edition.

† Ibid.

sons thus engaged in unwholesome places, never to swallow their spittle *.

128. Though, in general, the infectious effluvia of malignant fevers, act for some time on the system, before the accession of the fever, yet it frequently happens, when in a highly concentrated state, proceeding from the bodies of persons dying, from those who have died of these fevers, or from the infectious matter accumulated in the foul hospital bedding, that persons breathing these malignant vapours are seized immediately, or very soon after, with sickness, debility, and other signs of an approaching fever. The contagious matter appears to act chiefly in the primae viae, and to have a considerable effect in increasing the secretions, particularly of the bile. For if, in such a situation, an emetic is given, a quantity of phlegm and bile is thrown up, and the fever is thereby often prevented.

* Page 140.

ed. If at this time the bowels are also cleared of their contents by a gentle purgative, and a free perspiration is promoted through the ensuing night, our success in throwing, as it were, the cause of the fever out of the body, is more certain. But, if no such means are used, the fever comes on, and runs through its ordinary course. The following examples will throw more light on this subject.

129. Mr Osburn, surgeon's mate to the 3d regiment of Guards, after his recovery from an hospital petechial fever, gave Sir John Pringle, who attended him in his illness, the following account of the manner in which he was seized : ' About the middle of October 1758, the battalion of guards having changed their barracks and quarters ; in consequence of which, about a dozen of beds were sent from the Coldstream regiment to the regimental hospital ; these beds were packed up close, and carried into one of the rooms, to be opened

‘ pened by the matron, in order to be re-
 ‘ fitted and cleaned. Mr Osburn acciden-
 ‘ tally passing through the room in which
 ‘ the beds lay, then just opened, at most he
 ‘ did not stay above a minute, and was sen-
 ‘ sible of an offensive smell, that in less
 ‘ than half an hour he began to find him-
 ‘ self indisposed; but, being obliged to go
 ‘ out, continued walking for two hours,
 ‘ during which time his head and back be-
 ‘ gan to ach, he felt an unusual lassitude,
 ‘ with alternate fits of heat and cold,
 ‘ had no appetite for his dinner, but was
 ‘ thirsty, and felt his pulse quick and strong;
 ‘ he went to bed early after drinking some
 ‘ white wine whey, sweetened a little, slept
 ‘ as usual, and rose in the morning refresh-
 ‘ ed, went about his business, and found
 ‘ himself perfectly well. That evening he
 ‘ went into company, and, though he drank
 ‘ nothing that was strong, staid till three
 ‘ in the morning; during that time he felt
 ‘ all the symptoms returning. He took a
 ‘ draught of milk and went to bed. Af-
 ‘ ter

‘ ter passing a very uneasy night, he rose
‘ in the morning with a violent pain in his
‘ head and back, attended with a great an-
‘ xietas praecordiorum, and oppression at
‘ his heart, and was so feeble on getting
‘ out of bed, that he tumbled down. How-
‘ ever, being of a plethoric habit, and sub-
‘ ject to inflammatory disorders, he took
‘ away at once twenty ounces of blood ;
‘ but, instead of being relieved, was sensible
‘ of the increase of every symptom upon
‘ the evacuation, and, in particular, was trou-
‘ bled with heat and thirst. That evening
‘ Mr Fordyce would have had him take a
‘ vomit, but which he refused on account
‘ of the violent pain in his head ; he used
‘ only a saline mixture, with some of the
‘ pulv. contrayerv. comp. He believes he
‘ became delirious that night, for he did
‘ not recollect any thing that happened af-
‘ ter, unless in the most confused and im-
‘ perfect manner, except feeling a great
‘ pain in his eye-balls, with a most into-
‘ lerable heat in his body, and a great an-
‘ xiety

‘xiety or inquietude from that heat. Mr Osburn concluded his account with observing, ‘That he awaked from his delirium in about three weeks, and, after becoming sensible, recollected no material symptom, unless being troubled with a great watchfulness, and now and then pain in his legs. He was taken ill on the 16th of October, which was the third day after receiving the infection, and that was called also the third day of the fever *.’ It appears that the matron, and a foldier who assisted in opening out the bedding, soon found themselves indisposed in the same manner as Mr Osburn had been; and, after their recovery, all of them agreed in their account of the manner in which they received the infection on Saturday the 14th; but it was not till Monday the 16th that the foldier was obliged to take to his bed; after which the fever run through its ordinary course, though the symptoms were

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* Med. Annot. vol. 5. p. 317.

not of so dangerous a nature in this patient, as those which accompanied Mr Osburn's fever. This Sir John Pringle and Mr Fordice, who attended both patients, most justly attributed to the large quantity of blood taken from Mr Osburn at the commencement of the fever; for it is only when such disorders are combined with catarrhal or inflammatory symptoms, that venesection can be employed with advantage, or even with safety to the patient.

130. In both these cases, the cause of the disease acted on the system till the third day after receiving the infection, before its power had increased so far as to bring on the accession of the fever. At which time, although an emetic, and afterwards a cathartic, or such a medicine as usually operates both ways, as a solution of two or three grains of tartar emetic, given in small doses, every two or three hours, till it has had its proper effect in freeing the primæ viæ of a morbid febrile colluvies, has the most

most salutary effects in mitigating the symptoms, and rendering the fever, through its course, of a milder nature; yet it seldom has the effect to put a stop to the progress of the fever after the cause has operated for so considerable a time in the body. Notwithstanding, such a practice certainly has the salutary consequence of preventing the fever, when gone into immediately, or within a few hours after receiving the infection, as was the case with the matron, who, on the 14th, finding herself indisposed, and suspecting that she had received the infection of the hospital fever from the bedding, took an emetic, and sweated in the night, by which means she escaped the fever, and continued in perfect health.

131. If a person endeavoured to establish a theory on a single case, I should consider his doctrine as dangerous, and not to be adopted, unless with the greatest caution. But, where similar instances happen frequently, not only in his own practice, but
in

in that of others, who had no particular theory to support, or any thing else in view than a bare narration of facts, hesitation is less necessary. Every doctrine, however, concerning a subject so important as the health of mankind, should be most strictly and candidly examined. I shall, therefore, give such other proofs of the infection of malignant fevers being taken in with the saliva, as seem to support this supposition with the highest degree of probability. And although I make not the least doubt of their appearing so to many others, yet as it often happens that men reason very differently on the same fact, I do not expect they will carry that precise degree of conviction to every one they have conveyed to me, from the success I have had in practice by following the method observed by the subsequent respectable authors, when they supposed the infection to have been just caught.

132. Sir John Pringle, in his correspondence with the physicians of the military hospitals in the West Indies, on the subject of the yellow fever, has the following passage: ‘ About the conclusion of the fever
 ‘ in death, when the body is in the most
 ‘ corrupted state, then, indeed, the nurses
 ‘ were sometimes infected from the offensive
 ‘ breath of the sick, and, as they themselves
 ‘ imagined, mostly at the time the
 ‘ patients were expiring. One of the mates,
 ‘ upon opening the body of a man who
 ‘ had died of the fever, was seized with
 ‘ all the symptoms; but being bled, and having
 ‘ taken five grains of ipecacuan, with
 ‘ one grain of emetic tartar, thrice, at the
 ‘ distance of two hours between each dose,
 ‘ he vomited and discharged by stool a
 ‘ great quantity of green bile, and was well
 ‘ next day. Dr Huck (now Saunders),
 ‘ using the same method afterwards with
 ‘ those nurses who seemed to have caught
 ‘ the distemper, always succeeded. But this
 ‘ contagion was never considerable; for the
 ‘ patients,

‘ patients, who, for other disorders, lay in
‘ the same ward, were seldom taken ill of
‘ this fever.’

133. Dr Lind, who writes in the most intelligent and distinct manner on the subject of infection, says: ‘ In discoursing
‘ with several who had been infected by
‘ patients in contagious fevers, they generally compared the first impression to an
‘ earthy disagreeable scent, received into
‘ the stomach, as from a grave newly opened, but not quite so raw as the cadaverous stench. This is a particular smell
‘ that cannot be described, though it nearly approaches to the disagreeable affecting
‘ scent from a person labouring under the
‘ confluent small pox at their turn, yet not
‘ so strong; but it is well known to the attendants about the sick, and the nurses,
‘ as it usually accompanies fevers of extreme malignity, and with peculiar discharges from the blistered parts, may be
‘ reckoned among the most constant symptoms
‘ toms

‘ptoms of a bad fever*.’ The Doctor, after informing us that the effects of the infection were almost instantaneous, the person being immediately attacked with a shivering, sickness, and other symptoms of its action on the system, observes, ‘That
 ‘when, from such complaints, there is just
 ‘reason to apprehend an imminent fever,
 ‘then is the time for the advice of the
 ‘physician, as improper treatment, or the
 ‘delay of a few hours, may produce effects
 ‘beyond the power of medicine to
 ‘remove. To all who are supposed to be
 ‘infected by fevers, during this state of rigors, a gentle vomit is immediately to be
 ‘exhibited, before the fever be formed,
 ‘and before the fulness and hardness of
 ‘the pulse renders its operation dangerous.
 ‘If the vomit be delayed too long, and especially if bleeding must precede it, the
 ‘most certain and favourable opportunity
 ‘of procuring safety for the patient is past.
 ‘The

* Paper on Fevers and Infection, part 2d, p. 62.

‘ The effects of this antidote are so well
‘ known in the hospital, and have been so
‘ fully ascertained by our repeated expe-
‘ rience, that those who are employed in
‘ the fever wards, as soon as taken sick,
‘ have immediate recourse thereto, and it
‘ seldom fails to prevent the illness which
‘ was justly to be expected. I have found
‘ it equally serviceable in preventing relap-
‘ ses, when it is given immediately after a
‘ return of the shiverings. Let me add,
‘ that a loose stool or two should, at this
‘ time, be procured, either by means of
‘ the emetic or of glysters*.——There are
‘ now several nurses in the hospital who
‘ have been five, six, or seven times infec-
‘ ted, and thus successfully treated; and I
‘ have often had two or three of them ta-
‘ ken ill in a week. I am apt to think,
‘ that an infection, from whatever impure
‘ fountain it is derived, does first discover
‘ itself by affecting the stomach and inte-
‘ stines.

* Paper on Fevers and Infection, part 2d, p. 65.

‘ stines. It is uncommon to find a case of
 ‘ this sort which does not begin with shi-
 ‘ verings, commonly with a slight nausea,
 ‘ often a vomiting. This agueish state
 ‘ continues, with some, a shorter, with o-
 ‘ thers, a longer time ; after which, a pain
 ‘ is often felt to dart, with violence, into
 ‘ some one or other part of the body *.’

From the Doctor’s observations, as well as my own, the part affected is sometimes the head, at other times the back ; the limbs are often affected with pains, similar to those of the rheumatism ; and, in some particular cases, the pain attacks the breast, under the appearance of a pleurisy or peripneumony. But, in every case, a looseness supervening early, or brought on by medicine, is, from its salutary effects, thought to wash away the contagious poison, or to diminish its force.

134. The foregoing observations are applicable to all fevers which are known to

F f be

* Paper on Fevers and Infection, part 2d p. 75.

be infectious, or which arise from the vapour of putrid animal substances, and also to those occasioned by the putrid effluvia of swamps and marshy grounds in hot seasons and climates. In all which cases, the stomach and bowels appear to be the parts first affected by the operation of the cause of the disease. Sometimes this is so slow, as scarcely to be perceptible to the patient; either from the weakness of the contagious matter, or from the strength of the patient; sometimes from a peculiarity of system, which is capable of resisting for a longer time than usual the effects of such malignant vapours, as proves the cause of fevers; or it may arise from the habit which certain people have acquired to resist the causes of these fevers. But, from whatever circumstance this gradual advancement of the disease may take its origin, we know, from experience, that, when the cause has operated for any considerable time in the body, the fever, on its accession, can seldom be prevented by the exhibition of emetics, sudorifics,

dorifics, and laxatives, notwithstanding
 these remedies are of great service in the
 mitigation of symptoms. But when, from
 the great power of these noxious vapours,
 their action on our system is, from certain
 effects, quickly perceived, these medicines
 given after removing the patient to a free
 air, and within a few hours of the time
 when the contagion was received, seldom
 fail of restoring such persons to perfect
 health. To illustrate this by an example;
 allow me to give an instance or two of the
 speedy and surprising effects of the marsh
 miasma in the production of fevers, and of
 its influence on the body, according to the
 different manner in which the patients were
 treated after receiving the contagion. Lan-
 cisius tells us, that thirty gentlemen and
 ladies, of the first rank and distinction in
 Rome, making an excursion on a party of
 pleasure, towards the mouth of the Tiber,
 upon the wind suddenly shifting, and
 blowing from the south, over the putrid
 marshes, twenty-nine of them were imme-
 diately

diately seized with a tertian fever. Or rather allow me to say, that nothing being done to free the primae viae from the noxious vapour taken down with the saliva, and it continuing to act on the system, a fever was brought on, corresponding to the nature of the cause then operating on the body. For, besides the evidence already given of the success which usually follows the clearing of the alimentary canal, immediately after there was the strongest reason to suppose the febrile contagion to have been swallowed, I shall contrast this remarkable anecdote of Lancisius, with a similar one from Dr Lind, but where the treatment and success were different: ‘A
‘ company of gentlemen belonging to his
‘ Majesty’s ship the Phoenix, taking the
‘ diversion of hunting and shooting, at the
‘ mouth of the river Gambia, by follow-
‘ ing their game into a large swamp, were
‘ all of them affected by its putrid effluvia.
‘ They were immediately seized with a
‘ sickness, vomiting, headach, and a con-
‘ stant

‘stant hawking and spitting, from a disagreeable smell, which (as they expressed it) seemed to remain in their mouth and throat. Upon their returning to the ship, each of them was ordered a vomit, which immediately removed all those complaints *.’

135. Were it necessary, many other facts and observations might be advanced, similar to those already given, in support of the opinion, that the infectious matter of fevers is taken in with the saliva, and that the stomach and bowels are thereby first affected, and from them the rest of the system. But, when a proof of this kind is made as clear as the nature of the subject will admit, the running over the tedious detail of a thousand testimonies, in corroboration of what has been already proved, must be as tiresome to the reader, as it would be to the writer. I shall, therefore, only

* On the Diseases of Hot Climates, p. 138.

only observe farther, that the general disorder in the body, which always accompanies the accession of a fever, is more likely to arise from that wonderful extended sympathy which every part of the body has with the stomach and bowels, than to any other cause I can possibly suggest. Besides, those parts which are known to sympathise in a particular manner with the primae viae, frequently suffer in a remarkable manner on such occasions, as the head, the vital organs, the lumbar vertebrae, and the limbs. That phrenzy or high delirium, with which patients are sometimes afflicted at the commencement of the malignant autumnal fevers, and for which large bleedings have been often with so much impropriety ordered, have been frequently cured by a natural vomiting, excited by a quantity of bile and phlegm, or by emetics and laxatives, properly administered. Hence this alarming symptom does not always arise from an original affection of the brain, but often from sympathy with the primae viae,

viae, when loaded with bile and other acrid colluvies, and where the cause of the disease appears first to exert its power. A phrenzy is frequently the first and immediate effect of the putrid vapours of swamps, especially in hot seasons and climates, particularly when the febrile quickness of the pulse is accelerated by violent exercise. This delirium is commonly taken as an unequivocal symptom of an ardent fever, and of course medical practitioners usually begin their cure with large bleedings, but without success; because of the manifest injury they do in such cases; and of consequence is a dangerous practice, as appears from the delirium going off with a plentiful sweat, but returning with its former violence about the same time next day, until the disease shows itself under the form of a remitting, or intermitting fever, as may be seen more particularly by consulting Sir John Pringle on the diseases of the army*.

* Second edit. p. 167. and 171.

136. I never received much instruction, with regard to the origin of fevers, from consulting meteorological tables, which some philosophers and societies have carried on with such minute exactness. I know that an excess of cold, and the long continuance of easterly winds in the spring, are the principal causes of inflammatory diseases, rheumatisms, and sometimes of intermittents; or, rather, that they occasion relapses in those who have been formerly afflicted with such disorders. That an excess of heat and of moisture produce low malignant fevers, not at first remarkably infectious, but sometimes become so, as it were by accident, from the magnitude of the disease, or numbers being lodged in the same apartment or hospital, and afflicted with similar disorders.

137. Under these circumstances, I always suspect human effluvia so much accumulated and exalted in its powers, from the number and morbid condition of the sick,

sick, to have a considerable share in increasing the malignity and infectious influence of those fevers. In this way, such fevers as have very little of infectious power under the ordinary form, in which they most commonly show themselves, become remarkably infectious, when, from a singularity in the case, bad treatment, foul air, or from all these circumstances conjoined, the disease is pushed on to a higher degree of malignity and danger than usual.

138. A common continued fever of a mild sort, has very little infectious power, and is commonly confined to the person accidentally exposed to the cause which produced it. Sometimes such fevers seize a whole family, not so much from the contagious power of the disease, as from a similarity of constitution amongst the children, disposing them to be more readily affected than others*. This often happens

G g from

* This circumstance I have sometimes observed to
take

from the cold, or quick succession of frosts, and open weather in the spring, when such fevers frequently become endemic, but not properly contagious, the sick having caught the distemper from the same general cause; for nurses, and other attendants, for the most part, escape the disorder, (46. 114. 124). The truth is, that no proper fever can be said to be absolutely without some degree of infectious power. But these just mentioned, and others to be taken notice of afterwards, have so little of contagion, when properly managed, that physicians seldom express the smallest anxiety on that head.

139. When such circumstances as are above related, concur to heighten the malignity of the fever, and in some measure to alter its nature, they then become more or less contagious, and I believe all febrile disorders

take place in children of the same family, living at the distance of some miles from each other.

orders whatever, are, from foul air, and maltreatment, capable of such changes, a common catarrh not excepted. Indeed, I think foul air a more rational way of accounting for the origin of what is called an Influenza, than occult qualities in the air, which have been hunted after for so many centuries. The expression is rather calculated to hide our ignorance, than to give the final-
lest information relative to the source of this most infectious distemper, conveyed to us from the remotest parts of the world, in woolen, cotton, and other materials capable of retaining the infection, and not from any malignant quality in the air, which conveys infection but a very short way. Even the plague itself can scarcely be communicated by the air a few yards beyond the houses infected. This pestilential fever is usually conveyed from one to another by contact with the diseased, or from an accidental communication of goods. For we know that in Turkey, where this dreadful distemper sweeps off annually such numbers
of

of the inhabitants, that those who are in health can, with impunity, converse with the convalescents when airing themselves on the tops of their houses, though there is only a parapet wall between them. The only precaution they use is, to avoid such intercourse when the wind blows directly from the person infected. But, when fevers become infectious, and are communicated from one to another, the distemper caught being similar to that from which it took its origin, not only shows the great variety of specific contagion which may exist, but also that it appears to act in the course of the disease as a ferment on our fluids, which is corroborated by the inoculation of the small-pox, measles, plague, &c.

140. In this section I have related several facts and observations concerning the origin of fevers, their causes, their action on our system, and such other circumstances as I thought might lead to a more satisfactory explanation of certain phaenomena

mena of fevers, than has hitherto appeared. A number of particulars, however, remain still to be treated of, which could not yet be accomplished; because they are peculiar to certain species of fevers.

SECTION

SECTION V.

OF A CATARRH.

141. **I**N the following dissertation, I shall take no notice of that singular species of contagious catarrh known by the name of *influenza*. Being a fever *sui generis*, it ought to be treated of separately, and as a disease distinct from the simple catarrh. For the same reason, I shall postpone the consideration of those coughs which arise from haemoptysis, scrophula, and likewise from particular employments, as ropemaking, hemp and flax dressing, hewing of stones, &c. my design being only to consider the nature and ordinary course of a simple catarrh.

142. The general idea given by medical writers, of the nature of a catarrh, is taken from the supposition of a permanent spasmotic constriction of the excretory and other small vessels of the skin; by which means perspiration being proportionably obstructed, that acrid matter retained in the habit is supposed to be thrown on the internal membrane of the nose, fauces, bronchi, and other affected parts, and to give rise to the several symptoms attending this disorder. This opinion, concerning the nature and cause of a catarrh, appears so extremely plausible, that it is not surprising it should have received a general approbation.

143. Indeed, an invariable effect of cold, during its application, is a diminution of perspiration, from the constringing action of cold on the small vessels of the skin. But this usually happens without any injury to the body; for the person no sooner moves into a warmer air than his perspiration

piration is again increased in proportion to the degree of heat applied. But, with regard to the quantity of perspiration, or degree of cold that may be endured with impunity, custom allows of a considerable latitude (100.). Shepherds in the mountainous parts of this country bear the cold of winter surprisingly; and I have known the guides, where sea-bathing is used, have the greatest part of their bodies immersed five or six hours every day, for several months together, in water above forty degrees colder than the temperature of their bodies. For, unless the cold is so intense, or continued so long as to affect the energy of the nerves, it produces no bad consequences. I mean not to say, that long-obstructed perspiration is not hurtful to the constitution; for certainly it is often a principal agent in the production of scurvy, dropsy, and other diseases: But that a temporary obstruction of perspiration on catching cold, or at the commencement of a catarrh, should be the cause of that disease, I have never

never yet been able to comprehend. The spasm on the vessels of the skin, with sometimes a slight degree of rigour, about the beginning of the disorder, returning at uncertain periods, and commonly of short duration, can have very little influence. For although a free perspiration contributes, in general, to the relief of the parts affected, as shall afterwards be more particularly noticed, yet profuse sweats are not uncommon during the continuance of the disease, without any alleviation of its symptoms, when the cause of it has operated strongly on the system.

144. From the statical experiments of Sanctorius and those of our countryman Dr James Keill, it appears that a considerable increase or diminution of perspiration may take place in twenty-four hours without any apparent injury to health, or the smallest tendency to a cough or catarrh. Dr Keill, who was twice seized with a cold during the course of his statical experiments,

ments, never perceived his perspiration to be thereby diminished. In consequence of these repeated observations, accurately made during the course of his disorder, he, in his statical aphorisms, declares, ‘*Adiapneustia non est causa tussis* *,’ and refers to his tables and observations for the truth of his assertion. In his *Disquisitio Prima*, entitled, *Impedita Perspiratio non est Frigoris suscepti causa*, taking a view of the common, but erroneous opinion of obstructed perspiration being the cause of a catarrh, he says, ‘*At quam aliena a veritate est haec conclusio, observationes praecedentes manifeste indicant; etenim eo quo frigus susceptum est die, et per plures subsequentes, in quibus tussis graviter affligebat, nullo modo diminutam esse perspirationem invenimus. Stabilatae igitur opinioni, et diu jam apud omnes receptae, ipsa experientia refragatur; quae quidem per se satis est, cur homines, opinioni suae, non tenaciter*

* Aphor. Static. p. 17, l. 1.

‘ naciter addicti, hanc sententiam non am-
 ‘ plius tueantur; at si eam rationis etiam
 ‘ trutina ultra examinemus, levissimis ra-
 ‘ tionibus primum admissam inveniemus.’

Through the whole of this dissertation, and in several other parts of his writings, he is equally clear and distinct with regard to this point. The Doctor being fully convinced, from repeated experience, that obstructed perspiration did not attend either the accession or course of the catarrh, most justly concluded, that it could not possibly be the cause of the disease. He saw that the application of cold to the body, under certain circumstances, or even to a small part of it, was capable of producing that effect. But, not paying a proper regard to our internal oeconomy, nor attending sufficiently to the various effects of different stimuli on the system, the sympathy between the nerves of the skin and those of the mucous glands, internal membrane of the nose, fauces, and bronchi, when cold is applied in a general way, or to the sur-
 face

face of any part of the body, so as to have such effect on the nerves as shall be more particularly mentioned afterwards, he embraces the wild opinion of frigoric particles entering the pores of the skin, mixing with the blood, and thereby occasioning a coagulum or thickening of the whole mass, in the same manner as those particles have been supposed to bring on the congelation of water in freezing. This effect is certainly produced by a privation or diminution of heat, and not by the introduction of those imaginary particles, the existence of which has never been demonstrated. But, as it would be foreign to our design to enter on any explanation of this doctrine, we shall proceed to admit his facts, without adopting his reasoning upon them. Neither shall I here examine the opinion of Sanctorius with regard to the cause of fevers. It is sufficient for our present purpose to show what that very accurate and learned philosopher had repeatedly observed from his experiments, that no hurt
arose

arose to the health of the body from a stoppage of perspiration in the winter. His words are, ‘*Adiapneustia, aestate ma-
 ‘ lignam febrem, hyeme vix minimam al-
 ‘ terationem, efficere potest; corpora enim
 ‘ acriori perspirabili aestate referta sunt
 ‘ quam hyeme **.’

145. Indeed, the sympathy between the nerves of the skin, from the application of a certain degree of cold, and those of the internal membrane of the bronchi, is so remarkable, that many delicate persons are immediately seized with a cough, when part of their body, and especially their feet, have been exposed to a severe cold, independent of the application of cold air to the lungs. And if, the instant a person perceives it to have this effect, he moves into a warmer situation, so as to become, in a short time, comfortably warm, the cough soon leaves him. But, if he shall re-
 main,

* Med. Stat. sect. 2. Aphor. 35.

main, or be unavoidably exposed to the cold for some time, the cough may continue for a longer or shorter period, and be attended with all the effects of a slight or severe catarrh, according to the time he was so exposed.

146. My late ingenious and learned friend Dr Whytt relates an uncommon and curious case of a girl of eight years of age, whose system had become irritable to a most extraordinary degree. But, as constantly happens, when a particular part of the body suffers more from this diseased irritability than the rest, such part is uniformly observed to sympathise with every part of the body, which is stimulated more than the preternatural irritability of the system can bear. In the Doctor's patient it was the lungs which sympathised so strongly with the rest of the body, and brought on a convulsive, or what may be properly called, a nervous cough, there being no apparent fixed disease in the breast. For, although

though the girl remained perfectly free from the cough, and with a natural pulse, whilst she continued in a horizontal posture in bed, yet, in standing, kneeling, or in any other posture, which required a strong exertion of the muscles, the pulse rose to near 200 beats in a minute, and the cough returned, but ceased again on lying down, and the pulse also returned to its natural state. The principal view in the history of this case seems to have been, to show the anodyne powers of warm bathing, when properly conducted, and that this remedy was superior to any dry heat, to that given by warm wet flannels, and, in some cases, even to opium itself. For, besides the heat and moisture accompanying warm bathing, so agreeable to the nerves, and which recovers their powers in so remarkable a manner, (parag. 35.) the inexpressibly soft application of the water to the very delicate terminations of the nervous filaments on the surface of the skin, has a very uncommon and remarkable effect

fect in soothing the nerves, and lessening the preternatural sensibility of the system. But it was remarkable in this patient, that the application of cold to any part of the body, immediately brought on a fit of coughing, whether in a horizontal position in bed, or in a standing, or sitting posture. Nay, when the cough was stopped by the anodyne powers of the pediluvium, and whilst her legs continued to be immersed in it, if a bottle of cold water was applied to any part of her body, or her hands immersed in cold water, the cough was renewed, but ceased in a short time after removing the bottle or cold water from her hands, if her feet remained covered with the warm water. This might, no doubt, arise from the peculiar sensibility of the lungs, and the particular effect of stimuli, in general, on that weak part, (parag. 41. 42.) But, it must also be remarked, that the stimulus of cold seems to be specific with regard to the lungs.

147. After what has been said in Section III. we come now to take a more particular view of the effects of cold on the body. This, in general, must be considered as salutary, from the assistance it gives in regulating the standard heat; and in proportion to its operation in this way, it must give more or less vigour to the system. Its tonic powers, during cold and dry seasons, in strengthening the solids, and the use of the cold bath, when properly administered, are likewise remarkable. But, if the cold be so intense as to diminish or disturb the power of the nerves as conductors, and, of course, alter their natural mode of action in any particular part of the body, a morbid circulation, secretion, &c. must take place in the part so affected. If the cause has acted in a slight manner, the effects of it may be soon overcome by the strength of the system, the affected nerves being gradually brought to act in their natural manner. But, if the cold shall have operated so strongly as to

induce a more permanent morbid affection of the nerves, then a general sympathy of the system with the diseased part, gradually takes place, (parag. 40. and 47.) and is accompanied with a lassitude and preternatural irritability, approaching to that of pain. This general uneasiness is known to every person who has ever been affected with a cold.

148. What is called *creaks* in the neck, rheums in the head and other parts of the body, arise from sitting at open windows, doors, or being otherwise exposed in cold weather. It seldom happens that the person so affected is immediately sensible of any bad effects, from his body, or part of it, being thus exposed to the cold. It is not till the next day, or perhaps the second or third day after, that he begins to complain and recollect the cause of his disorder.

149. This common, but curious fact, is similar to what happens in the operation of
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the causes of other febrile diseases. From the commencement of their action on the body, some time must elapse before the system in general can be affected by them, so as to produce the disease corresponding to the nature of the cause. The symptomatic fever, in consequence of wounds, amputations, and other chirurgical operations on the body, is seldom considerable till the third day after they have been performed. There is, indeed, sometimes a tendency to fever from the time of the accident or operation, which gradually increases according to the degree of pain with which the wound is attended. But the general cause of irritation commonly requires some days before the whole system can be brought to sympathise with the seat of the disorder. Besides, from a law in the oeconomy, inflammations, in consequence of wounds, arrive not at any remarkable height till about the third day, and they often rise no higher than is necessary for the production of pus.

150. In like manner, if any part of the body is affected by the application of cold, so as to alter the natural mode of action in the nerves, by which a change is brought on the circulation in the small vessels of that part, this commencement of a disorder may happen without pain, or any apparent sign of morbid affection. For a slight deviation from the ordinary course of circulation in the capillary vessels is not attended, for some time, with any sensible inconvenience. But the effects of it in the part where such change has taken place, and afterwards in the system, must always be proportioned to the cause, and the strength of constitution to resist its force. This cause will go on slowly, to act with an imperceptible stimulus, (par. 47.) till the system in general is affected by it, exciting more or less fever, or that kind of disagreeable sensation over the body which generally precedes the accession of fevers. At this time the person complains of pain in the part first affected, which is often unattended

tended with any perceptible swelling, though sometimes a slight degree of puffiness in it is observable.

151. This sympathy of the whole system with a part of it morbidly affected, which is so general, but so little attended to, has been particularly taken notice of from par. 49. to par. 59. where I have endeavoured to show how certain stimuli chiefly affect particular parts of the body. In the present case, when a person is seized with a cold, in the manner above mentioned, it seldom fails to affect the membrane of the nose, sometimes the amygdalae, and other glands about the throat; but more frequently those of the internal membrane of the trachea and its branches, by which the natural secretion of all those mucous glands is changed. The secretion, in general, is increased and more acrid than usual; and a considerable discharge of a thin sharp rheum from the nose, glands of the throat, and fauces, takes place. The eyes are commonly

monly dull and watery ; and, from a general swelling of the membrana Schneideriana, and collections of mucus, there is an unusual difficulty of breathing through the nose, accompanied with a sense of heaviness in the forehead, and a dull pain above the frontal sinuses. These complaints have sometimes got the name of coriza and gravedo. But the most constant complaint in a catarrh, is a troublesome cough, arising from a morbid secretion of phlegm in the lungs. At first there is a tickling cough, from an increased sensibility of the internal membrane of the bronchi, with little or no discharge of mucus, from a spasmodic constriction of the excretories of the glands, and even of the small branches of the bronchi. But, as this spasmodic affection goes off, the expectoration gradually increases, becomes thicker, and by degrees diminishes in quantity until the morbid secretion ceases with the recovery of the patient. The cough, in general, returns in fits, and continues till the accumulated sharp mucus in the

the

the lungs is expectorated. This expectoration is often retarded in severe fits of coughing, by a temporary spasm and contraction of the branches of the trachea, causing a wheezing, with an uneasy sensation of fullness in the breast, which arises from some obstruction to the passage of the air in respiration, and to the blood through the vessels of the lungs during the continuance of the spasm. The sense of fullness usually subsists till a quantity of phlegm is forced up from the lungs by incessant coughing. The person is then freed from the cough till the bronchi are again stimulated by another accumulation of mucus. In this way the cough goes on for an indeterminate time, according to the severity of the disorder, the constitution of the patient, the manner in which he has been treated, or has managed himself during the course of the disease; for, after a slight degree of feverishness, which commonly attends this complaint for the first three or four days, goes off, though the cough continues

tinues to be troublesome ; yet, being free from pain or sickness, and supposing himself in other respects in good health, the disorder in his breast is neglected. He is tempted, on account of business or pleasure, to expose himself too freely to the cold air, by which means that preternatural irritability brought on the internal membrane of the bronchi is kept up, and the increased secretion and cough are often protracted for a considerable time. For, when the system is once morbidly affected, or even after the patient has apparently recovered from his indisposition, causes of the same kind, though greatly inferior to what was at first necessary for the production of the disease, will exasperate it, or subject the person to a relapse often more severe than the first attack. This seems to be the reason why people labouring under a catarrh, or just recovered from it, are so soon and so sensibly affected by cold air.

152. When a cough from a catarrh has continued for a considerable time, beside the mucous glands, those of the stomach come likewise to be affected. A larger secretion than usual takes place, the appetite fails, and, from the sympathy of the lungs with the stomach, (par. 43.) the cough becomes more frequent and troublesome, which explains the utility of emetics in coughs of some standing.

153. Though a catarrh generally affects the mucous glands, because they are less capable of resisting the action of such a degree of cold as is sufficient to produce that disorder, than other parts of the body, (par. 41. and 42.) yet it sometimes happens, from a peculiarity of constitution, but more frequently from the effects of some former disease, that particular parts of the body acquire a greater degree of irritability than the rest, and of course are more liable to be affected *. It is in this way that inflam-

K k mations

* The late Dr John Clerk of Edinburgh, who was deservedly

mations of the eyes, agueish, rheumatic, and gouty complaints, diarrhoeas, fits of the gravel and stone, &c. are so frequently the

deservedly reputed to be one of the best practical physicians in his time, in a letter to Sir John Pringle, on the supposition of moisture getting into the blood by the lungs being the cause of a catarrh, or of other disorders which are supposed to arise from cold, gives the following remarkable passage. With regard to the supposed entry of moisture by the lungs, he says, ‘ This
 ‘ I doubt much, is not true, from my experience, and
 ‘ I know none apter to be affected by it. It is certain,
 ‘ if I pass through a new washed room, my legs turn
 ‘ stiff, though the passage is of no longer duration than
 ‘ a few seconds of time; and, if I continue in it a little
 ‘ longer, the stiffness ascends gradually, till it affects
 ‘ the left kidney, or the tonsils, my two weak parts.
 ‘ This gradual, though very quick influence, I cannot
 ‘ ascribe to the entry of moisture by the lungs, or even
 ‘ to any change brought on the blood by its ingress at
 ‘ the pores of the skin, but merely to a stoppage of the
 ‘ pores. Wet sheets, an experiment I never tried,
 ‘ have the most pernicious effects of any kind of moisture; yet it is more than probable, that this moisture acts immediately on the skin.’ Med. Annot. M. S. by Sir John Pringle, vol. 4. page 412.

the consequences of an accession of cold in people who have been often affected with any of these diseases. For the seat of the disorder, from repeated attacks, acquires at last such a degree of mobility as produces returns of the same complaint, from causes different from those by which it was originally occasioned. Every one of the diseases mentioned, I have known to have arisen from cold; and, indeed, nothing is more common.

154. The immediate cause of a fit of the stone being more or less of inflammation on the internal coat and neck of the bladder, with an increased sensibility, corresponding to the degree of inflammation, there will be considerable pain on the least motion or friction of the stone against the parts affected. This pain is greatly augmented on every effort to make water, and for some time after it is made, from the action of the detrusor urinae, abdominal muscles, &c. on the diseased part, in expelling

elling the urine, which, from the great irritability of the urinary passages, appears to be immensely hot. Such an inflammation, or fit of the stone, is often the consequence of a cold, and perseveres while the cause of it continues to act on the body, or rather till the system, by returning to its natural state, after the cause has been removed, (parag. 46.) loses that preternatural irritability acquired on the accession of the cold.

155. Though it would be foreign to our present subject to explain the particular causes of these fits, yet it may not be improper to take notice of indigestion, acidity, and other acrimony in the stomach and bowels, as instances of stimuli acting at a distance from the parts to which they are applied, (parag. 41. and 47.) For, the system becoming thereby more irritable, the diseased state of the bladder will render it less capable of resisting the general effects of stimuli, and more liable to be affected with

with a preternatural sensibility than the rest of the body, independent of the sympathy which subsists between the stomach and urinary passages.

156. In every severe catarrh, there being more or less of a tendency to inflammation, after the patient has got rid of his cough, and seems to be perfectly recovered from his indisposition, there may frequently remain, in different parts of the substance of the lungs, small obstructions, without any apparent inconvenience. It is highly probable, that a gradual resolution of such obstructions takes place, especially if the person escapes a return of the same disorder for any considerable time. But if, from repeated colds, these obstructions increase in number and obstinacy, they become at last irresolveable, and lay the foundation of what are called tubercles in the lungs, which are sometimes attended with difficulty of breathing on any brisk or violent exercise, and are often the cause of

a chronic dry cough. But, as these complaints are temporary, and not accompanied with pain, the danger of the disorder is frequently overlooked, till, by some future catarrh, they are irritated into a state of inflammation, and afterwards suppurating, bring on a phthisis pulmonalis, the most treacherous and mortal of all diseases.

157. Some people have larger secretions of phlegm in the cavities of the vesicles and bronchi than are necessary for defending their internal surface from the effects of cold air in respiration, or preventing the sides of the vesicles and bronchi from growing together; and, of course, from every such accumulation of phlegm, a fit of coughing must be excited.

158. Every one who has been afflicted with a severe catarrh, ending in a troublesome cough of long duration, becomes more liable to returns of it, on catching cold, than he was before the first attack of
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that disorder. Such a person comes, by degrees, to have larger secretions of phlegm in his lungs than formerly, and, in consequence of it, frequent fits of coughing, without any accession of cold, especially in the winter or cold weather, partly from a diminution of perspiration, but chiefly from the general operation of cold on the body. This gradually increases as age advances, and often proves not only the cause of habitual coughs, but of humoral asthmas and peripneumonia notha, which last is usually brought on by a catarrh.

159. From the foregoing observations we perceive, that a disease arises in the body without the introduction of a materies morbi, but merely from an excess of stimulus, by which the powers of the nerves, and their action on those parts where the stimulus was applied, are altered from their natural state. When this morbid affection arises to such a degree, that it cannot soon be overcome by the strength of the system,

then

then the whole body sympathises with the part first affected. But, as all parts of the system are not equally capable of resisting the effects of certain stimuli, on account of a variety in the species of sensibility and irritability of different nerves, (parag. 68. 69. and 70.) or from a preternatural mobility in those of particular parts, (parag. 153.) we know that they become more liable to be affected by stimuli in general. From these circumstances we learn, that, although the whole system must be more or less disturbed by every stimulus acting in a powerful manner on any part of the body; yet it appears from the above diversity of irritability in the nerves, from a morbid sensibility in particular parts, or from a difference in the nature of the stimuli themselves, some possessing such a singularity in their mode of action as adapts them to act more powerfully on certain nerves at a distance, than on those nearer, or in the part of their application, that it cannot be thought that stimuli will always
act

act in a general way on the system. We every day experience the reverse in many instances, where certain parts are chiefly affected, sometimes characterizing the disease, and even pointing out the nature of the cause, whilst the rest of the body suffers only in a slight way, from general sympathy. This is almost, in every point, the case with a simple catarrh, which generally affects the mucous glands, (parag. 150. 151. and 152.) except in such instances where a peculiarity of constitution, or some former disease, have given a particular turn to the disorder. This may sometimes happen, when cold acts only as the occasional cause of some other disease, where a predisposition to it exists strongly in the habit.

160. On the accession of a catarrh, a preternatural irritability is brought on the whole system, but is most remarkably felt in those parts, which, from the nature of the cause, are particularly affected: These

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are the mucous glands of the nose, fauces, and bronchi. Their secretion is increased; but, being of a morbid nature, it becomes more acrid than usual. Thus, the mucus, when secreted, stimulates the glands and their excretories to a farther increase of secretion, which often occasions a very large discharge of sharp mucus. In this disease there is a general tendency to inflammation; in proportion to the degree of inflammation the pulse quickens, becomes stronger and fuller, and thirst increases. But the dangerous consequences of this disposition are greatly lessened by the considerable evacuation of mucus from the glands. The more free and copious this evacuation is, with respect to the magnitude of the disease, the less is the hazard of inflammation, which is generally the consequence of this secretion being stopped or considerably diminished, from a morbid circulation in the glands, which sometimes extends to the substance of the lungs.

161. A simple catarrh, when the symptoms do not run high, under proper management, and even without much assistance from medicine, commonly ends in six or eight days. But when, on account of neglect, improper treatment, or severity of the symptoms, the advice of the physician becomes necessary, the curative indications, from the view we have taken of this disorder, are, first, to take off all tendency to inflammation; secondly, to free the system from preternatural irritability; and, thirdly, to rectify the morbid secretion of the mucous glands.

162. The principal circumstance to be attended to in the cure of a catarrh, is, to remove, as much as possible, all tendency to inflammation; for, of all the symptoms which accompany this disorder, none are so dangerous, especially in the lungs. Nothing is so ready to relieve the breast, or take off a partial inflammatory distention of the small vessels, from an excess of stimulus

mus in particular parts, as a free and gentle perspiration. The benefit arising from this salutary evacuation, is not so much its removing the effects of an obstructed perspiration, as by its relieving and rectifying internal morbid secretions, which it certainly does on many occasions. With this view, the patient ought to be confined to bed, in a room kept moderately warm, but not heated beyond that of a temperate day in summer, which, in some cases, where the fever is high, may be too great. He ought to be restricted to a mild vegetable diet; and we usually prescribe with advantage diluent acid drinks, breathing the steam of warm water, warm bathings, and keeping the body open with gentle laxatives, for which purpose, neutral salts should, for the most part, be preferred.

163. If, notwithstanding a steady prosecution of this plan, the fever, or other symptoms, do not abate, bleeding must be
used

used freely, and repeated according to the urgency of the case. In a severe catarrh, bleeding is generally the first means of relief, and should be ordered without hesitation or delay; especially if, from some difficulty of breathing, accompanied with pain in the breast, the danger of an inflammation is suspected. For, from the relaxing and debilitating effects of bleeding, when directed with judgment, it is of the greatest service in such cases. But, as relaxation and debility may be carried too far, circumspection must be used, that it be not prosecuted beyond the strength of the patient, or what the symptoms may require. (parag. 14. 15. and 34.) After which, when there is a tendency to topical inflammation, or when it has actually taken place, a blister should be applied as near as possible to the part affected. It often carries off, or considerably diminishes the internal stimulus, and of course lessens the inflammation. Neutral salts may be given frequently in small doses, particularly nitre
from

from 4 to 10 grains, with a double quantity of crystals of tartar, every two, three, or four hours, in a glass or tumbler of water, sweetened with sugar. These powders, sufficiently diluted, assist in abating the feverish heat, and in agreeably allaying thirst, provided too large a quantity of nitre is not used, which disagrees with certain constitutions. Purging with a solution of Glauber or Rochelle salts, is also of service. This medicine is improved by an addition of juice of lemons.

164. The second and third indications are, in a great measure, answered by what has been already proposed in the preceding paragraph. But, in a variety of cases, we must have recourse to such means of relief as may be best suited to particular constitutions and symptoms of the disease. The cough is usually the most troublesome; for which mucilaginous and oily mixtures, emulsions, the acetum scilliticum, solutions of gum arabic, pectoral infusions, &c. are used

used by turns with advantage. Here I omit mentioning the warm pectorals, as they are more calculated for chronic coughs than those which arise from a recent catarrh, especially if attended with any degree of fever. But the medicine I have the greatest dependence on, in lessening the general sensibility of the system, and in moderating the mucous secretions, is small doses of opium, not above one-sixth or eighth of a grain at a time, compounded in a lozenge, as the trochisci behici nigri of the Edin. Dispensatory*, repeating it occasionally according

* In February 1782, I was consulted for a young man of 25 years of age, of a strong and healthy constitution, then ill of a catarrhal fever. From an incessant dry cough, difficulty of breathing, pain across the breast, flushed face, and the pulse at 120 beats in a minute, I suspected a tendency to peripneumony. But by large bleedings, blistering, and other means used for his recovery, those dangerous symptoms, with the fever, left him in a few days. After this a troublesome teasing cough remained, seeming to depend on a preternatural irritability which his disorder had left on the internal

according to the severity of the cough, giving from one grain to one grain and a half of opium in 24 hours to an adult, and proportionally to younger patients. These lozenges, when allowed to dissolve gradually in the mouth, I have thought had a better effect in removing the cough, than when taken in the form of pills. But I commonly accompany the exhibition of them with a weak solution of emetic tartar, from
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internal membrane of the bronchi. I ordered a few of these lozenges, directing him not to exceed seven, which contained a grain of opium, in the day; however, as he found so much relief from the use of them, he took 26 in less than 12 hours, which mistake, at first, gave me some uneasiness; but the only consequences were, that he appeared as if drunk, from the quantity of opium he had taken, and that his cough was entirely removed. But it must be remarked, that so liberal a use of opium is always attended with danger. For the same person, about six months after, was seized with a catarrh, and he had recourse, without advice, to the above lozenges; and, taking them nearly in the same quantity, during the febrile state of his disorder, was seized with a severe asthma, from which he recovered with difficulty.

one to two grains in eight or ten ounces of a common saline mixture ; but seldom exceed one grain when the tartar is good, giving about one eighth for a doze every two, three, or four hours. By this means a gentle perspiration is kept up, the preternatural sensibility on the lungs is abated, the mucous secretions are lessened, and by the spasmodic constriction of the bronchi, from the former irritability of their membranes, and sharpness of the phlegm being considerably diminished, expectoration becomes more free and easy. In some cases, particularly where the catarrh is accompanied with pains in the shoulders, neck, arms, and other parts, I prefer to those medicines 10 grains of the pulv. Doveri every two hours till a sweat is procured, seldom exceeding half a drachm of this powder. But, where the person cannot be strictly confined, I use the powder of squills, made into pills with soap, in such proportion that each pill contains half a grain, giving two of them twice a day, along with the lozenges,

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which I seldom have occasion to do above three or four days.

165. After this short view of the nature, cause, and cure of a simple catarrh, it might be expected that I should proceed with my inquiry into those diseases which are often the consequence of it, as peripneumony, consumption, tubercles in the lungs, &c. But, as my intention is not so much to give a system of physic, as to examine into the nature of the causes of certain fevers, and to point out their operation on the system, as far as facts, experience, and observations, can serve to illustrate these subjects, I shall proceed to the consideration of the catarrhal fever.

SECTION

SECTION VI.

OF THE CATARRHAL FEVER.

166. **T**HE circumstance most difficult to be accounted for in the history of fevers is their acceſſion; a diſtinct knowledge of the proximate cauſe of which muſt be of the utmoſt conſequence in giving us a juſt idea of the true nature of fevers in general. This I ſhall endeavour to inveſtigate from the hiſtory of a catarrhal fever, which I conſider as a febrile diſorder of a middle nature between a common cold and that of an inflammatory fever, not unfrequent when catarrhs are general, from cold and moiſt weather ſucceeding the heat of ſummer and autumn, and

and likewise from the same sudden changes during the spring. This species of fever is perhaps the most unfavourable for such an explanation ; but, if I shall be so fortunate as to show even a probability of certain morbid conditions arising in the body previous to the accession of such a fever, I make little doubt of being capable of illustrating my doctrine in the most satisfactory manner, when we come to treat of the *proximate cause of remittent and intermittent fevers.*

167. In the preceding section I have endeavoured to show, and I hope in a satisfactory manner, that a catarrh arises from the stimulus of cold applied to the skin, and a sympathy between the skin and the mucous glands of the lungs, &c. without any materies morbi. This, at least, is the nature of the affection on its first approach. In its progress, indeed, by reason of the disordered state of the circulation and secretion, the mucus secreted by these glands

glands acquires an unnatural acrimony, which may in some measure be considered as a materies morbi, morbid effects being induced by it in proportion to the increased irritability of the parts to which it is immediately applied. By a continuance of the disease, the mucous glands of the stomach come also to be affected. Hence the efficacy of emetics, in curing a catarrh, was explained: But if the disease, whether from the powerful effects of the original stimulus of cold, or from any subsequent cause, should resist the usual means of treatment, this viscid phlegm secreted in the stomach, though once discharged, will soon again be collected, and then proves a stimulus to the whole body, not so much by reason either of its quantity or acrimony, as by reason of the preternatural irritability of the system in general, and especially of the stomach itself. This irritability of the stomach is now so great as to render this organ incapable of bearing even the ordinary ingesta of a healthy state, without

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without manifest injury to the body ; and it appears to be the immediate active cause of the numerous symptoms which precede and accompany the accession of a fever, which do not admit of a satisfactory explanation on any theory of fevers I have seen ; but, from the above view of that general morbid irritability that so constantly accompanies every febrile condition of the body, in which the stomach suffers so remarkably, are not of such difficult solution. But, before any farther illustration of this proximate cause, it may be proper to give the following short history of the catarrhal fever of a particular season, which I prefer to any studied description taken from books ; for from a faithful, though loose narrative of this kind, taken down without any view to the doctrine I am endeavouring to establish, we are more likely to receive a just notion of the true nature of this disorder. We shall afterwards proceed to consider the several remarkable circumstances and symptoms which attend its course, and also the

the most successful means of cure ; from all which I hope to be able to draw such unequivocal conclusions as shall tend greatly to confirm the account I have just now given of the immediate cause of fevers in general.

168. After a warm and dry summer in the year 1758, the weather in the month of October was remarkably cold and moist. Catarrhs and fevers became frequent ; and, as almost invariably happens in such seasons, those who had formerly been afflicted with particular diseases, as agues, diarrhoeas, gout, rheumatism, coughs, sore throats, hysteric, hypochondriac, and other anomalous complaints, arising from a preternatural delicacy of system, with a particular morbid affection of the stomach and bowels, commonly called nervous, had a return of their disorders. The above change in the weather was not felt with equal severity throughout the island ; neither were the fever and catarrh general.

I did not learn that this fever extended so far south as Yorkshire, or northward beyond Dundee. The sick were sometimes affected for two or three days with the common symptoms of a catarrh. Some spit blood; others bled at the nose; and in all of them there was a disposition to inflammation, with an increased force in the arterial system. The accession of this fever was in general accompanied with a weariness and lassitude, headach, coldness, and shivering, rheum from the eyes, nose, and mouth, frequently a looseness, sometimes a sore throat, and a number of other symptoms of a catarrhal fever, varying in different patients, as did the frequency and hardness of the pulse, according to the violence of the fever.

169. Although I have chosen the above season as an example of the effects of cold and moisture on the human body in the production of fever, because I kept an exact record of it, yet all physicians meet with

with similar instances every year. This fever commences with the cold weather at the end of autumn, continues through the winter, and becomes more frequent in the spring, especially when there is a succession of sudden changes in the weather. These changes, from temperate to cold and moist, contribute to produce the disease under the form of a continued fever, with an inflammatory tendency. The pleurisy, peripneumony, angina, and other topical affections which sometimes accompany it, show the nature and origin of the disorder.

170. During the prevalence of catarrhal disorders, we often meet with the common continued fever. This, with respect to its cause, is more complicated than the catarrhal fever; and I suspect sometimes marsh miasma, but more frequently human effluvia, to be concerned in the production of it. This disease is not, in general, accompanied with topical inflammation; and, after a few days continuance, the pulse loo-

ses that fullness and hardness which indicated some tendency to inflammation at its commencement ; for the effects of the cold must not be considered as the sole cause, but rather as co-operating with other causes in producing this disease. If I shall therefore, in this section, use the expression *continued fever*, I wish to be understood to mean the disease just mentioned, or the catarrhal fever after it has put on the form of the continued fever, which frequently happens.

171. Since the above deviation from a healthy state is uniformly the effect of a sudden change from hot, or even temperate and dry, to cold and moist weather, especially when this last continues for any considerable time, it must be of importance to inquire into its particular mode of operating on the human body, in producing such changes from a healthy to a morbid state, as will in most cases necessarily constitute the

the proximate cause of a continued or inflammatory fever.

172. The first circumstance that demands our attention is the cold and moist weather, as the remote cause of this disorder. For, although the effects of such degrees of cold as do not disturb either the natural powers of the nerves or the regular performance of their offices, tend to strengthen the fibres, and, of course, to give alacrity and firmness to the whole system, (parag. 147. and 148.) yet, when the application of cold exceeds the above limits, in proportion to the excess with which it acts in diminishing the powers of the nerves, the arterial system is chiefly affected, and there arises in the habit a disposition to inflammation, which discovers itself on the least accession of fever from intemperance, catching cold, or other occasional causes. This sufficiently accounts for the spitting of blood, bleeding at the nose, plethora, and increased force in the arteries. But the mucous glands

glands being the principal seat of disorders arising from the stimulus of cold, which, in this respect, may be called specific; rheum from the eyes, nose, and mouth, coughs, and sore throats, are almost the constant attendants of a catarrhal fever.

173. When cold has operated on the body in the manner mentioned in parag. 148. though its effects must, in general, be the same, yet they will vary in different people, according to its intenseness, the time of application, the strength of the person, the peculiarity of constitution, or the patient having been formerly subject to some particular disease. For, in this last case, the effects of cold appear not under the form of a catarrh or a catarrhal fever, but under that of the former disorder with which the patient had been afflicted; as the ague, diarrhoea, gout, rheumatism, stone, ophthalmia, sore throat, or disorders of the stomach and bowels, such as hysterical, hypochondriac, and nervous complaints. Though the mu-
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cous glands are chiefly affected by an excess of stimulus from cold, yet any person who has formerly been afflicted with any of the above diseases, the causes which produced them having acted for a considerable time on certain parts of the body, a preternatural irritability is induced, which renders them less capable of resisting the effects of stimuli, in general, than the rest of the system, and, of course, subjects such persons to returns of their former diseases.

174. It has already been observed, (parag. 149.) that the cause of a disease may act for some time, without any apparent injury to the system; or, if its effects are perceptible, they are commonly of so mild a nature as not to be much attended to by the patient. His appetite is, perhaps, less keen, and his complexion a little paler than usual. He complains of a dull headach, or of a confusion in the brain, of slight pains in different parts of the body, and of a weariness, as if under the influence of a trifling

trifling cold. But these complaints are apparently so mild, that they prevent him not from attending either to his business or his pleasures, for some days. This inattention to the disease is still more remarkable in putrid fevers; for the person often goes about somewhat indisposed for several days before the accession of the fever. But, in the former case, persons are generally seized suddenly, and without the least forewarning of the impending inflammatory disease. To these observations there are some exceptions. Inflammatory disorders sometimes make their approaches slowly, whilst fevers of a more putrid nature attack the patient as if it were by surprise. But, in general, the contrary usually takes place with regard to the manner in which these two different fevers make their attack; the reason of which appears to be, that, in the one case, the accession is accelerated, and heightened by some inflammatory pain. This is sufficient of itself to give a considerable velocity to the circulation, and, when

when unaccompanied with the febrile stimulus of proper fever, as in the toothach, the whittlow, the application of a large blister, a burn, &c. is only considered as symptomatic. For most of our inflammatory diseases are of a mixed nature, and not to be viewed in the simple light in which they have commonly been by medical writers. They are usually excited by a proper febrile stimulus in the stomach and bowels, acting in conjunction with the inflammatory state of the arterial system. At the same time, it must be observed, that this febrile stimulus, which acts so powerfully on the system, is not, in some respects, so strongly marked, nor can its effects be so clearly traced in the inflammatory, as in fevers of the remittent or intermittent kind, which I hope shall be shown in a satisfactory manner, when we come to treat of these diseases.

175. The circumstances in a fever, which have always been the most difficult to explain,

plain, are those which attend the accession. For, as they are closely connected with the proximate cause, which is not sufficiently understood, the symptoms depending on it cannot admit of any satisfactory solution, and have therefore been justly placed among the opprobria medicorum: Because, from the manner in which these researches have been carried on, the cause of the symptoms has hitherto eluded the most diligent observation of those learned and ingenious men who have written on this subject. Even now, that our method of inquiry promises greater success, it may not be in my power, in considering the circumstances which may accompany the accession or course of the fever, to give so full and satisfactory an explanation of them as I could wish. For, in a subject of so intricate a nature, there must be some particulars not so easy to be accounted for as others; not so much from a deficiency in the plan of inquiry, as from our ignorance of certain laws and regulations in the animal body, which

which, it is to be hoped, by the industry and observation of others, will, by degrees, become more known to us, when the nature, causes, and cure of fevers shall be prosecuted with greater advantage than at present. But, until farther discoveries are made, we shall proceed on such facts and observations as I imagine will be allowed to be well founded.

176. Although an accidental exposure to an intense cold, for any considerable time, is soon followed by a catarrh, catarrhal, or inflammatory fever; yet the effects of such changes in the weather as are related in parag. 168. are commonly slow, and do not affect the health in any remarkable manner for some time. Because it is not the cold of a few hours which affect people in general. It usually requires the operation of some days before such changes can be brought on the system, as are mentioned in parag. 146. 147. and 148. On such occasions, its operation is continued as it were

by *prizes*, or successive additions. It is not the cold of one day, but of several, that is capable of producing such considerable effects on the arterial system and mucous glands. These, at first, are of a slight nature, but gradually increase according to the circumstances of exposure to the weather and constitution of the person, until a preternatural sensibility and irritability of the system, which always accompany and keep pace with the morbid effects of cold, arise to such a degree, as, in conjunction with the stimulus of a collection of phlegm in the stomach and bowels, from a diseased secretion of it in these viscera, an accession of the fever is brought on. During the time that this morbid process is advancing, such changes are produced in the oeconomy as are taken notice of in parag. 174. But a particular time, which varies in different persons, must elapse before a febrile paroxysm can be excited; because a certain degree of morbid irritability must be induced to give the secreted fluids in the *primae viae* that

that strength of stimulus which is necessary for producing that effect. These fluids act much in the same manner as other stimuli; that is, according to their quantity and acrimony, or the irritability of the system. This irritability, at the commencement of the morbid disposition, is little altered from its natural state, and the body resists, for some time, the stimulus arising from the diseased secretions as above mentioned. But, as the irritability of the system every day increases with the farther operation of the cold, the stomach, which is one of the most irritable organs, is first affected; and, from the general sympathy of the body, with this viscus, the various symptoms which precede, or attend the accession of the fever, chiefly arise. At which time there appears to be an unequal and irregular distribution of the powers of action through the body, with a farther increase of the diseased irritability of the whole system. Certain sympathies likewise take place, which are peculiar to that morbid condition

condition of the body. And as, on many other occasions, there is an evident reciprocal sympathy between the stomach and skin, this last is so affected by the febrile stimulus in the primae viae, as to suffer such a considerable spasmodic constriction, not only in its capillary vessels, but through the whole of its substance, as produces a paleness on the surface of the body, a sense of coldness, with horripulationes or rigors, which return at uncertain intervals. These symptoms, according to their severity, shew, in general, the magnitude of the future disease; for, in some slight cases, they are scarcely to be perceived; during which time the pulse becomes small and quick, but is not attended with that irregularity which takes place in the cold stage of an intermittent.

177. This feeble state of the circulation, as well as the weariness and lassitude, nausea, and sometimes a vomiting about the accession of the fever, and likewise that diminution

minution of strength in the animal functions, so remarkable during the whole course of it, I should imagine, would not be difficult to comprehend; for they are consequences of such a febrile stimulus as I have shown to exist previous to the commencement of fever acting in the primae viae: And, by sympathy with these parts, the whole system becomes extremely irritable. It is to this uncommon irritability of the stomach and bowels, that we must chiefly ascribe the want of appetite, the great dislike to all animal food, and to every thing that possesses any remarkable stimulus, except fruit; for which, and subacid diluent cold drinks, patients have the strongest desire *. For the same reason, a bright light, great noise, strong smells, and similar stimuli,

* This dislike to animal food in fevers may likewise arise from an instinctive reluctance to every thing which would increase the putrescency of the ingesta; and, as acids are known to resist putrefaction, the desire for such as are of a mild kind may also proceed from instinct.

muli, which were formerly borne with ease, and sometimes with pleasure, as in the use of tobacco, become exceedingly offensive to them.

178. At first, the whole powers of action appear to be exerted in a weak and tumultuous manner, most of the functions being carried on with less firmness and regularity than in a healthy state. The heart, in particular, is observed to suffer considerably, not only from the universally increased irritability of the system, but from a remarkable diminution of its force. This debility appears to arise from the action of the febrile stimulus in the primae viae, which has so considerable an effect on the whole system, and particularly on the vital organs, as, in the cold stage of some malignant intermittents, to put a stop to their motion altogether. This is no doubt a rare case; but, when it happens, we must suppose the febrile colluvies, from some remarkable noxious quality, to act on the
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stomach and bowels, and of course on the debilitated system, as a poison, in producing these fatal effects. I know this enfeebled motion of the heart, on the accession of a fever, is supposed to have some connection with the spasmodic constriction of the skin, and it may in a small degree be so. But this can only be understood in a secondary way; for the constriction itself, on the surface of the body, seems to originate from the febrile stimulus in the alimentary canal; and, when this stimulus has operated on the system for some time, the spasmodic constriction of the skin gradually lessens, and soon after entirely disappears; though, in some cases, during the first day or two of the fever, a slight rigour occasionally returns; but it rather resembles an hysterical chilliness, than a return of the cold stage.

179. As this febrile stimulus begins to abate, the action of the heart and vascular system becomes gradually stronger, and is accompanied with a proportionable increase
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of heat in the body, exciting the patient to use every means he can devise to carry off, or moderate its excess. But, how this transition from the cold to the hot stage happens, or what changes take place in the system, which are capable of producing that effect, have hitherto been questions of difficult solution. From the view, however, we have taken of the nature and cause of a catarrh and catarrhal fever, it is to be presumed that these effects will admit of some explanation, though it may not be, perhaps, in so full and satisfactory a manner as will afterwards appear, from considering the like phaenomenon in the bilious remittent and intermittent fevers. For there are certain circumstances in these diseases, which, I apprehend, will afford us an opportunity of discussing, in a more ample manner, this intricate part of our subject. I shall, therefore, at present, only remark, that, from the time the pulse begins to quicken, there is a greater absorption than usual of the fluids from every cavity of the body.

body. This absorption creates a thirst and desire for cool drink. But the absorption and thirst are not peculiar to a febrile quickness of pulse, but are common to every accelerated circulation, whether from pain, exercise, external heat, or other causes. This frequent desire for drink and dilution, so strongly solicited by nature, continues through the whole course of this fever, appears to keep pace with the degree of it, and is accompanied with the most salutary effects, by retarding the putrescency of the blood, which seems to increase with the accelerated circulation, and by supplying the place of the fluids absorbed, and sometimes carried off afterwards by perspiration, respiration, the kidneys, and intestines. The absorption and waste of our fluids in fevers must be very great; because the low diet, in such situations, does not altogether account for so remarkable a diminution of bulk in the body, as is so often observed after a brisk fever of only a few days continuance. But there is another consider-

able and important use derived from such large draughts of thin liquors taken into the stomach, and for which the sick in fevers are prompted by nature with so much avidity, I mean, the dilution of a preternatural quantity of phlegm from a morbid secretion of it in the primae viae, and which I have always considered as the principal febrile stimulus, and chief cause of those rigours and chilliness usually felt at the commencement of a fever. This dilution facilitates the absorption of the phlegm, which appears to be considerable on the accession of the fever: Of course, its quantity in the stomach and bowels is soon lessened; and, as this absorption, as well as diminution of quantity, proceeds, the chilliness, rigours, spasmodic constriction, and paleness of the skin, gradually go off; because, at last, there is not a sufficient quantity of phlegm to continue these effects.

180. At this time the body becomes warmer, the pulse harder, fuller, and stronger.

er. The skin recovers its natural colour, is sometimes observed to be redder than usual, but especially that of the face, which often becomes florid, with other signs of a general plethora, to which the quantity of fluid absorbed certainly contributes, though it chiefly arises from the increased force of the vascular system. This, with a number of symptoms, which vary in different people, according to circumstances, continue for an indeterminate time, or until the increased force of the heart and arteries, kept up by a perpetual irritability of the system, from the effects of the cold, ceases, and the morbid secretion in the mucous glands returns to its natural healthy state. But the time required by nature for accomplishing these ends must differ with the constitution of the person, the magnitude of the disease, some peculiarity in the disorder, and the manner of treating it. I know not if these fevers, when left to themselves, and without any medical assistance, might not terminate in a certain time. But,
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even in such situations, I have never been able to observe that regularity in the critical days, so strenuously insisted on by the ancients, and by many of the modern authors. This, however, I am certain of, that the period of a fever is shortened or protracted by a good or a bad practice,

181. I know it is a general opinion, that the cold stage, on the accession of a fever, is essential to it, and, by some, it is considered as the cause of every fever whatsoever. But, from the view we have taken of the nature of a catarrhal fever, the coldness and rigours at the commencement of it must be considered as an effect of the proximate cause, acting in the primae viae on the system, which is rendered, in an extreme degree, irritable, from the antecedent action of the remote cause. Neither am I clear, that a cold stage is essential to this species of diseases. For although it does, in a greater or less degree, accompany the attack of the greatest number of fevers,

fevers, yet there are instances of their coming on without any rigour or chilliness. But these disorders are generally of a mild nature, and usually terminate in the recovery of the person. Besides, how often does it happen to people afflicted with an ague, that they escape the cold fit altogether, which cannot be explained on the supposition of its being essential, and far less as the cause of the disease? But, it may be said, that a spasm on the surface of the body is sufficient of itself to constitute the proximate cause, independent of any sense of coldness or shivering; and, if this were the truth, one might naturally suppose a diminution of perspiration to be the consequence, which is by no means the case; for, profuse sweats, and the wasting of the body, contradict the hypothesis. Another circumstance invalidates this theory. If effects are proportioned to their causes, how comes it about, that the longest and most severe cold fit does not produce the longest and most obstinate hot stage? Though this frequently

frequently happens, yet it is not always the case. I have often observed fevers proceed a considerable length where the rigours and chilliness at the beginning were little more than those observed occasionally through the course of the disease, from an accumulation of phlegm or bile in the primae viae which sometimes occasions an increase of the fever for a few hours. This phlegm acts on the system nearly in the same manner as at the commencement of the fever, but, in general, with less force; and which phlegm, I believe to be the real cause of those exacerbations and remissions which are so common in almost every species of fever. For, till the preternatural irritability of the body and the morbid secretions in the alimentary canal are rectified, the sick must be subjected to those remarkable changes in the state of the fever from every accumulation of bile, phlegm, and other acrid matter in the stomach and bowels. Improper drink or food will produce the same effect, from the great irritability of the nerves

nerves of these viscera, which, at such times, cannot even bear the stimulus of the ordinary ingesta, without an increase of the fever, and raising other disturbances in the oeconomy. Sometimes a vomiting and purging is brought on, which, when conducted in a proper manner, give great relief to the patient.

182. But here a difficult question arises with regard to the regular accession of the fever at night, and the remission of it in the morning, which I wish it was in my power to solve. But, from our limited knowledge in the laws of the animal oeconomy, I despair of being able to give a full explanation of this intricate point. I shall, however, hazard a conjecture. In the first place, it must be remarked, that this accelerated circulation is not peculiar to a febrile condition of the body; for the same thing is observed to take place, in a less degree, in health. This is probably owing to an increased irritability of the system,

stem, occasioned by the continued exertion of our functions, and of the faculties of the mind through the day. For mental exertions, when carried to any uncommon degree, though the person should not move from his chair, never fails to quicken the pulse. This exertion of mind and body must be inconsiderable during a fever, but, from the debilitated state of the body, will have a proportionally greater effect in increasing the irritability of the system. Another circumstance which may contribute to this regular accession of the fever in the evening, is the remarkable diminution of perspiration which takes place at that time, and continues through the night. This fact is confirmed by the experiments of Sanctorius and Dr Keil. The last of these learned gentlemen, in his aphorisms, says, ‘*Perspiratio diurna est nocturnae sesquialtera.*’ Is it not, therefore, reasonable to suppose, that, in proportion to the diminution of perspiration, a degree of fever may arise, which, perhaps, receives some additional

tional strength from an augmentation of the febrile stimulus in the primae viae. This increased force of the fever, after a few hours continuance, commonly abates in the morning with a more free and copious perspiration. In as far as this accession in the evening may depend on its ordinary cause, it is seldom considerable. But an additional quickness of pulse, at such times, is always perceptible through the whole course of the fever.

183. There is such a similarity between a severe cold and a slight catarrhal fever, that it is difficult to draw an exact line of distinction; for they arise from the action of the same remote cause, and the same, or similar parts are affected. In both diseases, the vascular system and mucous glands are the parts chiefly attacked. But a catarrh is generally the effect of a sudden application of cold, (parag. 147.) sometimes only for a few minutes. With the exceptions mentioned in parag. 153. cold commonly

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affects the internal membrane of the bronchi, the tonsils, fauces, and nose, but seldom the glands of the stomach till the patient has been ill for some time, when the cough usually increases; but it is much abated on the expulsion of a quantity of phlegm by an emetic. During this time, or, at least, from the third or fourth day of the disorder, there is hardly any fever; for, about that period, the preternatural irritability of the body, in a great measure, goes off, and, of course, such a quantity of phlegm in the stomach, as might prove a febrile stimulus in a more irritable state of the system, has not the least effect. But if, at that time, the patient shall catch a fresh cold, be seized with a severe continued pain in any part of his body, or, from some other cause, his system becomes uncommonly irritable, then such a collection of phlegm in the primae viae usually brings on a feverish paroxysm. The catarrh then puts on the form of a catarrhal fever of an uncertain duration. But, when this takes place,

place, without a cough, sore throat, or any other of those topical affections commonly called catarrhal symptoms, then the disease, in general, receives the name of a continued fever. However, from this evident affinity between these two disorders, the indications of cure must be nearly the same, though the management in such a fever, according to the variety of the symptoms, ought to be somewhat different, and conducted with the utmost attention. But, as the morbid effects of the cold and moist weather in autumn 1758 were various, in different persons, those diseases which arose from it, and were not strictly catarrhal, as agues, diarrhoeas, the gout, rheumatism, &c. required each a particular treatment, suited to the nature of the disease. I shall now proceed to consider the curative indications of the catarrhal or continued fever, in the order in which they are mentioned in paragraphs 161. 162. 163. and 164. with such other remarks and observations as shall occur from a consideration of the different

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different symptoms which sometimes accompany the various forms of this disease.

184. Nature often points out the means to be used for answering our first intention, namely, that of moderating the force of the circulation, and taking off that tendency to inflammation which so uniformly accompanies every disease of this kind; for a person is no sooner attacked with the fever, than he feels a desire of going to bed, where, by an easy horizontal posture, he lessens the stimulus on the vascular system, which arises from the action of such a number of muscles as must be employed in an erect position of the body: But, in whatever direction he may lay himself, particular muscles, by being kept in constant action, soon become tired, and the patient seeks for a new posture to give relief to his wearied muscles; the same weariness recurs in a few minutes, and gives rise to that remarkable restlessness which takes place in fevers. I have already taken notice

tice of the incapacity of the sick (177.) to endure any great noise, bright light, strong smell, animal food, or whatever stimulates their system, which the disease has rendered extremely irritable. All stimuli of this kind they avoid in the most solicitous manner, from a consciousness of their having a tendency to increase their disorder; but an ardent desire of drink and dilution, which has so considerable a share in the cure of fevers, is kept up through the whole course of their illness. They have likewise the strongest desire for ripe fruits and subacid liquors. This is one of those natural appetites bestowed on us for answering some valuable purpose in the oeconomy, which, in the present case, is not only the correction of a putrid colluvies in the primae viae, but an abatement of the putrescency of the blood that every day increases: For, whatever may be the nature of the fever at first, it seldom fails, in six or eight days, to show its putrid disposition, by a variety of symptoms.

185. To answer the same intention, and to moderate the excess of heat and its consequences, the sick are equally desirous of cool fresh air, cold drink, and light bed-clothes, unless they are forced into a contrary practice by an ill-judged solicitude of their friends to keep them warm, though they are tormented with a degree of heat considerably above the standard, the reduction of which is always attended with the most salutary effects: Of this we have the clearest evidence in the small pox, and in every fever accompanied with great heat and a quick circulation. But the application of the cold must not be carried so far as to diminish the powers of action in too great a degree, of which there is very little hazard; for the patient himself, if free from delirium, will always, from his feelings, prevent any mistake of that kind. This is the antiphlogistic method of cure dictated in such strong and pathetic expressions by nature, in every inflammatory fever, and ought to be followed strictly by
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us, unless in cases of debility in the more advanced stage of the disease, when cordials, stimulants, and antispasmodics, are exhibited with advantage.

186. When the above plan of cure proves insufficient for moderating the excess of heat, and violence of the circulation, physicians have recourse to other methods of accomplishing these ends. The first is to lessen the plethora by venesection, which is also the most efficacious in diminishing the powers of action, and especially those of the heart and arteries. But it requires experience to judge how far bleeding may be carried with advantage, or even with safety to the patient. We do not say that a fever is high, when the pulse beats not more than 25 or 30 strokes in a minute above its usual number. At the same time, when we judge of the degree of fever, we should consider the age and sex of the patient, the constitution, the febrile symptoms, the fulness, hardness, or strength of the pulse,

pulse, and the time of the disease, before we can direct the quantity of blood to be taken, or the repetition of the operation. Bleeding may be performed more freely in plethoric habits, especially when accompanied with spitting of blood, bleeding at the nose, violent coughs, fore throats, or other topical inflammations, and particularly of the pleura, or lungs, than when the fever is not attended with any of these symptoms. It frequently happens, in practice, that a plethoric person, with a pulse only at 90, is bled freely, with the greatest propriety and advantage, whilst in another, under the same species of fever, having a pulse at 110 beats in a minute, but of a contrary constitution, venesection is forbid with equal judgment and benefit. Hence it is easy to perceive the impossibility of fixing precise rules for our conduct in this particular, the circumstances mentioned being the only means to direct our judgment in certain cases. But, it may be observed, in general, that no person in a catarrhal

tarrhal fever, with a strong and full pulse above 110 beats in a minute, is ever the worse for one bleeding, from 10 to 12 ounces; nay, we consider it as a necessary and safe practice on such occasions, which we are obliged sometimes to repeat, especially when any topical inflammation appears. In which case, we endeavour to assist the general effects of venesection by topical bleeding with leeches, or wet cupping, fomentations, embrocations, and blisters; which last ought to be applied as near to the part affected as possible, and rather above than below the ordinary size; because, from experience, blistering is found, next to bloodletting, to be the most effectual means of removing topical inflammation, (parag. 163.) and often supersedes the necessity of large and repeated bleedings, which, when carried too far, produce considerable debility, (parag. 14. 15. and 34.) and sometimes lay the foundation of drop-sies, and other chronic diseases.

187. So far our plan of recovery appears exactly to correspond with the account we have given of the nature and cause of the disease. But, as I have spoken so often of a febrile stimulus, from a morbid secretion in the mucous glands of the stomach and bowels, it is natural to suppose, that the clearing these viscera, by a gentle emetic and cathartic, should alleviate the symptoms, and, in most cases, lessen the degree of fever, which, during many years practice, I have, in general, found to be followed by these good effects, especially when administered about the beginning of the disorder. It is in this way we must account for the salutary consequences of the exhibition of antimonials, under the names of tartar emetic, calx antimonii nitrata, Kermes mineral, James's powder, &c. All of these may be managed in such a manner, as to have nearly the same effects in exciting vomiting, producing stools, and raising a gentle diaphoresis, which operations, after venesection, have often carried off the
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fever in a very short time, and have given rise to those numerous encomiums on James's powders, as a specific in fevers, with which the public has been amused for so many years. The good effects of these powders have gained them great credit with the world, without its being perceived, in general, on what their febrifuge virtues depended. I mean not to say, that every thing which will vomit, purge, and increase perspiration, will always be attended with the same good effects; for the above antimonials, when properly prepared, and given with judgment, appear to possess a peculiar stimulus which adapts them better for producing these ends than most other medicines. At the same time, the favourable opinion I have of their general use in fevers, does not preclude me from that variety in prescribing which different circumstances must dictate in particular cases.

188. The remarkable success derived from the active preparations of antimony
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in fevers, has created a general idea that they possessed a power of acting on the cause of the disease in such a manner as to counteract its operation, or to destroy its force altogether; which they certainly have not in any other way than is mentioned in the preceding paragraph. The success that has attended the proper exhibition of these powders, at the commencement of slight febrile disorders, has greatly contributed to promote this universal belief. For, although most of such cases usually terminate in the recovery of the patient, in the course of two or three days, without any other assistance than rest and dilution, yet the antimonial preparation being given in such a manner as to excite vomiting, purging, or both, and afterwards, from what remains of it in the bowels, such an *aegritudo* is kept up in the *primae viae* as to produce a *diaphoresis*, it seldom fails of shortening the period of the disease. Because, in such mild cases, if the alimentary canal is cleared in the manner mentioned, a gentle perspiration

ration after such evacuations, assists most remarkably in carrying off the morbid affection in the glands of the stomach and bowels, and consequently the fever itself. But, if the cause of the disease shall have operated so strongly on the system, as not to be removed by such gentle means, the fever will, notwithstanding, proceed for an indeterminate time, though the antimonials may have been given, so as to have produced the above effects. In such cases, the repetition of them is, for the most part, attended with bad consequences. For, as our principal view in the exhibition of such medicines is, to evacuate the stomach and bowels of a collection of phlegm, and other acrid matters, if the fever shall continue after this end has been obtained, persisting in the use of such stimulating remedies commonly produces debility, and other considerable disturbances in the system, which I have sometimes known to have been carried so far as to endanger the life of the patient. At the same time, it must
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be observed, that antimonials may be given at any period of the fever with the greatest advantage, when the patient has strength sufficient to bear their operation, and when there is a quantity of phlegm, acrid bile, and faeces, in the primae viae, which, from their stimulus, and putrescent nature, produce so much mischief in fevers. The neglecting to evacuate the first passages of a putrid colluvies, has given such frequent occasion to bestow the highest praises on the virtues of James's powders; because they often produce those salutary effects, at a time when nature was disposed to critical evacuations, but was impeded in her operations, from the disturbance raised in the system by the putrid fomes in the alimentary canal.

189. As it would here, perhaps, be premature to enter more particularly into the subject of the active preparations of antimony, I shall reserve any farther observations on this head till we shall have considered

sidered the cure of bilious fevers, those arising from marsh effluvia, and others of a similar nature, where antimonials are of more general utility, than in those of a catarrhal or inflammatory disposition. For, in these last, the exhibition of antimonials is more limited in the hands of those who know how to use them with propriety, which is seldom above once or twice during the course of the disease. Because, in fevers of the inflammatory kind, the primæ viæ are not so apt to be loaded with acrid substances as in fevers of a more putrid nature; and, of course, there is seldom any necessity for giving such remedies to evacuate the intestines. We, in general, find laxative glysters of sufficient efficacy for that purpose, through the whole course of the disease, except at its commencement, when, in particular cases, a dose of Glauber or Rochelle salts is given with advantage; and, if symptoms shall indicate any disorder in the stomach, from phlegm, bile, or indigested food, the adding a grain or
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two of tartar emetic to such solutions, and giving them in small doses, at proper intervals, so as to excite gentle vomiting and purging, is followed with considerable benefit to the patient, by alleviating the symptoms, and moderating the degree of fever. But, such a medicine can, in few instances, be repeated with equal advantage, especially in such cases as appear to be highly inflammatory, or where topical inflammation has already taken place; for, on these occasions, such stimulating medicines are apt to increase the disorder. Neither is their operation as antimonials, at such times, so much wanted; because, from the considerable dilution and absorption which take place during an accelerated circulation, there must be a proportionable diminution of phlegm in the first passages. Hence we rather choose to conduct the remaining part of the cure by the means mentioned in paragraphs 161.—164. giving, at the same time, neutral salts of various kinds, as the saline mixtures, made with the fixed or
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volatile alkalis, nitre, cream of tartar, and others, which possess cooling and sedative powers, or which promote perspiration and urine, without heating the patient, or exciting any remarkable disturbance in the stomach and bowels.

190. But, in a variety of cases, much will depend on the judgment of the physician, who, from his experience, will seldom be at a loss in the management of his patient under particular complaints, whilst he keeps in view the original cause and nature of the fever, guarding as much as possible against a state of debility, which generally takes place towards the end of the disease; and, when it has been protracted to any considerable length, often gives evident signs of its putrescent disposition, which it did not at first. At this period of the disorder, Peruvian bark, cordial stimulating remedies, antispasmodics, and wine, may be given occasionally, which could not be done in the more early stages

of the fever. With the same view of keeping up the vis vitae, and preventing the fatal termination of the disorder, from mere debility and a sluggishness in the powers of action, we are often obliged to have recourse to external stimulant applications, in the form of cataplasms, to the feet, and blisters to different parts of the body, which last are supposed, by practitioners, to have other beneficial consequences as evacuants; and, in cases of topical affections, they may likewise have their use. But their good effects, as general evacuants in cases of debility, I suspect are not sufficiently ascertained. However, in such debilitated states of the body, we are obliged to support the strength of the patient as much as possible by proper aliment, in small quantities, frequently repeated, with wine and other cordials, until the crisis or termination of the fever, which is for the most part accompanied with some sensible evacuation by the skin, kidneys, or intestines,

intestines, and sometimes by the whole of these emunctories.

191. The crisis of a fever is perhaps the most remarkable phaenomenon in the whole course of the disease. To this circumstance we look forward with the utmost solicitude as an operation of nature, by which we expect a solution of the disorder; the fever itself being considered only as preparatory to it, and as the state of coction or maturation of the materies morbi, fitting it to be thrown out of the body in the manner mentioned, or by exanthemata, pustules, boils, imposthumes, or other critical discharges.

192. Although it is highly probable that, in every species of fever, there is a materies morbi, yet I imagine it is chiefly generated in the course of the disease; for, in infectious disorders, the quantity of matter capable of producing diseases, similar to those from which they took their origin,
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is inconceivably small ; but the products of them, in the course of the disease, are exceedingly great. However, as infectious diseases are attended with some peculiar circumstances, we shall postpone the consideration of the changes brought on our fluids, and the maturation of the morbid matter during the course of these fevers, till we come to treat of the diseases themselves. At present, we shall only consider some circumstances that occur in the course of every catarrhal fever, which may perhaps lead us to a more just conception of the *materies morbi*, and likewise convey some idea of the manner in which a crisis and critical discharges take place towards the decline of the disease.

193. The chief circumstances which excite our attention, at the commencement of a continued fever, are the uncommon quickness and strength of the pulse, with a preternatural heat of the body, a constant concomitant of an increased velocity of the blood,

blood, which, when continued for any considerable time, never fails to produce a morbid change in the circulating fluids, and in some of the secretions, particularly of the bile: For that animal process, by which the chyle is assimilated or changed into blood, is always promoted by such an accelerated circulation. This naturally produces an uncommon putrescency in the fluids, which is constantly accompanied with some degree of acrimony. Besides, this additional proportion of heat, when long continued, has a remarkable effect on the secretion of the bile, which becomes more acrid, and greater in quantity, than in a healthy state. This effect is not so perceptible in a catarrhal fever as in the bilious kinds, where the principal remote cause is an excess of heat. The fact is, that, after an abatement of the inflammatory symptoms, if the fever continues, it never fails to show more of a putrid disposition than it did at first, and this is always in proportion to the duration of the disease.

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But there is another source of acrimony in the blood, occasioned by an absorption of acrid humours in the alimentary canal, arising from the morbid secretions of the mucous and other glands, from which I have always supposed the febrile stimulus chiefly to arise, and it is most likely does continue to act more or less in that way during the continuance of the fever; from which absorption, as well as from the uncommon velocity of the blood, and perhaps other causes, the putrescency and acrimony of our fluids are daily increased, from which, what may be called the *materies morbi* probably derives its origin, though it is by no means the cause of it. On the contrary, it appears to be the product of the disease, notwithstanding it adds considerably to the magnitude and danger of the disorder. It is highly probable that a considerable waste of the *materies morbi* takes place during the course of the fever, by perspiration, urine, and the intestines. But it does not appear that it is completely evacuated

evacuated till the crisis. I mean not, that the whole is thrown out of the body at the crisis ; for the person may be in a convalescent state for some weeks before he can be said to be entirely free from the disease ; during which time the morbid matter often proves the cause of boils and imposthumes. When these take place on the surface of the body, their usual seat, they are supposed to be salutary evacuations. I am aware that it may be asked, what is a crisis, and how does it happen ? To these and similar questions we should perhaps plead ignorance. But, that I may not be accused of that indolence or want of courage of which I have accused others, I shall proceed to consider what I imagine happens in the decline of fevers.

194. It requires no stretch of imagination to suppose, that the causes of fevers, in general, will act on the system with a degree of force proportioned to their power, and the strength of the person to resist their effects.

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effects. And, indeed, we find fevers of every species varying in their violence and duration, according to the circumstances just mentioned. It is true, that certain specific contagious fevers are less liable to vary in the time of their continuance previous to the crisis, as the measles, small-pox, &c. But, between the mild and malignant sorts, we perceive a difference, even of some days, before they can be said to be at their height; and especially in the small-pox; for the measles are more regular as to their time of duration, as far as respects the growth, number, and brightness of the exanthemata, which generally decline about the fifth day, though danger from the fever is, in many cases, not over for some time afterwards. These differences are generally foreseen by practical physicians from the third or fourth day of the disease. But, in a catarrhal or continued fever, the time antecedent to the crisis is, and necessarily must be, exceedingly various. For it is not reasonable to suppose, that the duration and danger of
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the fever will be otherwise, than in proportion to the force with which the remote cause has acted in the production of such morbid conditions of the body as have proved the immediate cause of the disease. Or, if we take another view of this important subject, and say, that this fever being an operation of nature, by which she endeavours to rectify the effects of the remote cause, then we must also say, that this operation, with regard to its force and continuance, will always be in proportion to the morbid conditions of the body it is calculated to remove. But, if these shall be found, at the same time, to be the principal source from which the fever derives its origin, then they must necessarily keep pace with one another. The fact is, that we find catarrhal fevers terminating on the 3d, 4th, 5th, and 6th day from their commencement, and sometimes continuing for a much longer period, without any regularity as to critical days, so as to settle that disputed point with any degree of precision. With

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regard to the morbid matter we have mentioned, the same way of reasoning may also be applied to it; because, according to the degree of fever, will be the quantity and time necessary for fitting it to be thrown out from the circulating fluids, as is evidently the case in other fevers. For in some mild kinds of the inoculated small-pox, I have known the pustules appear on the fifth or sixth day from the inoculation, with a degree of fever scarcely perceptible, and they have turned on the 6th, 7th, or 8th, seldom continuing out full till the 9th day, the usual period of the natural distinct kind. But in the more malignant sorts, we know that they do not arrive at their height till the 11th, 12th, 13th, or 14th day, from the first appearance of the pustules. What probably assists the evacuation of the morbid matter at the time of the crisis by the usual emunctories is, that, from a preternatural irritability of the whole system during the course of the fever, and likewise from an increased acrimony in the fluids,

there

there is a certain tension kept up on the secretory vessels, as well as on those of a larger kind, which I consider as a different affection from what is properly called spasm; because the vessels still continue to be pervious, and to perform their functions, though, perhaps, they are lessened in their diameters. But at the time of the crisis, the cause of the disease abating in its force, and at last ceasing to act altogether, the preternatural irritability of the system being, at the same time, considerably lessened, the general tension of the vessels is taken off, and the secretory organs act more in their natural way.

195. Our observations on the urine of people in fevers are chiefly directed to the state of maturation of the morbid matter, and the time of the expected crisis. We are led to judge of these circumstances, from clouds in the urine hanging towards the bottom, after the glass has stood for some hours. This appears to be a secretion of
part

part of that acrid matter generated in the course of the fever, which, at this time, is most probably facilitated by some abatement in the force of the cause of the disease, and, consequently, of the general tension on the vascular system, particularly of the secretory vessels of the skin, kidneys, and intestines. However, when these clouds or flocculi appear, they always give some hope of an approaching crisis. But, in this, we are sometimes disappointed, from the urine becoming next day clear again, which may be owing to some accidental impediment to the regular progress of that natural operation by which a solution of the fever is brought about. For, on a farther advancement of the disease, in those cases which terminate favourably, the clouds return, and, in a little time, the crisis comes on. When this ripening process, as it may be called, is complete, or nearly so, there is a considerable evacuation of the concocted matter, by perspiration, urine, and the intestines,

intestines, though we have no means of observing it but by its salutary consequences, except in the urine, by which there appears to be a large secretion of it, from its subsiding in considerable quantity, in the form of a soft, whitish, sediment. But, in such cases as are, from the violence of the disease, incurable, though clouds may sometimes be seen in the urine, yet, as there is no regular crisis, it very seldom happens that there is seen, before death, that distinct deposition of matter so uniformly observed in the salutary crisis.

196. It is certainly the duty of every person who publishes a new theory on any subject, to proceed with the utmost caution and candour in relating those facts and observations on which his doctrine is to be established. Because, the want of a proper circumspection is apt to draw him into inaccuracies, and even errors, which, becoming afterwards the subject of criticism, discredit his writings. It is a fear of incurring

curing the censure of the public that has kept me from treating the catarrhal fever in so copious a manner as might have been expected. Because, such additional evidence and arguments as might have been brought in support of the explanations I have given of the nature of the remote and proximate cause, and of their operation on the system, on which depend, in a great measure, the rationale of the symptoms, will be better understood when we come to consider them more particularly in the history of other fevers. For, though there are certain circumstances and symptoms common to all fevers, yet, every different species has symptoms peculiar to itself, sometimes called pathognomonic; and it is from a particular consideration of these only that we can be enabled to trace the singularity of the species, in what it differs from the other kinds, and must lead us into a more distinct knowledge of the general theory of fevers, as well as to that of each

each particular species. Therefore, having taken the above view of the effects of an excess of cold on the human body, in the production of diseases of an inflammatory tendency, we shall next proceed to consider some of the effects of an excess of heat; and, first, of the Cholera Morbus.

SECTION

SECTION VII.

OF THE CHOLERA.

197. **I**N section third, I endeavoured to take a view of the effects of an excess of heat, applied to the human body, by which certain operations are excited in the system, tending to obviate these effects, and to regulate the standard heat, on which the powers of action, in a great measure, depend. There I confined my observations chiefly to the circumstances just mentioned, reserving the consideration of the other effects of an excess of heat, in the production of morbid conditions of the body, till we should come to treat of the diseases arising from them; amongst which, the cholera, being

being more extensive in its influence, in laying the foundation of other disorders, than the rest, merits our first attention.

198. Most authors who have written on the subject of the cholera, have allowed it, in this country, to be the product of the heat in summer, which must, no doubt, be considered as the remote cause of this disease. For, although we sometimes have a case or two in the months of June and July, in particular constitutions, more readily affected by heat than others, yet, it is not till the month of August, or till the summer heat has had its full influence in predisposing the body to this disorder, that it can be said to be frequent. It often goes on, in a less degree, through the month of September, but usually abates in its violence and frequency on the setting in of the cold weather in October. It is not a disease of winter, or of the cold weather in the spring, except as it were by accident, in particular persons, constitutionally, or from former

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attacks

attacks of bilious complaints, disposed to larger secretions of bile than usual, which propensity to this disease is sometimes increased by full diet and living freely, in respect to vinous liquors.

199. In the consideration of the remote causes of diseases, it is of more consequence to the practical physician to have the facts relative to them established, than to receive the best theory that can be given with regard to their manner of operating on the system. I shall, therefore, on that part of my subject, proceed no farther than to enumerate those effects of an excess of heat applied to the body, as are known, in general, to be the natural consequences of it. Nor is there much reason to be very solicitous on this head, since the fact, that a cholera is the effect of heat, is established by the consent of all medical writers and practitioners who have attentively considered the subject.

200. The effects of heat, in the production of cholera, is by no means so remarkable in this country as in the warm climates, where it is a common disease in all seasons of the year, but especially towards the autumnal months. Strangers from Europe, in the East or West Indies, are more readily affected with this disease, and others of a bilious nature, than the natives; for, till nature is accustomed to this extraordinary warmth, and is brought by habit to accommodate herself to the climate, the uncommon heat to which such persons are exposed, must have a more powerful effect on their bodies than it can have on those who are more inured to it. Immediately on the arrival of strangers within the tropics, their circulation becomes quicker, their perspiration freer; a lassitude or debility takes place, partly perhaps from the particular stimulus of the heat itself, but chiefly from the uncommon expence of the powers of action, in preserving the standard point of heat. Their system comes
soon

soon to be endowed with a preternatural irritability, which appears more evident in the course of diseases, especially those that are known to originate from the climate; for every medical practitioner in those countries remarks, that the sick do not bear above half the dose of stimulating remedies that can be given in Europe to people of similar constitutions. Nay, this irritability in time extends to the mind itself, but especially to the children of Europeans, who have been born and brought up in these warm regions: For the warmth of temper, the keenness of passions, the impatience of controul, so characteristic of the generous inhabitants of warm climates, must not be attributed solely to the manner in which they are educated, but partly to the heat of the country, which has such influence on the mind, as has been more fully treated of in Section Third.

201. These circumstances of an accelerated circulation, increased perspiration, debility,

debility, and preternatural irritability, are the most obvious effects of an excess of heat; and, when the heat arises from the nature of the climate, it must act with unremitting influence, in producing considerable changes in the body. It is highly probable, that a greater putrescency than usual is thereby brought on the circulating fluids; and, in fact, we see that the diseases of warm climates have more of a putrescent tendency than those of the same kind in colder regions. But, whether this disposition in the blood contributes to a larger secretion of bile than ordinary, cannot be determined with precision, though we are certain, from daily experience, that the long continuance of a warm atmosphere produces larger secretions of bile than common; and, perhaps, it is more and more acrid as the secretion, in point of quantity, deviates from its natural state. But we cannot be altogether certain of this fact; for I suspect, that the great acrimony which the bile acquires is during the time it stagnates

nates in the bowels, where it accumulates by degrees, and sometimes to a considerable quantity, before it gives any remarkable disturbance to the patient; but at last, from its bulk and increased acrimony, a vomiting and purging are excited, accompanied with sickness, pains in the bowels, and a considerable prostration of strength. When this disorder is severe, or the system remarkably irritable, it is often attended with cramps in the abdominal muscles, the limbs, and other parts. These complaints continue for a longer or shorter time, according to the quantity of bile, its acrimony, and the morbid state of the secretion in the liver. A great deal depends on this last circumstance, particularly in warm latitudes, where it is often in a more diseased condition.

202. From this view of the nature and cause of the cholera, it is easy to perceive why the warmest summers or climates should produce the most considerable effects;

fects ; and why such people, whose circulation is much accelerated by hard labour in the field, and soldiers in their encampments, from their being more constantly exposed to the heat of the sun, and to considerable fatigue in the discharge of their duty, should be more subjected to severe attacks of this disease * than others living in towns and villages, where they are less exposed to the heat of the atmosphere, and live more at their ease. It sometimes happens in the month of August, that the mornings and evenings become cold, or that we have a few days of cold and rainy weather,

* ‘ Soldiers in a camp suffer a great deal from heat, by being constantly exposed to the sun, either without any shade at all, or only sheltered by a thin tent ; and, where the air being so much confined, the heat is often more insupportable than without, in the sun. This circumstance, joined to the damps of a camp, is the cause that the summer and autumnal diseases of an army, even in a northern latitude, resemble so much the epidemics of southern countries, especially of those with a moist air.’—Sir J. Pringle’s diseases of the army, 2d edit. p. 79.

weather, which appear to accelerate the attack of the disease, and perhaps to add somewhat to its severity, by an afflux of fluids to the intestines, from a sudden diminution of perspiration. In some few instances, the cholera returns periodically, similar to the fits of an intermittent. This form of the disease is most frequent in warm climates and in camps, and seems to derive its origin from the cause of the marsh fever acting in conjunction with that of the cholera. It is more dangerous in its consequences than the simple cholera, and is cured as an intermittent.

203. When a morbid secretion in the liver, the accumulation of bile in the bowels, and its acrimony from stagnation, are considerable, this disease, in irritable habits, is attended with great danger, and sometimes ends fatally, especially when strong vomits and drastic purges have been exhibited, with an intention to evacuate the bile, the acrimony of which, in such cases,

cases, is too considerable to admit of an addition from stimulating remedies. Warm water, weak chicken broth, thin water gruel, or such mild demulcent drinks, given in large quantities, are the only means we can employ in attempting to dilute and evacuate the superabundant bile, particularly during the first day or two of the disease, which is often so violent in its effects as to exhaust the whole powers of life ; on which account wine, as a cordial, is necessary ; and we are sometimes necessitated to moderate the severity of the symptoms by opiates, which otherwise ought not to be given, till the stomach and bowels are cleared of their acrid contents. But, fortunately, those dangerous cases are not frequent in this country, where a simple cholera seldom continues with any degree of violence above two or three days, and is not accompanied with any degree of fever. For that frequency of pulse, which so often attends sickness, pain, and consequently a general disorder of the system, does not

arise from a proper febrile stimulus, and, in this disease, ceases on the evacuation of the bile from the stomach and bowels. In slight cases of this disorder, it often goes off gradually in a gentle diarrhoea; but, where it is more severe, from a larger quantity of acrid bile, its expulsion is greatly promoted by mild emetics, laxatives, and plentiful dilution.

204. Whilst the bile remains in the bowels in any considerable quantity, it must, by its stimulus, increase the secretion by the glands of the intestines, and probably that of the liver itself. For the evacuation by vomiting, and by purging, in the course of 24 hours, is often amazingly great; but gradually lessens with the degree of stimulus applied to these parts. After the bile has been mostly carried off in the course of the disease, it often leaves such an irritability on the nerves of the stomach and bowels, as prevents these viscera from bearing even the natural stimuli of the gastric and intestinal

intestinal fluids; so that a diarrhoea with gripes, and an obstinate vomiting of every thing taken into the stomach, continue for some days. Our best remedies for these complaints are opiates given in small doses, and repeated at proper intervals. For the stomach, on such occasions, commonly rejects a full dose of laudanum when given at once. On which account I usually prefer the solid opium, giving no more than one-fourth of a grain, and repeating it every hour or two, until the preternatural irritability of the stomach and intestines is corrected. With some patients the saline mixture, given in a state of effervescence, is not only grateful to the stomach, but in some instances has stopped the vomiting when opium had failed. In such cases, it is only the lightest and the most grateful food, in small quantities, with wine, that will remain on the stomach.

205. In every case of cholera, it is to be presumed, from the nature of the disorder,
that

that a morbid secretion of bile has subsisted for some time previous to the attack of the disease. In most patients of this country, the disease is of a slight nature, and the secretion of the bile soon returns to its natural state. But, where an increased secretion in the liver still continues, subjecting the patient to a return of the disorder; or, when a diarrhoea is kept up after an emetic and laxative, to clear the stomach and bowels, we are obliged to have recourse to bitters; amongst which the columbo root is thought to be the most successful, to the quantity of ten, fifteen, or twenty grains twice a day, in a table spoonful or two of simple cinnamon or mint-water. But my greatest dependence is on the bark, riding, and a proper regulation of diet.

206. In military encampments, towards the end of a very warm summer, especially in the southern latitudes, this disease frequently becomes more formidable in its consequences. It is usually more severe in
its

its attack, continues longer, and the patient is more liable to relapse. These effects are owing to a more diseased state of the glands, and of the secretion in the liver, than commonly happens in Britain; the result of which is often schirrous obstructions in that viscus, and in some patients the liver inflames and suppurates. But as this last complaint is oftener the consequence of the bilious remittent and intermitting fever, than of the cholera, with which they are intimately connected, the consideration of it shall be referred till we treat of these diseases.

SECTION

SECTION VIII.

OF THE BILIOUS, REMITTING, AND INTERMITTING FEVER.

207. **T**HE bilious, remitting, and intermitting fever of autumn in this country, and in every season of the year in warm climates, is more various with respect to the danger attending it, and likewise to the form in which it makes its first attack, or assumes, during its continuance, than any other febrile disease to which mankind are subject. Its most common appearance, at its commencement, is that of a continued fever. It begins with a chilliness, lassitude, dulness in the eyes, a quick and depressed pulse, a nausea, usually a vomiting, headach,

headach, and sometimes a purging of bile, with an alleviation of symptoms ; especially, if these evacuations are assisted with plentiful draughts of warm water, or gentle emetics and laxatives. The patient often complains of pains in the back and limbs ; and, as the chilliness goes off, the pulse becomes gradually stronger and fuller ; the heat and thirst are considerable ; the tongue and fauces in a few days become foul, and covered with a thick slimy substance, which varies from a whitish to a brown or blackish colour, according to the severity of the disease. A certain inquietude and restlessness, with a want of sleep, commonly accompany the course of the fever. In three or four days, and sometimes earlier, it has sensible remissions. The exacerbations of the fever are usually in the evening. Its violence somewhat abates by an imperfect sweat in the morning. When the disease is of a mild nature, it, for the most part, goes on in this way for eight or ten days, and terminates in some critical evacuation
by

by the skin, kidneys, or intestines. But the same disease, in some parts of Hungary, in Zealand, or even in the fenny parts of Lincoln and Cambridge shires, but especially in the swampy grounds on the banks of rivers and lakes within the tropics, is a much more formidable distemper, as it often proves fatal in 48 hours from its first attack. It then commonly assumes the form of an ardent fever, with a high delirium, which, in some cases, goes off with a moisture on the skin, and remission of the fever in the morning; but returns about the same time next evening. Such fevers, under proper management, come in general to have complete intermissions; but, when they go on in the shape of remitting fevers, they usually last several weeks, with symptoms of great malignancy and danger.

208. The fever which I have endeavoured to describe commences, in this country, with the month of August, and
continues

continues till the cold weather in October, when it gradually declines. In dry and well ventilated situations, it is far from being a frequent disease, and is not attended with that degree of danger which usually accompanies the same disorder in the neighbourhood of swampy and fenny grounds, where it is almost, every autumn, an epidemic disease, especially after warm and rainy summers. In the former of these situations, this disorder commonly goes on in the form of a remitting fever till it terminates in the recovery of the patient, in some other disease, or in death. It seldom takes the form of an intermittent, though it does sometimes, especially in those who have been formerly afflicted with that distemper; and when this happens, after proper evacuations are made, the disorder is more easily cured, than in the low and marshy places. In such situations, the disease is of a more malignant nature, is more intractable, and assumes a greater variety in its appearance. For the magnitude of the

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disease

disease is always in proportion to the heat and moisture of the season or climate, and the quantity of dead animal and vegetable substances corrupting in the adjacent grounds. This distemper is most fatal to armies, and to Europeans, after their arrival in countries between the Tropics. For, in encampments, soldiers are more exposed to the heat of the sun, during the day, to cold in the night, to unwholesome vapours in the atmosphere, arising from wet grounds, or from privies, than the inhabitants of towns and villages. In warm climates, as the heat is greater and more constant than with us, the growth and decay of insects, reptiles, and vegetables, must be quicker, and, of course, the miasma more exalted and powerful in its effects than in colder climates. These fevers, among soldiers in the field, are of a more inflammatory nature than amongst the peasants, or people of better condition, because military men are much exposed to cold. And when, from necessity, hospitals become crowded,

human

human effluvia, the source of the hospital fever, adds greatly to the malignancy and danger of the distemper.

209. The different forms under which this disease appears in encampments, are those of remitting fevers, which are mostly of the malignant kind, quotidians, tertians, quartans, diarrhoeas, and dysenteries. This last is a most frequent disease in encampments and military hospitals, partly from the cold, whilst the soldiers are on duty in the night, acting as an occasional cause in giving the disorder this particular turn to the intestines, but chiefly from the infection of the privies. This is one of the many proofs we have of the power of every species of febrile contagion in the production of the same disease from whence it had its origin, and are, on that account, called specific.

210. The different names given to this disease, from the various forms under which

it

it makes its appearance, are apt to suggest the idea of their being essentially different from each other. In fact, this deception is carried on by nosologists, who arrange them agreeably to this supposition. But, when this distemper comes to be endemic, and assumes, in different persons, the several forms above mentioned, we frequently perceive that those who are seized with the dysentery, escape the fever, or, if seized with both, it is alternately, so that when the flux appears, the fever ceases; and when the first is stopped, the other returns*. Farther, that tertian agues become quotidian, these last take the form of remittents, and, in the end, change into continued fevers of the most dangerous kind. It is common for continued fevers to remit, intermit, and, at last, to end in a dysentery. These changes, from one form of this disease to another, are so well known to every

* Vide Sir John Pringle's diseases of the army, second edit. p. 51.

ry physician, that it is unnecessary to cite authorities in confirmation of them. For, if we consult these authors who have written on the diseases of warm climates, we shall find examples of such changes almost in every page. If I shall cite an authority or two from Sir John Pringle's medical annotations, it is because few can have access to them, on account of the conditions on which they were bequeathed to our college, which were, that they should not be published, or read out of the library. Dr Saunders (formerly Huck), whose correspondence with Sir John Pringle forms a considerable and valuable part of the above annotations, and who, in his observations on the nature and cure of diseases, discovers an uncommon sagacity, informs Sir John, in one of his letters from the West Indies, ' that he had observed a relation between
 ' the bilious, yellow, and intermitting fe-
 ' vers, apt to double, and the bloody flux,
 ' for they were distempers which prevailed
 ' at the same time, and very often changed
 ' one

‘ one into the other, at least, in the West
 ‘ Indies*.’ And Dr Turnbull, late physi-
 cian to the factory at Smyrna, informed
 Sir John Pringle, ‘ that the epidemic fever
 ‘ at Smyrna, of a bilious, putrid, or malig-
 ‘ nant nature, begins towards the end of
 ‘ August. They have the same at Con-
 ‘ stantinople, but milder, and approaching
 ‘ more to the nature of a regular intermit-
 ‘ tent. At Smyrna, this fever remits at
 ‘ first, but, if left to nature itself, ends in a
 ‘ continued fever. The paroxysms begin
 ‘ in the evening, and early in the morning
 ‘ there is a remission with a little sweat.
 ‘ The first paroxysm begins with a pain in
 ‘ the back and rigour, but afterwards none
 ‘ of the accessions begin with any cold fit ;’
 and farther observed, that the description
 Sir John had given of the autumnal bili-
 ous, remitting, and intermitting fevers of
 the camp, and that of marshy countries,
 answered nearly to theirs of Smyrna. He
 added,

* Vol. vi. p. 531.

added, ' that the distemper disappeared ge-
 ' nerally about the end of September, but
 ' sometimes ran into October, and by that
 ' means continued about two months. In
 ' some cases the fever began in a tertian
 ' form, but more generally in a quotidian ;
 ' and, if no proper means were used, they
 ' all ended in a continued fever. The du-
 ' ration of each incidental case is uncer-
 ' tain, there being no critical days. Some
 ' grow yellow about the fifth or sixth day,
 ' and that is accounted a very bad sign, as
 ' are worms, and the coming on of the fe-
 ' ver with a vomiting of a greenish or yel-
 ' lowish bile. If the usual vomit of eme-
 ' tic tartar, in the advanced stage of the dis-
 ' ease, has no effect, it is a mortal sign. In
 ' this fever the hypochondria are common-
 ' ly inflated, and an uneasiness is felt by
 ' the patient when they are pressed. The
 ' cure of this fever was chiefly effected by
 ' such medicines as cleared the primae viae,
 ' as tartar emetic, laxatives, and glysters.
 ' When the fever remits, the cure is car-
 ' ried

' ried on by the bark in the following
 ' manner : ℞ Mellis ʒi, Camphorae ʒi, simul
 ' probe terantur ad solutionem camphorae,
 ' dein adde cort. Peruv. pulv. ʒi m. f. maf-
 ' fa, et e singulis drachmis formentur pilu-
 ' lae No. xv. capiat aeger omni bihorio,
 ' remittente febre, pil. x. If the patient
 ' had time to take fifty such pills before the
 ' accession of the next paroxysm, it was
 ' always an easier one than any of the pre-
 ' ceding ; but if he could, in that space,
 ' take one hundred pills, the fit never re-
 ' turned. When there was a more than
 ' ordinary disposition to putrefaction, and
 ' the pulse was low, he doubled the quan-
 ' tity of camphire, and with a good effect.
 ' He seldom had occasion to use more than
 ' one ounce of the bark, or an ounce and a
 ' half : He cured common intermittents in
 ' the same way. The eating of meat or
 ' fish was apt to bring on a relapse with
 ' the convalescents*.' But, as these Medical

Annotations

* Med. Annot. vol. vii. p. 526.

Annotations appear to have been begun and carried on, with a view to render the history of diseases more complete, from a great number of cases, with general observations on most of them, though without seeming to have any particular theory to support, my intention, in reading through the whole of this voluminous work, was to observe what this learned Gentleman and his correspondents would say on such a plan, which might lead us to a more intimate acquaintance with the origin and nature of the diseases under consideration. In this pursuit, I have every where observed, on the subject of the bilious fever, from whatever part of the world he received his information, that intimate connection between the several forms under which it makes its appearance, so often mentioned in the preceding pages. This evidently shows that they had the same original cause, notwithstanding their apparent difference. This circumstance deserves our serious consideration ; for, if we shall be so fortunate

as to discover the source of this strict relation between these several diseases, we may arrive at a more distinct view of their nature and causes.

211. Almost the whole of the general causes of fevers, (p. 105.) are, at different times, more or less concerned in the production of the bilious fever of autumn. It has been shown in section 7th, that an excess of heat long continued, is specific in increasing the secretion of the bile. This effect of heat is various in different persons; for in some it is considerable, whilst in others, the secretion in the liver is little above its ordinary standard. But, whenever this secretion is remarkably increased, if previous to the coming on of the cholera, or other disorders of the stomach and bowels, the person is so exposed to cold, as to bring on some degree of fever, then the acrid bile in the primæ viæ helps, in proportion to its quantity and acrimony, to promote the accession of the fever. This
is,

is, perhaps, the least complicated species of the bilious fever. It is not often that we meet with it in this simple state, with respect to its causes. These are more frequently combined with human effluvia, or marsh miasma; the former always disposing it to a continued form, whilst the latter prevailing in the habit, inclines it more to remissions and intermissions. Hence it is evident, that this disease must, in different times and situations, exhibit a considerable variety in its nature, according to the combination of the causes which produce it, some examples of which I shall endeavour to point out.

212. That species of this disease, which arises from a catarrhal fever supervening on a morbid secretion of the bile, and an accumulation of it in the primae viae, is, in its nature, more inflammatory than the other kinds. It is most frequent amongst soldiers doing duty in camps, or men whose business or pleasure leads them to the field, where,

where, being exposed to cold, rain, and wet clothes, they catch cold, which often proves the occasional cause of this disorder; and, from the inflammatory symptoms which are thereby induced, helps to distinguish it from the other kinds, where marsh miasma, or human effluvia, are more predominant, as causes from which the fever derives its origin. Although these are probably more or less connected with the causes of every species of the bilious fever, as will appear by consulting parag. 111. and 112.; yet in many cases they act not with such power on the body, as to characterise the disease, as in this we are now describing, where the principal causes, acting on our system, are a morbid collection of bile in the alimentary canal, and the ordinary cause of a catarrhal fever. But it must here be observed, that those changes which are brought on the arterial system, by the action of cold on the body, are not so considerable in the autumnal months, as in those of winter and spring. For, after the solids have acquired

an additional strength from the tonic powers of the cold, and the assistance it gives in regulating the standard heat, at such times, catarrhal fevers, from an excess in the application of cold, will show more of an inflammatory disposition, than the same disorders in autumn, after the body has been relaxed and debilitated by the preceding heat of the summer.

213. From the above view of the causes of this species of bilious fever, it is easy to perceive that their action on the primæ viæ must be more powerful than that of a simple catarrhal fever, where the morbid affection and secretion of the mucous glands appear to be the principal source of it. Whereas, in the present disorder, an increased secretion of bile is superadded, and, for the most part, a stagnation of it in the bowels, by which its qualities are soon altered; and I am apt to believe, as mentioned in the preceding paragraph, that human effluvia, or marsh miasma, have some share in the

the morbid affection of the alimentary canal. Of course, the accession of this fever is more strongly marked with coldness, shivering, oppression at the stomach, headach, and pains in the loins, than in the catarrhal fever. All which complaints are somewhat relieved by a natural vomiting, or the exhibition of such a medicine as shall prove gently emetic and cathartic. But it does not entirely remove them; for, as the morbid affection in the liver and in the primæ viæ still subsists, these complaints will continue with greater or less violence, according to the state of the alimentary canal during the course of the fever, the duration of which is various, in proportion to the force with which the causes act on the system.

214. What may be called the inflammatory state of the fever, continues not commonly above three or four days; after which the remissions become more perceptible than in the catarrhal fever. Because
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the diseased state of the mucous glands, and of the secretion performed by them and the liver, exist in a much higher degree, and the quantity of the fluids secreted by them, is also greater than in that disorder; to a small accumulation of which in the primæ viæ, I imagine, those exacerbations and remissions are owing. For, in the very irritable state of the stomach and bowels, an inconsiderable collection of acrid fluids will prove a febrile stimulus to the system; and, of course, heat, thirst, and an accelerated circulation must take place, and continue until its quantity is diminished by absorption, (Sect. V. parag. 178. and 179.) after which a moisture on the skin commonly brings on a remission; and this sometimes happens without any sensible evacuation, and continues till the secreted fluids in the stomach and bowels are again collected to such a quantity as is sufficient to give some addition to the febrile stimulus in these parts. This is sometimes brought about by errors in diet, or some mismanagement of the patient;

tient ; but the usual time of the exacerbation of the fever, is in the evening, and the remission in the morning. This periodical return I have endeavoured to account for in parag. 182. Such of the other symptoms of this disease as are mentioned in parag. 207. and are common to the catarrhal fever, have been already treated of in Sect. V. ; and the others, which are peculiar to this disorder, we shall have an opportunity of explaining, in the course of the cure of this fever.

215. From the above view of the nature and cause of this species of the bilious fever, the indications of cure must be obvious. So far as the origin of this disorder is connected with the common cause of a catarrh, or catarrhal fever, that of obviating all tendency to inflammation, has already been sufficiently treated of in parag. 162. 163. and 164. ; but, at the same time, it must here be observed, that, for the reasons mentioned above, the necessity of venesection

tion is not so urgent in this as in the catarrhal fever.

216. Medical practitioners are not always agreed in the propriety of bleeding in the bilious fever of autumn; but this must have arisen from their not distinguishing the different species of it. For that we have now under consideration, in general, requires bleeding at the commencement of it, and sometimes it is repeated with great propriety; especially in cases of topical inflammation, where blisters are also of singular benefit. But in those fevers arising chiefly from human contagion, or marsh miasma, where such a remarkable prostration of strength takes place from the accession of these diseases, venesection is, in general, not only improper, but hurtful; because it increases the general debility and danger of the disease. Even the late sagacious Sir John Pringle adopted it as a general rule, to bleed at least once at the commencement of the autumnal bilious fever of the camp;

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and expresses his surprise at the contrary practice of Dr Monchy, physician to the Dutch forces, who, in a letter to Sir John on that subject, assured him that he seldom had occasion to bleed any of his patients in these fevers; the cure of which he, in general, conducted by emetics, and by keeping up a gentle diarrhoea by crystals of tartar, decoctions of tamarinds, and other medicines of a similar nature. And, in his commentary on this letter, says, ‘ It would seem, ‘ by the above account of the cure of the ‘ bilious fevers, that the constitution of the ‘ Dutch soldiers was somewhat different ‘ from that of our men, since Dr Monchy ‘ could cure his patients so easily without ‘ bleeding, an evacuation, we believed, so ‘ essential in the treatment of those fevers ‘ that prevailed so much in our army abroad. The same kind of fever, though ‘ in a milder degree, occurred likewise in ‘ our camps in England; and in these I ‘ still found it necessary to begin with bleeding, and generally to a pretty large quantity;

‘ tity ; and was sometimes obliged to repeat the evacuation in such cases as had joined to them any considerable inflammation*.’ And this I suppose to have been done with great judgment ; for the fevers which attacked the British soldiers encamped in England, on a dry and healthy situation, were likely to be more inflammatory than those which they or the Dutch soldiers were seized with, when encamped on the unwholesome situations in Flanders, which the nature of the war obliged them to occupy.

217. It is only from an accurate distinction of the several species of the bilious fever, that we can account for the difference in the practice of these ingenious men, with respect to the necessity of venesection at the commencement of these fevers. It is more than probable, that, from the success Sir John met with by bleeding, and even repeating

* Med. Annot. vol. 6. p. 33.

peating it in many inflammatory cases, he might conceive a prejudice in favour of this practice, and perhaps carried it too far, by ordering this evacuation to be made soon after the attack of the malignant fever of the marshes, where the patient often becomes suddenly delirious ; but this is prescribing to a symptom, and not to the cause of the disease ; for, upon the evacuation of the acrid contents of the stomach and bowels, on which it depends, by emetics and laxatives, the delirium ceases. But as these fevers, from marsh miasma, are more inclined to remissions and intermissions than other fevers, the headach and delirium are, after a certain period, apt to return ; but the removal of these troublesome symptoms ought to be attempted by a repetition of the same evacuations, and by blisters, rather than by bleeding, which never fails, on such occasions, to induce a general debility. What is apt to deceive a physician, is the strong, full, and frequent pulse, soon after the accession of the fever. But this must be understood

derstood to proceed chiefly from the febrile stimulus on the primae viae ; and this fact is ascertained by practice ; for, on clearing the primae viae of a load of viscid phlegm and acrid bile, these complaints are greatly alleviated, and sometimes entirely removed. On the other hand, Dr Monchy, observing the bad consequences of too free a use of the lancet, amongst the Dutch soldiers afflicted with the bilious autumnal fever of the camp, it might render him extremely cautious with regard to bleeding them in those diseases ; and, when a person is under a prejudice in this respect, it makes him timid, even where it may be done with advantage.

218. Sir John, on account of the difference between Dr Monchy's and his own practice, alledges, that the constitutions of the Dutch soldiers may be somewhat different from those of the British troops, and in some measure it may be so ; for it is not unreasonable to suppose, that the Dutch soldiers,

diers, living in so low, moist, and marshy a country as Holland, may, notwithstanding the power of habit, bring to the field the predisposing causes of the malignant fever, in a higher degree than British soldiers, who, previous to their embarkation for Germany, lived in a dryer and more healthy climate.

219. I should not have insisted so long on this article of venesection, if I had not been convinced of the importance of the subject, which can only be settled with advantage to the sick, by the physician of judgment, who knows how to discern between the inflammatory species of the bilious autumnal fever, where the effects of an application of an excess of cold to the body, appears to have a considerable share in the production of it, and the malignant kind, which chiefly arises from the putrid vapours of marshes and fenny grounds. For, in the former of these, bleeding is, in some few cases, indispensibly necessary; but the

the quantity to be taken away, and the repetition of this operation, must entirely depend on the constitution of the patient, and the inflammatory state of the fever; whereas in the latter, venesection is seldom necessary; and where, on account of some urgent symptom, it is thought adviseable, it ought to be done with caution; for a large evacuation of blood, in such cases, is commonly attended with danger, and, from the reduction of the strength of the patient, the least of its bad consequences is a tedious protraction of the disease. And it is only in this way of considering the subject that we can possibly settle this point, which is so warmly litigated by various authors.

220. The next indication is to clear the stomach and bowels of their acrid contents, which, in this particular species of the bilious fever, is best done by a common emetic, and afterwards a gentle laxative medicine, suited to the strength and constitution of the patient, which in general alleviates
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the symptoms, and renders the course of the fever milder and more tractable, than when these evacuations are omitted ; but it seldom entirely removes the fever, unless when the patient gets naturally into a general perspiration or sweat. This perspiration may be encouraged, but ought by no means to be forced ; for, as partial sweats are never critical, and debilitate the patient, they ought to be avoided as much as possible, by light clothes, cool air, and cool drink. Sometimes, a spontaneous vomiting and purging of bile supersede the necessity of the above medicines, little more being wanted than some draughts of warm water, to assist nature in the expulsion of it. But where I suspect that a complete evacuation of the bile has not taken place, I commonly, to obtain this end, give, from time to time, small doses of tartar emetic, so as to produce a full vomiting, and this usually brings on also a diarrhoea ; but, where it fails to have this effect, some laxative medicine ought to be administered.

221. I have formerly shown, (parag. 149. and 174.) that the causes of diseases may act for some time without the body being sensibly affected, as is the case before the accession of most fevers. And we may here also observe, that when, from the force of their action, or the length of time in which it has been continued, such considerable changes take place in the system as to constitute a disease, though we may, on such occasions, remove some of the effects of these changes, or such stimuli as evidently heighten the disorder; yet these morbid changes still existing in the body, some time is required, even in such cases as are curable, before the effects of the causes which have acted on the body can be removed, and the several functions which have been thereby disturbed can be brought back to their natural and healthy condition. If, therefore, after the necessary evacuations are made at the commencement of a fever, we perceive that the disease still goes on, then the greatest ad-

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vantage the patient can perhaps receive from the attendance of the physician, must be from his endeavours to restrain the efforts of nature when too violent, to support her when languid, to remove stimuli of every kind which aggravate the fever, to remedy the effects of the causes acting on the system, and, as far as it may be in our power, to prescribe to the causes themselves, until a salutary crisis shall put a period to the distemper.

222. If we take a view of the practice of such physicians as have been eminent in their profession, we shall perceive the whole of their method of cure, in fevers, to be conducted upon such a plan as the above: For, whilst the inflammatory state of the fever continues, if it runs so high as to prognosticate danger to the sick, then every means is used to repress its violence. But, as this cannot be done without inducing a proportionable debility, it must be prosecuted with discretion, and not carried too

too far ; because, if the fever shall be protracted to any considerable length, and no one can say precisely how long it may continue, then, from the great irritability of the system, the rapid manner in which the circulation is carried on, the irregular performance of the several functions, a considerable waste of the fluids, and low diet, the strength of the patient must daily diminish, which obliges them often, in the course of the fever, to adopt a contrary plan of increasing the strength of the patient by stimulants, cordials, and wine, sometimes to a considerable quantity : But, as these circumstances of their plan of recovery are applicable to all fevers, and what will be naturally attended to by every practitioner of judgment, it is unnecessary in this place to enlarge farther upon them. Indeed, most of the morbid conditions which exist under any proper febrile disorder of the body, being common to every species of fever, the indications of cure, in all, must be nearly similar. They differ only in certain

tain particulars, respecting the origin of the fever, and in some symptoms necessarily arising from it, which help to characterise the species, and no doubt often constitute an essential difference amongst them. Hence, in so far as the above species of the bilious fever may have a similarity, at its commencement, with the common catarrhal fever, the indications of cure and general management of the sick, during the course of the disease, having been already fully stated in paragraphs 184, 185, &c. it is unnecessary in this place to repeat them: On which account we shall proceed to consider some other circumstances, which, although not peculiar to this distemper, are more conspicuous in it than in the continued catarrhal fever.

223. One of these circumstances is a larger secretion of bile, and, I imagine, of phlegm, from the mucous glands in the primae viae, than usual, which in some cases brings on a diarrhoea, but for the most part

part accumulates and stagnates in the intestines, where, from its stimulus, the fever is heightened, and is often the cause of headachs, stupor, delirium, and other affections. This shows the necessity of keeping the body moderately open through the course of the fever, which ought to be done by such medicines as create the least disturbance in their operation on the bowels. An inexperienced person might imagine, that an emetic and laxative would be the most likely means, on such occasions, to clear the primæ viæ ; but practice every day shows, that this is not always the most adviseable method ; for, although this can be done with advantage at the beginning of the fever, and even repeated occasionally on the third or fourth day, yet, when the fever is farther advanced, all medicines of a rough operation ought to be avoided, because of the greater debility and irritability of the body at that time, which are apt to be increased, and sometimes to a considerable degree, by medicines of a violent

lent operation. I seldom in those fevers give a vomit after the fourth or fifth day, unless where such an evacuation has been omitted at the commencement of it; and, even then, I commonly prescribe in such a way as not to excite a full vomiting, but only to cause the person to throw up as if his stomach was disordered, giving him no more than a draught or two of warm water to assist its operation, directing the emetic to be taken afterwards in smaller doses and at longer intervals, until it shall procure the patient two or three loose stools. This is done in a variety of ways, often by a solution of tartar emetic in common or some simple distilled water, in the proportion of half a grain to an ounce, giving this quantity every hour till it operates. I more frequently prescribe a grain of emetic tartar, rubbed with ten or twelve grains of sugar, to be given every two hours till it has had the desired effect. Sometimes, to obtain the same end, two or more grains of tartar emetic, with an ounce of Rochelle salts,

salts, are dissolved in a pint of water ; two, three, or four ounces of which solution are given every two hours, or in such proportion that every dose shall contain at least half a grain of the emetic tartar : But, if this medicine is made with the butter of antimony, half that quantity is sufficient, it being double the strength of that made in the common way.

224. After the primae viae have been thus cleared, we must return to the general management of the patient, as mentioned in paragraph 222. till a favourable crisis puts a period to the disease. It is usual, at such times, to prescribe saline draughts, made with the fixed or volatile alkalies, which is a good enough vehicle for other medicines of a more certain operation, but, of themselves, are of little use. I believe, if they could be given in larger doses than is commonly ordered, they would, in many cases, prove diuretic, diaphoretic, and sometimes laxative. But the stomach
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can seldom bear such a quantity as to have these effects. At the same time, in private practice, physicians cannot repeat their visits often without prescribing, otherwise they run the hazard of being thought neglectful of their patient, or at a loss how to prescribe; and on such occasions it is as good a medicine as any other, when little or nothing is to be done.

225. As the effects of heat, in the production of large secretions of bile, have been fully stated in Sect. VII. then, in every febrile disorder, especially those which continue for any considerable time, where the heat of the body, from an accelerated circulation, is constantly kept up some degrees above the standard point, it is not unreasonable to suppose, that the same effects take place. In fact, we find, that in all fevers, but particularly in those of the bilious kind, where an increased secretion in the liver has subsisted for some time, collections of bile in the primae viae often obstruct the

the ordinary course of the fever, raise considerable disturbances in the body, and particularly in the head, which sympathises in so remarkable a manner with these viscera. Notwithstanding our knowledge of this fact, we cannot, for the reasons mentioned in parag. 223. administer the same remedies, in the advanced state of the fever, for the removal of the acrid contents of the intestines, we could have done at the commencement of it, when the strength of the patient was less impaired. For, after the fifth or sixth day of the disorder, if we have reason to suspect an aggravation of the symptoms, from a retention of the faeces, and other acrid colluvies, and, on that account, are obliged to clear the bowels of them, we must have recourse to gentler means. Laxative glysters, in general, answer this purpose, provided they are daily exhibited. But it often happens, after the fever has continued for some time, and a stupor commences with a slight delirium, that the bowels appear to lose somewhat of

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their irritability, and likewise of that force in their peristaltic motion they had in the earlier part of the disease. In such situations, the bile, and other intestinal fluids, accumulate, and stagnate about the sack or beginning of the colon, generally beyond the reach of glysters, which, at such times, have very little effect in clearing the bowels of their contents, and this obliges us to have recourse to other means. From half a drachm to a drachm of polychrest salts in a draught, sometimes with the addition of a few grains of rhubarb, given once or twice a day, for the most part answer the purpose of emptying the bowels, and may be repeated occasionally, during the course of the fever, with great advantage. If any considerable degree of costiveness has subsisted for some days, I often prefer a decoction of tamarinds with fenna, giving two or three ounces every two hours till it operates; after which I usually return to the above draughts, when there is occasion for them.

226. This circumstance of freeing the primae viae from faeces, bile, and viscid phlegm, so apt to accumulate in them, and thereby to protract and increase the danger of the disease, ought to be, from time to time, carefully attended to, but, in such a manner, as to guard against any diminution of the strength of the patient. For, if such an accident should unfortunately happen, at an advanced period of the disease, much mischief is to be apprehended from it, as it is seldom in our power, by wine, or other cordials, to re-establish the strength of the system. At the same time, it must be observed, that, in most cases, where the bowels are loaded with acrid contents, and where the sick can bear the evacuation proposed, it is commonly succeeded by a greater degree of firmness and regularity in the pulse. It frequently carries off a slight delirium or stupor, and disposes the person more to a critical evacuation by sweat than could be expected, whilst the functions of the

the body were so much disturbed by the putrid fomes of the alimentary canal.

227. It is from these remarkable changes in favour of the patient, and sometimes from a crisis happening soon after the bowels had been thus relieved, that the active preparations of antimony have been brought into such general use, and that James's powder has acquired so much reputation in the cure of all febrile disorders. Not that I believe it possesses greater virtues than tartar emetic, or the calx antimoni nitrata, when properly prepared, and given with judgment, as will appear from my observations on this subject in parag. 187. and 188. Nay, Dr James himself seems to have been of this opinion; for, in repeated conversations with the late Sir John Pringle, on the use of his powders in fevers, he frankly owned, that their principal efficacy consisted in clearing the primae viae of viscid phlegm, putrid bile, and faeces. This, from long experience, he
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had found was an essential circumstance to be attended to, in every species of fever; and, after this evacuation was made, if no sweat succeeded, it was his usual practice to give small doses of his powder every four or six hours, to bring out a moisture on the skin. But, if he did not succeed in this intention, the powders were laid aside, and the cure conducted agreeable to the general practice of other physicians; and he appears to acknowledge, with more frankness and honesty, than the venders of nostrums commonly possess, that all the effects of his powders were to be obtained by a judicious exhibition of tartar emetic, when the precise strength of it was known to the prescriber. For his notion of fevers was, that they all had a tendency to remit or intermit; but these changes, from a continued form, are in certain cases obstructed, either from some inflammation or a foulness in the primae viae, and that his powder did not so much cure a fever, as dispose it to remit or intermit, and thereby to make way

way for the bark, which he properly considered to be the grand febrifuge. He sometimes, however, met with instances of fevers kept up solely by putrid bile, and other acrid excrementitious matters in the intestines, and with such persons his powders usually carried off the disorder entirely, in a few hours *. This fact, Sir John must have been perfectly satisfied with, because he himself gives several examples of remittents and intermittents which had resisted the bark and other medicines, but were immediately cured on the evacuation of viscid phlegm and putrid bile, of an offensive smell, from its having been lodged in the primae viae for a considerable time †. And, with regard to the whole of Dr James's practice in fevers, Sir John was not only so well convinced of his judgment in his general plan of the cure of fevers, but, from the

* Med. Annot. vol. iii. p. 163. 170. and vol. viii. p. 126. 218. 264. et seq.

† Ibid. vol. vi. p. 174. 323. and vol. vii. p. 63.

the free and unreserved manner in which he answered every question put to him on that subject, that he resolved never to refuse to meet him again in consultation.

228. But if, after having taken the above view of the manner in which the preparations of antimony produce their salutary effects in fevers, we shall proceed to consider how far many of them are calculated to operate in an uniform way in most cases. We may, without being tedious, on a subject so well treated in most of the modern systems of chymistry, be allowed to observe, that all those preparations which are the result of a calcination of the antimony, either alone, or with the assistance of various portions of nitre, will not always turn out to be of the same degree of strength, when the identical process is repeated, from the great difficulty there is in giving the antimony always the same precise degree of calcination. This is the reason why the same medicine, but made at
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different times, varies in its strength; because the exact quantity of the soluble calx, in the several specimens, are different; and, of course, when dissolved by any acid in the stomach, their operation will be in proportion to the quantity of soluble calx they contain. For, from the precipitate of the butter of antimony, by diluting it with warm water, in which a sufficient quantity of fixed alkaline salt has been dissolved, to render the precipitation complete, we have a very active preparation; because it contains a due quantity of the inflammable principle of the semimetal, to insure its solubility in any acid. But, when the same powder has been repeatedly dissolved in the nitrous acid, and afterwards calcined, as in the process for making the bezoar mineral, it is thereby entirely deprived of its principle of inflammability, on which the solubility of all metallic substances depends, and becomes an inert calx, incapable of being acted on by any acid. The same may be said of the other calces of antimony, when

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an over proportion of nitre is used in the preparation of them. But the greatest inconvenience arising from the exhibition of all these preparations of antimony, not previously combined with an acid, is the uncertainty of their operation; for, if they meet with a sufficient quantity of acid for their solution in the stomach, their action on the primae viae will be in proportion to the quantity of the soluble calx they contain; but, if there shall be no acid in the stomach, then they can have no more effect than as much crabs eyes. This last circumstance ought to direct us to those preparations of antimony which are already joined with an acid; because they are more certain in their operation, and their strength is easily ascertained.

229. Our calx antimonii nitrata was supposed to be similar to James's powder. But, upon repeated trials, I have found, that five grains of the latter were equal to about eight or ten grains of the former,

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and were always more certain in their operation. This made me imagine that Dr James had mixed a certain portion of tartar emetic with his prepared calx; and, from a report of his using mercury in the composition of his powder when he obtained his patent, I supposed him at that time to have used a small portion of the powder of algaroth, or of emetic tartar made from it. But being afterwards told, that he had thrown out the mercury from the composition of his powder, I naturally imagined that he substituted in the place of his former preparation, a certain proportion of common tartar emetic*. And, in fact, I find, that, if one grain of that medicine, prepared according to our last dispensatory, is intimately mixed with twenty grains of the calx antimonii nitrata, by rubbing them well in a glass or glazed mortar, its operation

* In this supposition I was confirmed from Dr James's powders becoming much milder in their operation than they were for some time after he first obtained his patent.

tion and strength appear nearly similar to those of the celebrated powder of Dr James, which never did contain any mercury, though corrosive sublimate might be used in the process for making his first tartar emetic.

230. Upon the whole, I am of opinion, that the active preparations of antimony are useful remedies in the cure of fevers in general, and particularly in those of the bilious kind. For, in certain cases, after the usual evacuations have been made, if, about the fourth or fifth day of the disease, bile and faeces are suspected to be again collected in the bowels, then a scruple of the calx antimonii nitrata well rubbed with one grain of tartar emetic, and divided into four equal parts, prove an excellent medicine for clearing the primae viae, and answering the other intentions of an antimonial, by giving one paper every three or four hours, until it has had a proper effect. After this, though the fever continues, I seldom repeat this medicine

medicine for some days, being convinced, from experience, that the keeping up a constant irritation on the bowels, for several days, by antimonial preparations, debilitates the system considerably. On which account, for some days, the body ought to be kept open by laxative glysters; and, when they fail to procure the necessary discharge, the powder may be again renewed; which, of all the antimonial powders, comes the nearest to that of Dr James in its operation and effects, and, as I know the composition, I always prefer it. But I am giving a reason for its preference, which is not always a good one with the public, who, from an unaccountable imbecillity, have greater faith in the virtues of any medicine vended as a nostrum, than when they come to know its exact composition. Physicians of practice, on many occasions, are obliged to avail themselves of this knowledge, otherwise the medicines they order lose credit with their patients, whose faith in their virtues continues strong, even in the
 most

most simple remedies, whilst they remain ignorant of what is prescribed for them.

231. After the inflammatory symptoms of this species of fever come to abate, it usually remits; and in some few patients it puts on the form of an intermittent, especially in camps and in the neighbourhood of marshy grounds; at which times, in both cases, the Peruvian bark, under a right management, is the proper remedy for carrying off the disease, or securing the patient against a relapse. This, in general, is to be suspected, when the fever goes off without any critical discharge by the skin, intestines, or kidneys; and, from our not observing that distinct precipitation of a whitish smooth sediment in the urine, which commonly attends every salutary crisis, sometimes approaching to a brown or brick dust colour, as the disease partakes more or less of the nature of an intermittent. When the remission happens, in consequence of an evacuation of bile and faeces, from the exhibition

hibition of such an antimonial medicine as mentioned in the preceding paragraph, or by other means, I commonly begin to give the bark in substance, to the quantity of half a drachm, or two scruples, every four or six hours; and, although it does not always carry off the fever immediately, yet it has often the effect to lessen the degree of it. But, where the remissions happen without such an evacuation, it ought always to be endeavoured, if the strength of the patient will permit, to clear the primæ viæ, which usually renders the remissions more complete; after which the bark is given with greater advantage.

232. In prescribing this medicine I observe not any particular formula, being obliged to vary the mode of giving it according to circumstances; for it may be taken in wine, in butter-milk, or in the form of a bolus, or of pills. I sometimes mix it with ten or twelve drachms of a decoction of the bark, and, to this are added about two
drachms

drachms of the tinctura corticis, which makes it more cordial, and, with particular persons, it sits lighter on the stomach. But I am more solicitous to make the patient take a certain quantity in the 24 hours, which is from two to four drachms, than about the mode of giving it. When it purges, four or five drops of laudanum, in two or three of the draughts, commonly remove that effect. But if, after two days use of the bark, the fever is not diminished, or the intermissions are not rendered more distinct, I lay it aside, and wait for a more favourable opportunity to renew the exhibition of this medicine with greater success. This is done with more advantage when the inflammatory state of the disease is lessened, when the action of the cause of the fever on the body has become less powerful, or when a farther evacuation has been made of acrid fluids in the intestines. For, if any of these circumstances exist to a certain degree, such an irritability is excited in the system as prevents the
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bark from having its proper effect in lessening the mobility of the system, and rectifying the morbid secretions in the primæ viæ, on which the continuance of the fever and its consequences seem chiefly to depend. In both the remittent and intermittent diseases, the operation and effects of the bark appear to corroborate this supposition, the particular consideration of which I shall postpone until we come to the cure of an intermittent.

233. Although certain fevers, at their commencement, may be more or less of an inflammatory nature, yet, from the several evacuations, and other means used to repress their violence, they, by degrees, lose a great deal of that disposition, and, from the low diet, a constant accelerated circulation, and increased heat, the powers of the system gradually decline, the fluids become more putrescent, and the fever puts on a different type from what it had at first. In this advanced state of the disease, debility prevails,

prevails, the secretions are less mild, the tongue and teeth are covered with a whitish or brownish coloured glutinous matter, and a quantity of viscid slime frequently collects about the fauces. This slime often gives the sick some degree of difficulty in swallowing, until it is cleared off by washing or gargling the throat; and, when a patient is under such circumstances, we may suspect the fluids in the stomach and bowels to be of a more putrid nature than usual. On which account, I commonly prescribe five grains of my compound powder of the calx antimonii nitrata, (parag. 229.) to be given every four hours, to clear these viscera; if the person can possibly bear that evacuation, which, on such occasions, is commonly done with an alleviation of symptoms, and, I have often had reason to believe, brought on a crisis sooner than would otherwise have happened.

234. Till a crisis takes place, our most valuable remedies are corroborants, cordials, and antispasmodics, as the bark, camphire, wine, and opium. But, in low conditions of the body, the doses of medicines ought to be proportioned to the strength of the patient, otherwise we rather do mischief than good, by increasing the debility, from their effects on the stomach, and, of course, on the rest of the system. Camphire, in many cases, is an excellent cordial, and, as an antispasmodic may be given, when the powers of the body are but little impaired, and in such a quantity as would, in the low state of fevers, prove a poison. The same may be said of laudanum, and I have often known such a quantity of bark and wine given in low conditions of the sick as had evidently a contrary effect from that which was intended. On which account, I have always thought it the safest plan rather to give the patient less medicine than to err in giving more than he can easily bear. In this way, my doses are exceedingly

ceedingly various. I give, for example, of camphire, when it agrees with the stomach from four to twelve or fifteen grains in the twenty-four hours, when I perceive it answers as a cordial and antispasmodic. Laudanum ought to be managed in the same manner, when it is necessary to be given on account of watchfulness, slight delirium, subfultus tendinum, or other signs of a preternatural irritability; and, as to wine, though half a pint in the day is a sufficient allowance in most cases, yet we are often obliged to increase it to double that quantity, and, with some particular patients, to a bottle in the twenty-four hours, which I seldom exceed, for the excess of a cordial stimulus may prove as fatal to the body as that of any other, (parag. 64.)

235. I have hitherto made no mention of antiseptics. The use of these are, by practical writers, thought to be strongly indicated, when symptoms occur that show the disease to have become more of a putrescent

trefcent nature, which naturally takes place
 in the advanced stage of almost every fe-
 ver. Not that I discredit the use of anti-
 septics, because every tendency to putrefac-
 tion ought, no doubt, to be corrected. But,
 if these writers imagine that such medicines
 directly correct an over putrescency in the
 circulating fluids, they carry their idea of
 the power of antiseptics too far, because
 their operation is chiefly confined to their
 action in the primae viae. The bark, wine,
 and all the other cordials used in fevers,
 are certainly antiseptics, and, of course,
 have some effect in correcting the putrid
 nature of the fluids in the alimentary ca-
 nal. But the greatest benefit derived from
 them is produced by their corroborating,
 cordial, and antispasmodic virtues excited
 on the stomach and bowels, and by sym-
 pathy communicated to the rest of the sy-
 stem. For, other medicines that appear,
 from experiment, to possess much stronger
 antiseptic powers, are of little or no use in
 fevers.

fevers *. Nay, the most essential service we can render to the patient in this respect, is a scrupulous attention to cleanliness in the bed-clothes, in the room, and in every other article. Even two beds, where the room will admit of them, is of great service, by enabling us to move the patient from the one to the other. A free circulation of fresh air should be promoted in the apartment, and by this practice we remove a foul and putrid air, the retention of which often protracts the disease and increases the danger of it.

236. If a delirium, or a disposition to it, comes on about the commencement of this fever, and there is reason to believe, from the state of the pulse, a slight degree of redness in the great canthi of the eyes, and other symptoms, that it arises from inflammation, or some tendency that way in the brain, we sometimes, with other means, such

* Vid. the Append. to Sir John Pringle's Diseases of the Army.

such as bleeding at the arm or jugular, blisters to the head and back, &c. order topical bleeding by wet cupping or leeches to the temples, and they are frequently of service in the removal of that dangerous symptom. But, when a delirium comes on at an advanced period of the disease, and, from the feebleness of the pulse, clearness in the eyes, and other circumstances, we have reason to suspect that it proceeds from debility, an increased irritability, or from some foulness in the primae viae, then any evacuation of blood, even by cupping or leeches, constantly do harm. For this diminution of strength is often increased by bleeding, and the patient should rather be supported by the means mentioned in parag. 233.

237. I judge it unnecessary here to take notice of such accidental symptoms as sometimes occur in the course of this, and almost every fever, but are not strictly connected with them, and, of consequence, are not constant

constant in their appearance, because they usually derive their origin either from a peculiarity in the constitution of the patient, or from some former disease with which he had been afflicted. The proper method of alleviating or removing these symptoms will naturally be suggested to the practitioner, after he has received the necessary information relative to their nature. There are likewise some circumstances in the history and cure of this fever which would have admitted of some farther explanations, but are purposely omitted, as I shall have an opportunity of introducing them, with more advantage, in the account I am about to give of the nature and cure of another species of the bilious fever, arising chiefly from marsh miasma, under the form of an intermittent.

SECTION

SECTION IX.

OF INTERMITTENTS.

238. **I** FORMERLY remarked, that the feveral causes of fevers, not specific, seldom act singly on the system, but in conjunction with others. In proportion to the prevalence of any one of them, must arise that variation in the form, so often observed in fevers, which in many circumstances have so strong a similitude to each other, that they are allowed by practitioners to be only varieties of the same disease; and in no instance does this happen more frequently, than in those fevers which derive

rive their origin principally from marsh miasma: For, even when this cause acts singly, the disease arising from it will vary in its malignancy, according to the quantity received into the stomach, its degree of activity, the habit of people exposed to such unwholesome vapours, and the strength of the constitution to resist their effects. When, however, marsh miasma is conjoined to a morbid secretion of bile, human contagion, catarrhal symptoms, and other causes capable of producing fever, it is reasonable to suppose, from the great variety of combinations that may arise from them, assisted by some peculiarity of constitution, that the form of the disease will vary in different persons: But, as the action of several causes of fever on the system are extremely similar, if we shall be so fortunate as to give a just idea of the manner in which they produce their effects, the variety of shape in which they make their appearance will then admit of a more easy explanation. Not that I judge it necessary

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to take notice of all the varieties which are to be observed in this species of fever ; for whoever comprehends the action of the causes of this disease, under its most common appearances, will readily understand every variation from its usual form. I shall therefore proceed to consider only such varieties of this fever as most generally occur ; and, as the most simple, with respect to its cause, shall begin with an intermittent.

239. In the foregoing pages, on the subject of fevers, it has been frequently remarked, that the vapours arising from swamps, marshy and fenny grounds, where dead vegetables, insects, reptiles, and sometimes fishes, corrupt and decay, are known to contain something hurtful to the human constitution, which is termed marsh miasma. As this miasma is of a putrid nature, it may exist in the place from whence it arises, in various degrees of strength, according to the climate, season, and quantity
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of putrid vegetable and animal substances. Hence, in the cold or temperate regions, it is weaker, more diluted, and less powerful in its effects than in the more southern countries, where, on account of its greater activity, agues become more and more intractable. As we approach the south, and especially within the tropics, they are in general of a malignant nature. This last species of ague, for the most part, commences in the form of a continued fever, and, according to the degree of heat which has preceded the attack, is always accompanied with a proportionable increase of the secretion of the bile: But, that we may the better understand the operation of the marsh miasma, let us first take a view of the effects of the mildest sort, which is capable of producing an intermittent.

240. In those districts which are remarkable for the production of agues, they usually commence with the bilious autumnal fever, and are often connected with it:

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But, when the remote causes of this last disease have not acted so powerfully as to give the approaching disorder that particular type, and when the marsh miasma appears to have been the principal remote cause, the disease then, in this country, generally assumes the form of an intermittent. But, some time before the accession of the fever, the complexion is observed to become paler than usual, the eyes are dull and heavy, the person complains of head-ach, want of appetite, and, from a languor and weariness, is less active than formerly, with other signs of some decline from his usual health. At other times, though these symptoms of an approaching disease are always more or less discernible, yet they are not in some so conspicuous as to give any alarm, and the person is taken as it were by surprise with a paroxysm; the usual phaenomena of which are, a lassitude and weariness, and, from a general debility, there is a sluggishness in his motions; he is seized with some uneasiness about the loins, with

with pains, stretchings of his limbs, and yawning; he turns pale, complains of a coldness, particularly about the back, as if cold water was thrown on him. These symptoms are accompanied with a head-ach, some degree of shivering, oppression about the praecordia, nausea, and soon after there is for the most part a vomiting of bile. The sense of coldness becoming more general and severe, he is seized with a considerable tremor and shaking of the whole body, attended with a weak, quick, and irregular pulse, a considerable thirst, and a quick and sometimes laborious respiration. After this state of the paroxysm has continued some time, the sense of coldness gradually diminishes, and the person by degrees becomes warmer than natural, the face flushes, and the pulse turns stronger, fuller, and more regular. When the body has continued in this condition for some time, a moisture, and afterwards a sweat, becomes general, with an abatement of the hardness and frequency of the pulse, and likewise

likewise of the heat and thirst. From this period there is a gradual diminution of the febrile symptoms ; and the sweat being ended, leaves the patient free from fever, or in what is called a state of apyrexia, though somewhat debilitated, from the effects of the preceding paroxysm.

241. The time of this intermission is various in different persons. If, from the beginning of one paroxysm to the commencement of another, there is a space of twenty-four hours, the disorder is called a Quotidian. But the most frequent form of an ague, in this country, is that of a Tertian, which takes up an interval of forty-eight hours. When the interval of a tertian is protracted a day beyond its usual time, the disease gets the name of a Quartan ; if two days, it is called a Quintan ; and, if three, a Sextan. When these periods are interrupted, so that they cannot be brought under the above denominations, then the terms of Double Tertians and Double Quartans

tans are introduced. Authors have gone no farther in distinguishing the different intervals between the paroxysms by particular names. Indeed, I think they have, in general, gone too far, in this and in many other instances, in their multiplication of names for the same disease. Nature is here rather uncivil to those physicians who would split hairs in their distinctions of the varieties of the same disorder. They will insist on tying her down to stated times and hours, with which she ever has refused, and ever will refuse, to comply. For these periodical returns are by no means so regular, the attacks of the fits being often from one to four hours before, and, at other times, as many hours after the usual period of the former paroxysms. These distinctions, therefore, of intermittents, taken from the difference of their intervals, and arising from particular circumstances, or a peculiarity of constitution, do not so much merit our attention as the periodical returns of the paroxysms after a
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state of apyrexia for a certain time, which is no doubt the most surprising circumstance that attends an intermittent.

242. Although marsh miasma is universally allowed to be the remote cause of certain fevers, particularly of the intermittent kind ; yet I do not recollect to have met, in medical writers, with any satisfactory account of its operation, in producing those morbid effects which bring on the accession of the fever ; nor do they give us the smallest information relative to the cause of the periodical returns of the paroxysms, which can be relied on, with any degree of certainty. But, from the supposition I have regularly carried on, that the causes of fevers, which proceed not from cold, or inoculation, are taken into the stomach with the saliva, and supported it by many experiments (from p. 127—133 inclusive) most of the phaenomena of fevers, especially of intermittents, will admit of an easy explanation ; for, when the putrid exhalations
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from swamps are in their highest degree of activity, as in warm climates, their operation on the stomach, in producing nausea and retchings, is felt almost immediately after they have been swallowed. What is more, when the person is moved to a healthier situation, and has a vomit given him within two or three hours of his first complaints, the fever is often totally prevented, parag. 126—133. But, in the colder regions, where the marsh miasma is less powerful and less active, its effects take place more slowly, and are less perceptible, for some time, on the stomach and bowels, where, notwithstanding, from the constant addition of this noxious vapour taken in with the saliva, it continues to act with a decisive influence in changing the secretions in the primae viae, from a healthy to a morbid state. Its action in this way being slow, its effects, for some time, are only observable by a want of appetite, indigestion, sometimes a want of rest, or at least of that sound refreshing sleep in the night the

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persons commonly enjoyed in health, and from the other symptoms which precede the paroxysm. This diseased secretion, however, still subsists; and, together with the secreted fluids stagnating in the alimentary canal, augment at last to such a quantity as is sufficient to produce the cold fit, of which I have, in parag. 167. and from parag. 175. to 180. given some explanation. But, as the quantity of acrid bile, stagnating in the alimentary canal, is more considerable in this than in the catarrhal, or, for the most part, in the bilious fever, the symptoms of the cold stage run higher, and are more severely felt in an ague, than they are on the accession of either of these fevers.

243. In the cold fit of an intermittent, particularly that of the first paroxysm, there is usually a vomiting of a large quantity of phlegm and bile, supposed by some to be the effect, and nowise concerned as the cause of the cold stage: They imagine
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it to be emulged from the excretories of the glands of the primae viae and of the liver, by reason of some spasmodic affection with which they are seized during this period. But the great quantity thrown up, and its offensive smell and taste, by no means favour such a supposition. On the other hand, the general sympathy of every part of the body with the first passages, is a strong presumption that the proximate cause of this disorder originates from the phlegm and bile. Emetics, and other strong stimulants, have effects on the stomach, and, of course, on the whole system, somewhat similar to those which arise from the immediate cause of the cold fit of an ague. They bring on lassitude, general debility, oppression about the praecordia, nausea, paleness, and cold sweats, accompanied with a weak, quick, and irregular pulse. But a vomiting coming on, carries off the offending matter; and, when no remarkable injury is done to the stomach, the effects just mentioned soon cease. It is true that the general coldness,

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the involuntary shaking of the limbs and trunk of the body, during the cold fit of an ague, rise commonly to such an height, that they may be said to be peculiar to it. This may be owing to the nature of the stimulus, and to its extending through a considerable part of the intestines, and also to a preternatural irritability of their internal coat, from the diseased state of their glands.

244. Although the quantity of phlegm and bile in the stomach and bowels, on the accession of the cold fit of an intermittent, is often lessened by vomiting, and sometimes by stool; yet the most considerable diminution is, by a quick absorption of them, commencing with the acceleration of the pulse after the attack of the paroxysm. This is much facilitated by dilution, from the large quantity of thin drink the patient is prompted to take to allay his thirst. But, as the quantity of acrid fluids in the primæ viæ is lessened by this absorption,
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which is so remarkable, as in some cases to occasion the drying up of sores and blisters during the continuance of the paroxysm, the symptoms of the cold fit, by degrees, abate in their severity. When these symptoms abate, the hot fit gradually commences. But, before it is completely formed, the patient now and then suffers a slight rigour or shivering from some portion of the phlegm and bile remaining in the alimentary canal ; but, upon a farther diminution of them in the manner mentioned, these symptoms of the cold stage at last totally disappear.

245. By this time the hot fit is completely formed ; the pulse is now more regular, fuller, and stronger, and the face flushes, with other signs of a general plethora. About this period the blood vessels are furcharged with a quantity of fluids, arising from the great absorption which has preceded, and still continues to go on, from every cavity of the body, especially from
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the stomach and bowels. This distension of the blood vessels will naturally occasion some degree of pressure on the brain. Hence may arise the severe headach, delirium, or comatose state, with which the patient, at this time, is afflicted. Not that I imagine these symptoms to be a consequence solely of the plethora. The increased force of the arteries certainly have some share in producing these effects, to which some degree of acrimony, in the circulating fluids, may also contribute. But the principal cause of them is, most probably, the febrile stimulus still acting with a considerable force in the primae viae. This stimulus, in so far as it may depend on a quantity of acrid fluids in the alimentary canal, I have supposed to be gradually lessening from the accession of the paroxysm, at which time its force was so considerable, as to give rise to the several symptoms of the cold stage; during the continuance of which, there is such an irregular distribution of the powers of

of action, with a considerable diminution of the force of the arterial system.

246. This last circumstance is usually the consequence of the action of most stimuli when raised to a great height, which, in a less degree, increases the force of the heart and arteries in a remarkable manner. It is only by this way of considering the different effects of stimuli according to their degree of action on the system, that we can account for the gradual increase of the strength and regularity in the pulse as the hot fit advances. Neither can we account for the circumstance of a person escaping the cold fit of an intermittent, but on the supposition of there not being a sufficient quantity or acrimony in the fluids, in the primae viae, to produce that effect. This often happens on a natural vomiting of phlegm and bile; but more frequently from an emetic given two or three hours before the expected return of the fit; and, when we are by that means successful in clearing
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the stomach and bowels of their acrid contents, it sometimes prevents entirely the coming on of the paroxysm for that time; which circumstance corroborates the general doctrine here given of the proximate cause of these fevers.

247. After the formation of the hot fit, there still remains in the primae viae such a quantity of acrid fluids, as are sufficient to keep up a febrile stimulus on the system, with a spasmodic constriction of the vessels of the skin for some time. But, on a farther diminution of these fluids, and of the febrile stimulus depending on them, the general spasmodic constriction on the surface of the body, by degrees, goes off, a relaxation of the vessels and excretories of the glands of the skin succeeds, an universal moisture comes on, and terminates in a profuse sweat, which lasts some hours. By this evacuation, the distention of the blood-vessels is gradually lessened, a great part of the acrid fluids absorbed by the lacteals during

ring the paroxysm, is carried off by these and other emunctories, the urine deposits a copious sediment of a brick-dust colour, which it probably receives from the bile; but, the febrile stimulus at last ceasing, a complete intermission takes place.

248. If the reasons I have given for the several phaenomena of a paroxysm are well founded, the periodical return of the disease cannot be of difficult solution. By the time the sweating stage is finished, I have supposed the acrid fluids in the alimentary canal, on which the febrile stimulus depended, to have been so far carried off by absorption, that what remained gave little or no disturbance to the system. Although an intermission takes place, yet, as the secretions in the primae viae continue in the same morbid state, it is reasonable to suppose, that the acrid fluids will again collect, after a certain interval, to such a quantity as shall be capable of renewing the paroxysm. This return, however, of the fit

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with so much regularity, in twenty-four or forty-eight hours, as is commonly observed, has, next to the accession itself, always been the most unaccountable circumstance attending an intermittent. But, when we seriously consider the great uniformity of nature in all her operations, it is easy to conceive, that near an equal quantity of bile and of the gastric fluids will be secreted in equal times ; and when the patient gets over those irregular returns of the paroxysms, which sometimes accompany an intermittent at its commencement, and the disease comes to assume the regular type of a quotidian, tertian, or quartan, then we say, that twenty-four, forty-eight, or seventy-two hours must elapse, before that quantity of fluids, necessary to bring on a paroxysm, can be secreted, or, that they can acquire, by stagnation and heat, the degree of acrimony requisite to produce that effect. From this mode of reasoning, the periodical return of the fit must appear less surprising. For, except such cases, in which
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the ordinary course of the disease is interrupted by particular causes, the interval between the paroxysms will be nearly equal, and even the paroxysms themselves will be nearly similar to those which have preceded, whilst the general causes of the disease continues to act on the system with the same force. A circumstance which facilitates the return of the paroxysms, and subjects aguish people to frequent returns of their disorder, is, as formerly mentioned, that promptitude in nature to those precise movements she has been so much accustomed to raise in the body, when stimulated in a similar manner with that which originally produced them. This frequent repetition of morbid movements, sometimes begets such an aptitude in the system to a particular mode of acting, from slight causes, as can never be remedied.

249. Authors, and practitioners in physic, have, in all ages, remarked, such a similitude amongst fevers in general, especially

ally in those of the bilious kind, with regard to their accession, and to many other circumstances attending their course, that they suspected most fevers to have something in common with respect to their causes, and, where these were essentially different from one another, they supposed their operation on the system to be extremely similar, as many of their effects on the body were nearly the same. But, as they traced not the causes of fevers to their source, and, consequently, were unable to take any tolerable view of the manner in which they operate on the body, they remained ignorant of a number of circumstances relative to fevers, and also of the reasons of that similitude in many particulars so observable amongst them. Neither could any distinct account be given of the intimate connection which subsists between the several species of the bilious fever. They observed a continued fever of this kind, first to remit, then intermit, and, at last, to end in a dysentery. Sometimes these

these disorders run in a contrary course, and, from observation, they knew, that, when a person was seized with a dysentery, he escaped the fever, *et vice versa*. But, how these changes and interchanges happened, or from what particular circumstances they took their rise, no tolerable reason was assigned.

250. In this uncertainty, with regard to the true nature of fevers, the cure has hitherto been conducted on the empirical plan. It is from the experience of former ages, of which there remains many valuable precepts, together with a number of useful observations by the moderns on this subject, that our most approved methods of the cure of fevers has been derived. In this particular, experience alone has supported the credit and character of the physician, and is a proof how far observations, made by men of judgment and good sense, will sometimes conduct them to the most effectual means to be used in the recovery of

of the sick, without having any distinct notion of the original cause of the disease, or of its operation on the system. For, neither the history of the disease, nor the effects of particular remedies in the cure, would admit of explanation on any theory that had hitherto been given.

251. The theory of fevers delivered in the preceding sections deserves some credit, on account of its simplicity. It is easily comprehended, and not liable to the several objections just mentioned; because, from it most of the phaenomena of fevers may be explained, the chief circumstances in which they differ, and the connection which the several forms of the bilious fever have with one another, are readily understood. These are, no doubt, strong proofs in favour of the preceding doctrine. But the strongest evidence that can be given of its truth, will naturally arise from a consideration of the operation and effects of

of the medicines used in the cure of those fevers.

252. In the preceding section I have given my reasons for supposing, that more or less of a catarrhal disorder accompanies the common form of the bilious fever. The less these catarrhal effects prevail, the sooner the fever remits or intermits; and when it comes to have regular intermissions, I then imagine the effects of the cold, by keeping up a preternatural irritability of the system, have, in a great measure, ceased; for, while this irritability continues, no distinct apyrexia takes place. I have reason to believe, that, when the morbid secretions arise to an extraordinary height, it has the same effect on the body in increasing the irritability of the system, and in continuing the fever, as the catarrhal effects just mentioned. This I suspect to be the case in most of the marsh fevers, which generally proceed in the form of a continued or remitting fever for some time. But those of

a less malignant nature, deriving their origin chiefly from marsh miasma, sooner intermit. Few of them, at first, are regular as to the intervals of the paroxysms, because of the very irritable state of the body, and the extraordinary quantity of acrid fluids in the primae viae at that time, but are soon brought to more regular intermissions, by evacuating the stomach and bowels of their contents.

253. This is the first indication of cure to be attended to, chiefly during the state of apyrexia, by a proper exhibition of tartar emetic, calx antimonii composita, ipecacuan, sacred elixir, tincture of rhubarb, tincture of senna, infusion of senna, polychrest, Rochelle, and Glauber salts, or by medicines composed of these, according to the circumstances of the case, and intention of the prescriber. When these evacuations have been carried on with judgment for two or three times, the state of apyrexia becomes more perfect, the paroxysms
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are more regular as to the time of their return, and in some cases they are stopt for several days, or altogether : But the most frequent consequence of this treatment is to bring the disease to be milder and more regular in its type.

254. Our next indications of cure are, first, to remove the preternatural irritability of the system, which still subsists during the continuance of an intermittent, though not always to such a degree as to prevent the state of apyrexia from being complete ; secondly, to rectify the morbid secretions in the primae viae, and thereby to prevent a return of the paroxysms ; and, thirdly, by strengthening the system to secure the patient from the danger of a relapse.

256. As the preternatural irritability of the system commonly abates by a prosecution of the general plan of recovery in intermittents, we seldom have occasion to pay

any particular attention to this circumstance ; but, in certain cases, where this morbid irritability rises during the paroxysm to a remarkable height, and the febrile stimulus acts in consequence on the primæ viæ with a proportionable increased force, it thereby often proves the cause of violent headaches, delirium, and other complaints. This obliges us to have recourse to such means as lessen the irritability of the system ; and, on these occasions, laudanum effectually answers our purpose, when given from twenty-five to forty drops in a draught immediately on the accession of the cold fit. By this medicine those disagreeable symptoms are, for the most part, not only prevented, or considerably abated in their violence, but the fit itself is in general rendered milder ; and there are many instances of the patient's escaping the paroxysm altogether by this prescription. The beneficial effects of laudanum in intermittents, for the above complaints, were first accidentally discovered by Dr Lind of Haflar

Haslar Hospital ; and, in so far as our view may be, merely to lessen such a degree of irritability as is apt to produce violent and uncommon symptoms, it is a valuable medicine : But if, from the success some practitioners have had, in stopping a few paroxysms of a slight intermittent by its use, they should carry their idea in favour of opium so far as to imagine that they may practise with it alone, they will in many cases find themselves mistaken. For, if the causes of intermittents exist in the body in the manner I have endeavoured to show in this and the preceding sections, then it will evidently appear, that an indiscriminate use of opium must frequently be attended with bad consequences.

257. At the commencement of an intermittent, after the usual evacuations have been made, it is a common practice to begin the cure with saline draughts, the *decoctum febrifugum* of the military hospitals, bitter infusions, and laxatives, and, in some
 slight

flight cases, with success. But the medicines which have been found most effectual, are such as, by their known properties, have a more direct influence in rectifying the morbid secretions in the alimentary canal. These commonly consist of vegetable stomachic bitters, aromatics, and astringents, of which there are recommended by authors a great variety of formulae. But, from the experience of physicians for many years past, it is universally known, that the Peruvian bark, when properly administered, is superior in its effects to all the other medicines given in this disorder.

258. It is success alone that has established the general practice of giving the Peruvian bark in intermittents, and not from a particular knowledge of its manner of operating on the system, or from a distinct idea of the cause of this disease, neither of which have hitherto been well understood. The whole of the stomachic simples used by physicians, in the debilitated

ted state of the stomach and bowels, possess more or less a bitterness and gentle astringency, and some of them have an agreeable aromatic taste and flavour. Their salutary effects consist in increasing the appetite and digestive powers, by restoring to the nerves those conditions they possessed in a healthy state; and, as they recover their strength, the system becomes less irritable, and the secretions, of course, return by degrees to a healthy state. It is perhaps in this manner we are to account not only for their effects in the cure of intermittents, but even for those of the bark, the peculiar bitterness and astringency of which are most singularly adapted for strengthening the nerves of the primae viae, and, of course, those of the whole system. Besides, these qualities of the bark are more permanent in the stomach and bowels than those of any other simple or compound of the same class of medicines we are yet acquainted with; all of which have, in a short time, their medical virtues much weakened

kened by the force of our digestive powers. But this is not the case with the Peruvian bark; for, although it yields its properties to the same powers, yet it possesses them in so remarkable a degree, that it is a difficult matter completely to exhaust it of them; by which means, the corroborating qualities of the bark are continued in their full force, and nearly in an equal manner, through the whole of the alimentary canal, as frequently appears from its being thrown up by vomiting, some days after it has been taken, very little altered in taste or smell from what it was when first swallowed. It is only in this way of considering the properties of the bark, its operation and effects on the body, that we can have any tolerable idea of the manner in which the beneficial consequences of its use are brought about, in all such diseases as take their rise from a diseased and debilitated state of the nervous system.

259. The time of giving the bark with the greatest success in intermittents, is during the intermission. We succeed best when it is given in substance, and in such a form as may be most agreeable to the patient, beginning the first dose about the end of the sweating stage of the paroxysm. Our rule for the dose and repetition of it ought to be, not to exceed that quantity which the stomach can easily bear. An error in this respect is always attended with bad consequences, from its creating sickness and vomiting, and sometimes a looseness. But the worst circumstance is, that patients take such a dislike to this medicine, that it is often with the greatest difficulty they can conquer their aversion to it; and, with some, this aversion is carried so far that they refuse to take the bark in any form in which it can be given. Our not paying a proper attention to this circumstance, is frequently the cause of that want of success so often met with in the cure of intermittents; for, when the stomach is oppressed

fed with a quantity of bark, it cannot act as a corroborant. On the contrary, the appetite and digestion fail, with other signs of a debilitated system ; because stimuli, even of the most salutary kind, when carried to excess, always do harm, and have often different effects from those which attend the moderate application of them. I do not mean, by this way of reasoning, to preclude myself or others from every benefit that can be derived from the use of the bark, in every disorder in which it may be given with advantage ; I only wish to guard against the abuse of it. A person, ill of a remitting fever, cannot take such a quantity of the bark, in the same space of time, that may be given to another during the intermission of an ague ; because, in this last case, the febrile stimulus is as it were suspended for a time, and, of course, the system is less irritable : And it is known, that still larger quantities of the bark may be given in the same space of time, with the greatest success, in ill-conditioned

ditioned sores and mortifications, when no proper febrile stimulus exists in the habit.

260. The first doses of the bark I prescribe, during the intermission of an ague, usually consist of half a drachm of the powder in a draught or bolus every two or three hours. This dose is gradually increased to two scruples, and sometimes to a drachm; but I seldom exceed that quantity. Making an allowance for the time of sleep, and of the cold and hot fits of the paroxysm, when this medicine is intermitted, we seldom can get our patients in quindians to take above half an ounce or six drachms of the bark in twenty-four hours; but in a tertian, by much the most frequent form of an intermittent, an ounce may in general be taken during the intermission. It is not uncommon for the sick to show a reluctance to the bark when so often presented to them. In this case it is proper for the physician to inform himself whether the aversion arises only from the ge-

neral dislike many persons have to every kind of medicine, or from the stomach being oppressed with too large a quantity of the bark. In this last case, the dose must be lessened, or the same dose is often brought to sit lighter, by giving it in two or three ounces of Madeira or other strong wine; and, with those who cannot afford to purchase them, the same quantity of distilled spirits and water, made equal in strength to Madeira, answers the same intention. By proceeding in this way to give as much of the bark as can be taken without oppressing the stomach, the paroxysms, in most cases, become milder, somewhat irregular, and at last cease. But, notwithstanding this appearance of the cure of intermittents, to secure the patient against the danger of a relapse, it is necessary to continue the use of the bark, diminishing gradually the quantity of it, till the patient's health is fully established.

261. The time taken up in the cure of an intermittent is various. It depends on a number of circumstances, as, the primæ viæ being cleared of viscid phlegm and bile, before the bark is given; the capability of the person to take the necessary quantity of bark; the apyrexia being more or less complete; the degree of irritability on the system; and a variety of other circumstances observed during the course of the disease. A vomiting or looseness, whilst the patient is taking the bark, may proceed from over-dosing, or from an uncommon irritability in the alimentary canal: But, in either case, it is necessary to stop these evacuations, which protract the disease by carrying off the bark too quickly.

262. Although, from the view we have taken of the nature and cause of this disease, and of the operation of the bark on the system in the cure of it, we must consider this medicine as the most powerful
febrifuge

febrifuge hitherto known ; yet it sometimes happens, that we fail of success in the cure of intermittents, though the bark has been given in large quantities and for a considerable time. This want of success, I apprehend, may be owing to several causes, but chiefly to a want of attention to the circumstances mentioned in the preceding paragraph. It is this inattention to those impediments to the cure, and to the means of removing them, which is for the most part the reason why, in particular cases, the bark does not act with its usual influence on the cause of the disease ; the consequence of which is, that, by the frequent repetition of the paroxysm, the system becomes exceedingly moveable. Hence the fits are renewed from very slight causes, and the disease is protracted *. Besides, the

* A gentleman, forty-two years of age, who had always enjoyed a tolerable state of health, though rather of a delicate than robust constitution, was, in autumn 1750, seized with an intermittent, in the form of a tertian.

the stomach and bowels being habituated to the stimulus of the bark, from its long and continued use, its effects on the system become extremely feeble, and inadequate to

tertian. This disease apparently left him in a few weeks. But, by an injudicious treatment of it, the paroxysms returned, in an irregular manner, for a considerable time. In less than a year from the commencement of this intermittent, he became, in a remarkable degree, subject to returns of it. Not only the common causes of cold and damp weather, &c. brought on a relapse of the ague, but the least error in diet was immediately followed by the same bad effects. He has frequently been attacked with a paroxysm in five minutes after he had taken certain articles of diet, which particularly disagreed with his stomach; and the propensity to ague fits became, at last, so strong, that he was often seized with them instantly after washing his hands in cold water. These, in general, run on to four or five fits of a quotidian or tertian, before the disorder left him for that time. He usually enjoyed a tolerable state of health during the intervals of his illness, which were seldom above three weeks or a month, though they were sometimes protracted to three or four months, and, in this way, he continued for eighteen years, when he died of a disease perfectly different from the

to the cure of the disorder, even when it has become milder, and those obstructions to the cure have been partly removed.

263. In such cases, where the bark has failed, the disease subsisting more from an excess of irritability in the system than from the morbid secretions existing in any remarkable degree, nostrums come in for a considerable share of credit in the cure of this disorder, as bitter stomachic infusions, tinctures, powders, and electuaries, of various

the intermittent, which had afflicted him for so long a time. This case is one of many which might be given as proofs of the very strong propensity, that often prevails in the system, to a particular mode of action, when any stimulus, which usually acts in a general way, is applied to it, especially if it proceeds from the stomach or bowels. Indeed, it is only in this way of considering our subject we can possibly account for those paroxysms which are said to return at the distance of six, seven, or twelve months. They are, in general, owing to indigestion, a cholera, or to some other accidental cause, in persons who had formerly been afflicted with agues.

rious sorts, cordials, antispasmodics, astringents, and laxatives; all of which medicines have been successful in the cure of intermittents. But, as we were ignorant of the true nature of this disease, the manner in which these remedies operated on the body, in producing their salutary effects, was likewise unknown. What added to our difficulty in reasoning on the cure of this disorder, was the different, and sometimes opposite, qualities the medicines possessed, that were used with success in the recovery of the sick. But, from the foregoing view of this disease, and of the different circumstances under which it may exist, I imagine, that the manner in which these different remedies prove successful in the cure of intermittents will now be better understood. I shall give a few examples, by way of illustration.

264. Dr Saunders was consulted by three officers, who were ill of an ague, caught at the Havanna, upwards of seven months before

before this application for advice. Two of these Gentlemen, with a servant about thirteen years of age, having, at the same time, a diarrhoea, the Doctor gave each a dose of tincture of rhubarb, about seven hours before the paroxysm was expected, with a view to moderate the looseness. But he was surpris'd, that, by its operation as a cathartic, it stopp'd the fits, which considerable quantities of bark, taken at the Havanna in North America, and on their voyage home, were not able to accomplish *. He afterwards tried the same experiment, successfully, with several obstinate intermittents. And Mr Drummond, surgeon to the second battallion of Royal Highlanders, hearing of Dr Saunders's practice of giving tincture of fenna and rhubarb about seven hours before the coming

* This diarrhoea appears evidently to have derived its origin from the same acrid fluids in the primæ viæ, which had given rise to the paroxysms.

ming on of the paroxysm, tried it on himself, and thirty soldiers, with success*.

265. This simple method of curing chronic agues, which have resisted the power of the bark, deserves particular attention. It not only explains the reason of the want of success that so often attends the improper exhibition of the bark, as mentioned in parag. 260. but serves also to throw considerable light on the true nature of this disease. A gentle purging draught of tincture of rhubarb and fenna, given seven or eight hours before the expected paroxysm, at the commencement of an intermittent, has very little effect in the cure of that disease. In so far as such a draught may free the alimentary canal of viscid phlegm and bile, it may contribute to render the succeeding fit milder. But, as the cause of the disease still acts in the body with considerable force, and the secretions are conse-

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* Sir J. Pringle's Med. Annot. vol. vii. p. 63. MS.

quently in a morbid state, the paroxysms will return. But, when the disease has continued for a considerable time, and subsists more from an uncommon irritability in the intestinal tube, than from any other circumstance, then we can readily perceive how the clearing of the primæ viæ of a collection of acrid fluids, previous to the usual time of the expected fit, should prevent its return. Nay, if this purging draught is repeated three or four times, so as to carry off the acrid contents of the bowels before they are accumulated in such a quantity as is sufficient to produce a paroxysm, it may prove effectual in the cure of this disease. For nothing keeps up the debility and preternatural irritability of the body, more than a frequent repetition of the paroxysms; and, of course, when the patient escapes his usual fits for eight or ten days, it often happens, that the system recovers so remarkably from its former morbid condition, as to be able to resist such stimuli as were capable, in its more diseased

diseased state, of producing a paroxysm. The successful treatment of chronic agues with flowers of brimstone, after the bark and other medicines had failed, by giving them in such a quantity as to keep up a moderate looseness, is a confirmation of the above reasoning on the cure of this disease by laxatives *.

266. A contrary practice with astringents has been sometimes followed with success. A solution of alum in brandy, with a little nutmeg, or some other aromatic added to it, and given immediately before the time of the paroxysm, has, I have been told, prevented the fit from taking place, and, by repeating this draught, in the same manner, two or three times, has cured some intermittents. When such medicines have proved successful, it has probably been in chronic agues, under such circumstances as are mentioned in the preceding

* Med. Annot. vol. viii. page 236.—239.

ceding paragraph. The salutary effects of this remedy must be ascribed to its astringency and cordial quality, which give such a stability and firmness to the nerves, as enables them to bear the stimulus of those acrid fluids which used formerly to produce a paroxysm. Such a practice, however, could never become general, because the whole of this solution being soon absorbed, its effects on the stomach and bowels would be less permanent than those of the bark, or even medicines of inferior virtues.

267. It is a fact, that opium or laudanum, given in a proper quantity, immediately before the accession of a paroxysm, will sometimes prevent its return for that time (p. 257.) But so extraordinary an effect of laudanum has been thought somewhat unaccountable. It may, however, be easily understood; for, if we allow, that, by restoring to the nerves their usual firmness and stability, fits may be prevented, when

when the return of paroxysms depend on an uncommon irritability of the system, we can readily comprehend, that a dose of laudanum, given immediately before the commencement of the cold fit, will, by lessening the irritability for a time, have the same effect in preventing the return of the paroxysm, especially if the disorder is of a slight nature. But this method of cure can seldom be prosecuted with advantage ; for, as opium has no other effects than as a cordial and sedative, the body, continuing in the same debilitated state, will subject the patient to a return of his disorder. In speaking of the cordial qualities of opium, this must only be understood to take place when a moderate quantity is given ; for large doses have a contrary effect, and always leave behind them a considerable debility, with other disturbances of the functions.

268. Several nostrums used in the cure of intermittents, appear to act on the system by their antispasmodic qualities. As

a cordial and antispasmodic in fevers, camphire is unquestionably one of our best remedies. In the low, malignant, remitting, or intermitting fevers of autumn, in the neighbourhood of marshes, camphire, joined with the Peruvian bark, is given with the greatest advantage. Some chronic agues, after they have been removed, leave such a mobility in particular parts of the body, as subjects the person to periodical pains, shakings, or partial convulsions, similar to the paroxysms of an intermittent. When these anomalous complaints derive their origin from the common causes of an ague, the clearing of the primæ viæ by an emetic and laxative, and afterwards giving the bark, commonly removes the disorder. But it sometimes happens that these diseases are merely spasmodic, and are owing to causes different from those which originally produced the intermittent. In such cases, the bark usually fails of success; but the disorder is readily cured by antispasmodics, and particularly by camphire.

269. It is true, that this antispasmodic quality of camphire has been generally known for many years. The experience of Hoffman established its character. From experiments made on camphire, by dissolving it in any of the fossil acids, spirit of wine, or oils, after it is recovered by the addition of water, it is found to be the same camphire, unchanged in its principles; and, as it may be sublimed numberless times in close vessels, without producing the smallest decomposition of its substance, or alteration of its properties, we may, with great probability, conclude, that it is unalterable by our digestive powers; and, of course, that its effects on the system will be permanent and uniform, while it continues in the primæ viæ, which is far from being the case with most of the other antispasmodics. But the doses of camphire usually given, have hitherto been too small to show its full powers in obstinate cases, and the strong sedative effects of half a drachm of camphire taken by Dr Alexander, may have checked

ed the courage of practitioners in going so far as we know may be done, not only with safety, but advantage ; for, by gradually increasing the dose, it may be raised to 14 or 15 grains thrice a-day.

270. When the composition and qualities of other remedies given with success in an ague, are known, the manner in which they operate on the body, in the cure of that disease, may, from the explanations already given on this subject, be readily understood. To avoid, therefore, being tedious, I shall only remark, that the few observations made on the seemingly contradictory practice of curing the same disorder by laxatives, astringents, sedatives, and stimulants, serve to illustrate the true nature of an intermittent. They corroborate the preceding doctrine concerning the original cause of the disease, the explanations given of the periodical return of the paroxysms, after a state of apyrexia for a certain time, and show the different circumstances

stances under which the disorder may exist. Indeed, the whole of the cure of this disease, under the various forms in which it appears, throw considerable light on every part of this subject, and explains most of the phaenomena that attend the disorder in its several stages, and in different patients.

271. When the rich inhabitants of marshy grounds, or strangers arrived amongst them, are seized with intermittents, they ought to remove, as soon as possible, to drier and better ventilated situations, at a distance from those putrid exhalations which gave rise to their diseases. By this removal to a more healthy air, their disorders are more easily and speedily cured. But this is an advice which cannot be followed by the poor, whose indigent circumstances preclude them from those advantages, and oblige them to submit to the ordinary course of the disease. It would be of great benefit to the inhabitants of marshy countries,

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in the preservation of their health, could they be properly impressed with the importance of cleanliness in their persons and in their houses, and to render their habitations as dry as their situations will permit. Such people being kept open in their bodies by some gentle laxative, during the whole of the sickly season, is of the greatest advantage. The chewing of the bark as a corroborant, is an excellent preservative against marsh fevers, as is a glass of the stomatic tincture of the bark taken once or twice a day. But these subjects have been so fully treated of by various authors, that I judge it unnecessary to enlarge upon them. Neither shall I insist on the articles of diet and exercise, as the advantages arising from a proper regulation of them are sufficiently known to every practitioner.

F I N I S.



