

A treatise on the more obscure affections of the brain : on which the nature and successful treatment of many chronic diseases depend ; being the Gulstonian lectures, delivered at the College of Physicians, in May 1835 / by A.P.W. Philip.

Contributors

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A
TREATISE
ON
THE MORE OBSCURE AFFECTIONS OF
THE BRAIN,

ON WHICH THE NATURE AND SUCCESSFUL TREATMENT OF MANY
CHRONIC DISEASES DEPEND.

BEING THE
GULSTONIAN LECTURES,

DELIVERED AT THE COLLEGE OF PHYSICIANS, IN MAY 1835.

By A. P. W. PHILIP, M.D. F.R.S. L. & E.,
FELLOW OF THE ROYAL COLLEGES OF PHYSICIANS OF LONDON AND EDINBURGH, &c.

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1835.

THE TREATISE

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(LATE T. DAVISON.)

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A TREATISE

ON

THE MORE OBSCURE AFFECTIONS OF
THE BRAIN, &c.

INTRODUCTION.

THERE is no other department of physiology which has either been so productive of error, or the errors of which have so extensively or to so great a degree influenced the practice of medicine, as those which have prevailed, and, indeed, in a great measure still prevail, relating to the functions of the nervous system.

While we are disputing respecting the powers of particular nerves (a subject, doubtless, of no small importance in elucidating the functions of life), the attention has been so little directed to the great laws of the nervous system, on which all the phenomena of both health and disease more or

less directly depend, that even our most respectable writers seem hardly aware that they have been made a subject of inquiry.

The errors I refer to are of two kinds. They relate either to the functions of the nervous system itself, or to the relation they bear to the other functions of life. By the latter, the treatment of almost all diseases has been more or less influenced; by the former, the nature of many obscured, and of some wholly misunderstood.

Such, at first view, is the influence of the nervous system in the animal economy, that, in the earlier states of physiological knowledge, the functions of this system were supposed to constitute the source of all its powers. It was not till more accurate observation and better principles of induction began to prevail, that physiologists suspected that there might be other sources of power in the living animal.

Haller was the first who made any attempt to establish this position in a way that attracted general attention. He maintained, and endeavoured to support his opinion by experiment, that the power of the muscular fibre is independent of any influence derived from the nervous system, to which he maintained it is subjected in no other way than to any other agent capable of exciting it.

Such inquiries have, by those little accustomed

to reflect on the principles which must always, more or less, regulate the treatment of diseases, been called abstract, and regarded as but little connected with actual practice: it will, however, I think, be admitted by the gentlemen I address, and the statements I shall have the honour to lay before them will strikingly illustrate the observation, that although this is certainly the case with respect to the practice which is merely empirical—merely founded on the simple principle of employing the remedy which has been found useful under similar circumstances, to a knowledge of the laws of our frame we are, in consequence of the varying nature and infinite variety of disease, constantly obliged to recur for guidance, and to the same source for all practical improvements except such as are merely the results of chance. Is it not a knowledge of those laws, and the principles thence resulting, which constitutes the chief difference between the rational physician and mere empiric?

I shall divide the following lectures into two parts. In the first, I shall point out the physiological errors which have, in modern times, most influenced the practice of medicine, and the means which have been employed for the purpose of correcting them; and in the second, consider the manner in which they have influenced the practical

part of our profession, and point out the advantages which result from their correction.

The latter part of the subject being much too extensive to be considered at length in the space allotted to these lectures, I shall here confine my attention to a class of diseases of no small importance, whether we regard their frequency or the suffering and danger which attend them, the nature of which, in consequence of our erroneous views of the animal economy, has been overlooked, and the sufferer thus deprived of all chance of effectual assistance from our art.

I shall no farther enter on the physiological part of the subject than is requisite for a full understanding of what I am about to say of the practical part; but it is necessary, in order to place the whole in a clear point of view, and one that will both better command the attention and otherwise assist the memory than a simple statement of the results would do, to give a short history of the origin and progress of the errors in question.

The necessity of such a detail will be apparent if we look into the works of the latest writers on the subject. When the prominent nature of sensation, volition, and the other mental operations in the animal economy is considered, it is not surprising that, till the functions of the brain and spinal marrow were made the subjects of direct

experiment, physiologists should have regarded them as organs of these functions alone; but it must, I think, surprise us that the same opinions should still be maintained.

Dr. Henry, of Manchester, in the *Report of the British Association for the Advancement of Science, for 1833*, observes, “The function of the spinal cord is simply that of a conductor of motive impulses from the brain to the nerves supplying the muscles, and of sensitive impressions from the surface of the body to the sensorium commune.” It will appear, I think, from the facts I am about to lay before the College, that it would be difficult to conceive a more erroneous statement—a statement in which the most important functions of the spinal marrow are wholly overlooked; for, important as the functions of the sensitive system are, those of the vital system must, at least in a medical point of view, be regarded as still more so; and from the same work similar observations respecting the brain itself might be quoted; and similar opinions are maintained by Dr. Alison, Professor of the Institutes of Medicine in the University of Edinburgh, in his *Dissertation on the State of Medical Science from the Termination of the Eighteenth Century to the present Time*, published last year in the *Cyclopædia of Practical Medicine*. The latter author is not satisfied with a simple

statement of the opinions in question, but attempts, as we shall find, to reply to the facts which oppose them.

These writers are not to be ranked among the medical scribblers of the day. When such men as Dr. Alison and Dr. Henry maintain opinions, as far as I am capable of judging, in direct opposition to the simplest facts—opinions which strike at the root, as I think it will appear, of all correct knowledge of the most formidable diseases—it is time seriously to review the subject, and determine where the truth lies.

CHAP I.

ON THE STATE OF OUR KNOWLEDGE RESPECTING THE GENERAL LAWS OF THE ANIMAL ECONOMY AT THE TIME MY INVESTIGATIONS WERE BEGUN.

I HAVE already had occasion to observe that Haller was the first who taught, in a way that commanded general attention, that the muscular power is derived from the mechanism of the muscular fibre itself, and is therefore independent of the nervous system. Not satisfied with this inference alone, and finding that he could not influence the heart in the same way as the muscles of voluntary motion, through the nerves, he too hastily inferred that this organ is removed from the immediate influence of the nervous system.

Both inferences were attended with difficulties too apparent to permit them to be generally received. We are not warranted, it was said, to infer that the power of the muscular fibre is independent of the nervous system, merely from finding that it retains its power for a short time after it is separated from the brain, spinal marrow, and

larger nerves; because the extremities of the nerves are too minute and intimately blended with that fibre to be removed; and to nervous influence, which may be supposed to remain in them, the temporary power of the separated muscle may be ascribed: and with respect to the immediate influence of the brain and spinal marrow on the muscles of involuntary motion, even on the supposition that they derive their power from their own mechanism, questions were put to Haller and his followers to which they were unable to make any satisfactory reply. Why, it was asked, if the heart be not under the immediate influence of the nervous system, is it supplied with nerves?—and why is it influenced by the passions?

Difficulties thus presented themselves on both sides; for it was evident, from the experiments of Haller, that the heart could not be influenced through its nerves in the same way as a muscle of voluntary motion.

When an account of M. le Gallois's experiments appeared, it was for a short time supposed, both by the physiologists of this country and the continent, that they had removed all difficulties, not only with respect to this question, but also with respect to the source of muscular power, by proving that the heart derives the power of maintaining the circulation from the spinal marrow. It was

only necessary to suppose that the brain influences the heart through the spinal marrow, in order to give a satisfactory reply to Haller and his followers, respecting both questions.

A committee was appointed by the Royal Academy of Paris, consisting of the celebrated Humboldt, and other eminent physiologists, to witness the repetition of M. le Gallois's experiments, and deliver a report respecting them, and the inferences they afford. In their report, which is nearly as long as the original account of the experiments, this committee not only admitted the accuracy of the experiments, and the legitimacy of M. le Gallois's inferences from them, but declared that they had removed all the difficulties which had so long and vainly engaged the attention of physiologists.

It was at once evident, from the nature of M. le Gallois's experiments, that they proved, in opposition to the opinion of Haller, that the heart is under the immediate influence of the spinal marrow. They proved that its power could be impaired, and even almost instantly destroyed by agents, the operation of which is confined to that organ; but with respect to the source from which the heart derives its power, the accuracy of his inferences we shall find very different.

In the first place, admitting every thing that

M. le Gallois and the committee say, all difficulties were not removed, because the action of the heart continues after it is separated from the body, which ought not to be the case, if its power depend on the spinal marrow; and in attempting to surmount this difficulty, they were forced into the very improbable conclusion, and which we shall find is even inconsistent with some of M. le Gallois's experiments, that the heart possesses two kinds of power—one depending on the spinal marrow, and another (in conformity with the opinion of Haller) on its own mechanism; but which, it was alleged, unassisted by the former, is wholly incapable of maintaining the circulation.

But were this conclusion of M. le Gallois and the committee, which we shall find in opposition to the most direct facts, admitted, there are much more formidable objections to their opinions on this part of the subject; for none of M. le Gallois's experiments, when duly considered, it will appear, afford the conclusion that the spinal marrow possesses any power over the heart, not equally possessed by the brain itself.

The inferences of M. le Gallois and the committee, however, were carried much farther. From other experiments, they inferred that the powers of circulation in every part of the body depend on the corresponding part of the spinal marrow. In

their inferences on this part of the subject, we shall find there is more than one fallacy—a fallacy in the experiments, as well as in the inferences from them, which is equally fatal to their conclusion.

But still greater difficulties attend their opinions: for they found that while the sudden destruction of a certain part of the spinal marrow never failed to impair the circulation in the part observed, the destruction of the same part, by small portions, produced little or no effect on it. Here the difficulty appeared so formidable, that M. le Gallois confesses it had nearly induced him to abandon the inquiry. “Après bien des efforts inutiles,” he observes, “pour porter la lumière dans cette ténébreuse question, je pris le parti de l’abandonner, non sans regret d’y avoir sacrifié un grand nombre d’animaux, et perdu beaucoup de temps.” And just before, he remarks, “En un mot, j’eus presque autant de resultats differens que d’periences.” We shall find him displaying more ingenuity than accuracy, however, in the means by which he persuaded himself and the committee he had removed this difficulty.

Other opinions to which M. le Gallois and the committee were led, are no less unfounded. The opinion of the great sympathetic nerve wholly deriving its origin from the spinal marrow, is of much less consequence than the inference that the

functions of all the vital organs are equally dependent on the powers of the nervous system. It will appear, from what I am about to say, to how great an extent the last of these errors evinces mistaken views of the functions of life; which are no less evinced, we shall find, by the difficulties of M. le Gallois respecting the function of respiration. He had adduced sufficient proofs of the spinal marrow, to which the nerves of respiration belong, being capable of its functions, independently of the brain, yet, on the removal of a part of the brain—the medulla oblongata—respiration ceases. This difficulty he acknowledges he sees no means of removing; calling it, “*Un des grand mystères de la puissance nerveuse, mystère qui sera dévoilé tot ou tard, et dont la découverte jettera la plus vive lumière sur le mechanisme des fonctions de cette merveilleuse puissance.*”

The foregoing errors, we shall find, invalidate all the inferences of M. le Gallois and the committee, with the single exception of the heart being under the immediate influence of the spinal marrow, and leave him the discoverer of certain highly-important, but unconnected facts, instead of the author of a new system, founded, as the report alleges, on a basis never to be shaken.

The experiments of M. le Gallois, indeed, by ascertaining some very valuable facts, while others

immediately connected with them escaped his observation, left the subject in greater confusion than he found it. Instead of removing the difficulties which formerly existed, the additions he made to our knowledge have shewn us others.

The heart's being subject to the passions yet independent of the brain, on which so much has been written, does not present a greater difficulty than that the destruction of the same part of the spinal marrow should, according to the way in which it is effected, either destroy the function of the heart, or little, if at all, influence it.

Why should the spinal marrow possess a power over the heart not possessed by the brain, since we know, from the structure of our bodies, that the brain, like the spinal marrow, contributes to the formation of the ganglionic nerves, to which the nerves of the heart belong?

Why, if the power of the heart depend on the spinal marrow, as it appears to do from the experiments of M. le Gallois, the accuracy of which I have ascertained by repeated trials, have foetuses been born alive where no spinal marrow had ever existed?—and why does the heart continue to perform its usual motions after it is removed from the body?

Why, if the various organs of involuntary motion bear the same relation to the nervous system, is the function of the heart uninfluenced by decapitation,

and the functions of the stomach and lungs impaired even by dividing or throwing a ligature around the eighth pair of nerves in the neck ?

Why does respiration cease on the destruction of the medulla oblongata, the nerves of the muscles of respiration arising from the spinal marrow, which M. le Gallois has shown to be capable of its functions independently of the brain ?

These apparent contradictions, it is evident, as well as those which existed before the discoveries of M. le Gallois, must be reconciled before we can understand the general laws of our frame. The doctrines which cannot reconcile them must be erroneous.

SUCH was the confused state of our knowledge respecting the general laws of the animal economy at the time I commenced a very laborious set of experiments, which have not been the task of a few months or years, but, with interruptions, of the greater part of not a short life ; the detail of which, with the more immediate inferences from them, the reader will find in the third edition of my *Inquiry into the Laws of the Vital Functions*, and eleven papers published in the Philosophical Transactions of London since 1814 ; the seven last of which have since been republished under the title of *An Inquiry into the Nature of Sleep and Death* ; and whatever

may be said of the results of this investigation, I believe I am correct in stating that more time and labour have been bestowed on it than was ever before devoted to any single physiological inquiry; which will easily be believed by those acquainted with such subjects, when they compare the number of published experiments with those which must have been made, according to the proportion which, on such subjects, the published usually bear to the unpublished experiments.

Nor has the undertaking been free from many discouragements, for few will be at the trouble to follow the inquirer in so protracted an investigation with even a moderate degree of accuracy, although all are ready to give their opinion of his labours. In proportion as the inquiry necessarily becomes complicated, the trouble of keeping pace with it increases; and what the critic does not understand, it is more agreeable to him to ascribe to the inaccuracy of the author, than his own carelessness and want of information. I hope I may be excused for taking the present opportunity of thus making a general reply to a certain description of writers, whose criticisms betray them, and that to such a degree, that sometimes, in the very quotations they give, the intelligent reader finds a reply to their censures; for such all must encounter who assail, whether correctly or not, long-established opinions. But I have not been without my

defenders, and such as might well encourage me to proceed.

It is evident that our knowledge of the general laws of the animal economy must be freed from the various sources of confusion above pointed out, before any successful application of it to the practical part of our profession can be made.

I am now to consider how far this has been effected by the inquiry just referred to; and it will form the best introduction to what I am about to say to point out the proofs of the errors above detailed. We shall thus be led to consider the results that seem to remove the many difficulties which beset the subject; and to the practical application of the principles deduced from experiment, the chief basis of all physiological knowledge; as their practical application is at once the measure of their utility, and the best proof of their soundness.

I have already had occasion to observe that none of the experiments of M. le Gallois, although at first view indicating that the spinal marrow possesses a power over the heart not possessed by the brain, when duly considered, afford this inference; and I am now to point out the manner in which M. le Gallois and the committee were deceived.

His experiments demonstrate, that when a

stilette, of nearly the same diameter with the cavity of the spine, is forcibly passed into it, and thus made an agent acting with such power on the spinal marrow as suddenly to destroy its mechanism, the power of the heart is instantly so impaired as to be incapable of maintaining the circulation; while, on the other hand, he proved that the brain may be wholly removed without at all influencing the power of that organ.

In the inference from these experiments, an important circumstance was overlooked: the one organ was removed, the other destroyed. It is not, on the one hand, a fair inference, that, because the power of the heart was nearly destroyed by the injury done to the spinal marrow, it derives its power from this organ; because its power, being derived from some other source, might be influenced by affections of the spinal marrow; nor, on the other hand, that the power of the heart being unimpaired by the removal of the brain, affords any proof that its power may not be influenced by the brain while their nervous connexions remain. It was only necessary to reverse the circumstances of the experiment, in order to shew the inaccuracy of the inferences of M. le Gallois and the committee. This was done in a set of experiments, an account of which the Royal Society did me the honour to publish in their Transactions for 1815.

The spinal marrow was removed, and the brain crushed. The result also was thus reversed. In the former case, the power of the heart remained unaffected; in the latter, it was as much impaired as by the destruction of the spinal marrow. Before the Royal Society published the foregoing experiment, it was at their request repeated, and its result confirmed by Mr. Clift; an account of the repetition of the experiment being published in the same volume of the Transactions.

With respect to the inference of M. le Gallois and the committee, that the circulation in every part of the body depends on the corresponding part of the spinal marrow, it has already been remarked that there is a double fallacy, for here the experiment, as well as the inference, is erroneous. To establish this position, it is not only necessary to prove that the circulation in the part equally fails, whether the corresponding part of the spinal marrow be destroyed, in whatever way, or removed; but it must also be proved, that it is the circulation in the part in question alone that is impaired when the corresponding part of the spinal marrow is destroyed, because the effect observed in the part may be the consequence of the diminished action of the heart, which M. le Gallois had shown is the effect of suddenly destroying certain portions of the spinal marrow.

Now neither M. le Gallois nor the committee relate any experiment which proves in which of these ways the destruction of any particular part of the spinal marrow operates in influencing the circulation in the part observed.

We have seen that in his experiments another difficulty arose, which had almost induced him to abandon the investigation ; for he found that when the same part of the spinal marrow, the sudden destruction of which impaired the power of the heart, was destroyed by small portions, little or no effect was produced on the heart.

Neither M. le Gallois nor the committee, it appears from what has just been said, relate any experiment which proves that the destruction of part of the spinal marrow affects the vessels of the corresponding part of the general frame, nor, indeed, at all affects the vessels themselves, because the effect they observed might have been the mere consequence of the weakened action of the heart ; yet, in attempting the removal of this new difficulty, they take for granted that that position has been established, and they attempt to remove the difficulty in the following manner :—

M. le Gallois had found, that when the power of the heart is so enfeebled by the destruction of a certain part of the spinal marrow, that it can no longer maintain the circulation, all the vessels

being free, it is enabled to maintain it by throwing ligatures around the vessels at a certain distance from the heart, so as to narrow the compass of the circulation—an observation, it may be remarked in passing, which might have assured M. le Gallois that the effect of suddenly destroying the spinal marrow was simply that of enfeebling, not changing, the nature of the action of the heart. Now he and the committee maintain that by destroying the part of the spinal marrow in question by small portions, the circulation in the parts of the body corresponding to these portions being destroyed, the same effect is produced as by the ligatures, and thus the heart is enabled to support the circulation. As the foundation on which this explanation rests we shall find is a mistaken one, I need not detain the College by pointing out the facts with which it is wholly incompatible.

The position of M. le Gallois and the committee, that the great sympathetic nerve wholly derives its power from the spinal marrow, is a consequence of the opinion adopted by them respecting the exclusive powers of that organ, and must share the fate of the opinion on which it is founded; and the fallacy of the position that the functions of all the vital organs are equally dependent on the nervous system, appears from the simple experiment, to which I have already had occasion to

refer, of interrupting the passage of the influence of the brain, along the eighth pair of nerves, which uniformly destroys the functions both of the stomach and lungs, while it leaves the function of the heart wholly unaffected.

Nor are the errors of M. le Gallois, which led to his difficulties respecting respiration, of less importance, in attempting to trace the laws which regulate the functions of the more perfect animals.

I have, in a paper published in the Philosophical Transactions for 1829, entered at length into the proofs that respiration partakes of the sensorial as well as of the nervous and muscular powers. Now M. le Gallois not only made no experiments to determine the line of distinction between the sensorial and nervous functions, but never even inquired how far the functions of the sensorial, influence those of the vital system; without a clear understanding of which, it will appear, it is impossible to comprehend the nature of respiration: hence the difficulties he experienced. Respiration ceases on the destruction of the medulla oblongata, not because this organ either affords or conveys to the spinal marrow any part of its power, but because, on its destruction, the power of sensation, and consequently of volition, ceases, respiration being, under all circumstances,

an act of volition. If the apoplectic breathes when he can be excited to no other act of volition, it is because the want of air in the lungs at length becomes a more powerful stimulant than any other we can apply. In proportion to the importance of its supply is the sensation which impels us to obtain it. We have instances of the hand held in the fire, but none of the breathing voluntarily interrupted.

Enough, as far as I am capable of judging, has been said to prove the position above stated, that of the conclusions of M. le Gallois and the committee of the Academy of Sciences, from his experiments, there is but one which is established by them—that the heart is under the immediate influence of the spinal marrow. This inference, however, alone, is sufficient to refute some of the most important of the prevalent errors respecting the laws of the nervous system, to which I have had occasion to refer.

If such be the fact, how erroneous, for example, must be the position of Dr. Henry, that “the functions of the spinal cord are simply those of a conductor of motive impulses from the brain to the nerves supplying the muscles, and of sensitive impressions from the surface of the body to the sensorium commune,” and all the inferences of authors, from the opinion that the

nervous system consists alone of the organs of the sensorial powers.

The author just mentioned is satisfied with simply making the statement here quoted, and others of a similar tendency; but Dr. Alison, as I have already had occasion to observe, attempts to reply to the facts which oppose such statements; — how vainly, I think will at once appear from a very partial reference to those facts.

“ In regard,” he observes, “ to the functions of nutrition, secretion, and excretion, to which the circulation is subservient, perhaps the most important information lately obtained is of a negative character. Notwithstanding the opposite opinion of some eminent physiologists, it may be stated, as the general belief, and as a fair inference from a review of the different departments of living beings, as well as from experiments and observations on the higher animals, that these processes are independent of any influence or energy necessarily derived from the nervous system;” and in a note to this passage, he continues—“ It is perfectly in conformity with this doctrine to state, that the nutrition of certain parts, (as of voluntary muscles and the organs of sense), and that the secretions of other parts, especially of mucous membranes, are habitually excited by voluntary motions and by

sensations, and therefore become deficient when certain nerves of voluntary motion or of sensation are injured or palsied."

As Dr. Alison is here the asserter, it might be sufficient to ask for the proofs of his statement; but a more direct reply will be more satisfactory. If Dr. Alison's opinion be correct, why are not the functions of nutrition, secretion, and excretion, suspended in a limb which has wholly lost both sensation and voluntary power? The fact of their continuance under such circumstances, duly considered, may be regarded as conclusive against it. Others, however, are not wanting which may make a stronger impression. He will hardly maintain that the stomach derives sensation, and what he calls voluntary power—a term which, as applied to the stomach, it is difficult to understand—from the lumbar portion of the spinal marrow; yet the secreting and other assimilating powers of the stomach and lungs are as much deranged by the destruction of this portion of the spinal marrow as by the division of one of the eighth pair of nerves; and by the destruction of the lower half of it as completely destroyed as by the division and separation of the divided ends of both those nerves, although in both instances, in all those parts of the animal above the part of the spinal marrow destroyed, sensation and voluntary power is as perfect as

before its destruction *. It may be thought that a position so unsupported as Dr. Alison's required not this discussion ; but we shall, I think, find the question of such importance, in a practical point of view, that it cannot be considered too cautiously.

The foregoing observations, it is evident, are equally conclusive, whether we regard the formation of the secreted fluids as a function of the secreting organs, or as taking place in the blood itself, the function of the secreting organs being confined to their separation from that fluid ; an opinion which some recently discovered facts would seem to warrant, and which, I may observe, certainly receives some countenance from what we know of the changes which take place in the blood in the course of circulation, compared with the function of the lungs. All this, of course, must be the subject of future investigations. In the meantime this question, in whatever way determined, in no degree influences the conclusions to which I think we shall necessarily be led by the facts I am about to lay before the College.

In addition to the errors respecting the disputed points we have been considering, there is one very generally prevailing in the writings of physiologists, which has commanded little attention. The nervous

* Experimental Inquiry, Part II.

and muscular systems are not the only sources of power in the living animal. The blood, no less than these systems, is possessed of vital powers, which have no direct dependence on the powers of either; for it retains them for a short time after it is separated from the organs of both*. It is true that the vital properties of the blood have an indirect dependence on the moving powers, all of which belong to the nervous and muscular systems, but in no other way than for the healthy state of its composition; precisely as the powers of these systems themselves depend on those of each other, and the powers of the blood for the healthy state of their organs.

* See the Experiments of Mr. Hunter on the Blood, and those relating to the evolution of caloric from arterial blood after it is removed from the body, detailed in my *Inquiry into the Laws of the Vital Functions*, Part II. Exp. 80, 81, 82, 83, 84, 85, and 86.

CHAP. II.

THE RESULTS OF INVESTIGATIONS RESPECTING THE
GENERAL LAWS OF THE ANIMAL ECONOMY.

HAVING pointed out the errors respecting the general laws of our frame which prevailed at the time I commenced the investigations on which the present lectures are founded, and their proofs; I shall now state the results of these investigations with their proofs (to some of them I have already had occasion to refer), on which it appears to me is founded the only correct view of those laws. But as the object of the present lectures is to call the attention of the College to the nature and treatment of a certain class of diseases, which appear to be very imperfectly understood, I shall enter no farther on the physiological part of the subject than is necessary for this purpose.

IF we pass over the numberless inaccuracies which prevailed before any well-directed application to physiology of the principles of experimental inquiry, the first important error respecting the laws of the nervous and muscular systems, and

the relation they bear to each other, was that above stated, that the muscles of involuntary motion are not under the immediate influence of any part of the nervous system—a position which, as we have seen, had been directly disproved by the experiments of M. le Gallois; but with respect to the nature of the influence which the nervous exercises over the muscular system, disputes still prevailed—some maintaining with Haller, that the nervous influence here operates on the same principle as other stimulants; while, according to others, it is not only the stimulant which excites that fibre, but the source of its power.

It was evident that the principle on which this point was argued could lead to no decision. It was as easy to affirm as deny that the remaining nervous influence was the cause of the temporary power of a muscle separated from the body; and by what means could either position be established? The parts are too minute and intimately blended to admit of separation.

It appeared to me that the most conclusive means of determining the question would be an experiment capable of ascertaining whether the effect of the nervous influence on the muscular fibre be that of maintaining, or analogous to the effect of other stimulants, of exhausting its excita-

bility. It appears, from the thirty-second experiment related in my *Inquiry into the Laws of the Vital Functions*, that the latter is the case to a degree that leaves no doubt respecting the result of the experiment; which was confirmed by other experiments, in which I found, in many trials, that when the powers of the nervous system are destroyed by opium or tobacco, the loss of power in the muscles is not proportioned to the degree in which the powers of the nervous system are impaired, but simply to the degree in which their contractions had been excited through it.

It appears from these experiments that the opinion of Haller is correct—that the nervous influence affects the muscular fibre in the same way as other stimulants, and consequently that the power of that fibre is not derived from the nervous system; a position we shall find of great consequence in judging of the nature of the nervous influence, and consequently of that of many other functions of the living animal, beside the excitement of the muscular fibre.

ON reviewing the functions of the living animal as they appear independently of all experimental investigations, two great classes present themselves—those of the sensitive system, by which we are connected with the world that surrounds us, and

those of the vital system, by which our bodies are maintained. It is to the latter that the attention of the physician is chiefly directed.

It is evident, without much consideration, that the vital functions include respiration, circulation, those processes by which our food is assimilated—that is, converted into the various organs of our bodies, and their temperature maintained,—and those by which such parts of them as have become unfit for the purposes of life are separated and expelled; for all are in a constant state of change.

Now in all these functions some part of the means employed are evidently the same which operate in the inanimate world. Respiration is performed; that is, the air is drawn into and expelled by the lungs by means which act on the same principle as the bellows. The blood in the circulation moves on the same principle as the water in a set of water pipes; it obeys a propelling force, and is subjected to the same laws of gravitation. Similar observations apply to the various processes of assimilation and excretion. We can trace in these processes the same chemical laws which obtain in the laboratory of the chemist; but there is at the same time, in all the foregoing functions, something more in operation, analogous to which we find nothing in inanimate nature.

The force, indeed, by which the air is drawn in

and expelled in respiration, operates on the same principle as in the bellows, but the power by which the machinery is worked is the contractile power of the muscular fibre. The motion of the blood depends on the same principles as that of the water in its pipes; but it is the contraction of this fibre also which supplies the power which moves it. In like manner in the maintenance of the organs of our bodies, and the separation of those parts of them which have become useless, and therefore noxious, while we trace the same chemical laws which operate in other parts of nature, we can perceive that they are constantly modified by those powers which are peculiar to the living animal; for it is not only impossible by any chemical arrangement to produce the same results in inanimate nature, but even to trace all the steps by which they are effected. It is in consequence, for example, of the same combination of oxygen and carbon that the caloric which supports animal temperature is evolved, by which its evolution takes place in so many of the processes of the external world. It is literally a slow combustion which maintains the temperature of the living animal; but we can neither imitate the process by which caloric is evolved from living blood, nor even trace all its steps. No position can be more erroneous than that the chemical pro-

cesses of the living animal depend alone on the same laws with the chemical processes of inanimate nature. The property of life bestows on matter powers as peculiarly its own as the property of gravitation.

It is not, however, impossible, nor, as far as relates to the mechanical parts of respiration and circulation, difficult, to ascertain what parts are employed in the several functions of the living animal. The mechanical part of respiration, we know, is performed by means of the bones, muscles, and nerves of the chest, although we can neither tell what enables the muscle to contract, or the nerve to convey the stimulant which excites it. The mechanical part of the circulation is effected by the muscular power of the heart and vessels (for it will be admitted, I think, from the facts stated in a paper published in the Philosophical Transactions for 1831, and re-published in my Treatise on Sleep and Death, that the powers of the heart and vessels are of the same nature), although we cannot tell how the stimulating contents of the blood operate in exciting these organs.

In the foregoing functions, it is only necessary to be acquainted with the structure of the parts and observe their operation, at once to perceive where the power resides ; but with respect to the parts

employed in the functions of assimilation and excretion, the question is more difficult. By what parts of the living animal are these processes effected? This is the information which the physician most wants, because the functions to which it relates are those, in most instances, both most uniformly and to the greatest degree deranged in disease. He wants to know, when these essential functions fail, where he is to look for the cause of failure.

When the mechanical part of respiration or circulation is deranged, we know where to look for the cause of derangement. When the chemical parts of these or any of the other assimilating functions are deranged, where is the fault?

The common reply is, in the assimilating and excreting vessels. What is meant by this? Do we mean that the vessels themselves are endowed with a chemical power? that organs which, according to the most accurate experiments, possess only the muscular and elastic powers, become capable, by some mysterious endowment, of separating and re-combining the chemical elements of the blood? a position not only at variance with every thing we know of the laws both of the animate and inanimate world, but in opposition to simple matter of fact; for when the powers of assimilation are wholly and finally destroyed, all the vessels of the

part, we find, may still retain all their known powers, the blood be still carried on by them in precisely the same way, as may be ascertained by the aid of the microscope, as when the assimilating powers were unimpaired. How, then, shall we ascertain where the fault lies when the assimilating functions are deranged? Simply by ascertaining on what organs they depend.

As all the powers peculiar to the living animal, with the exception of the vital powers of the blood itself, which we know, unassisted, to be unequal to the maintenance of the assimilating functions, because these functions require peculiar arrangements in the solid parts of our frame; I say, as all the powers peculiar to the living animal, with the exception of those of the blood itself, belong to the nervous and muscular systems, it follows that if the muscular cannot immediately co-operate with the blood in the maintenance of the assimilating functions, there is no other source to which we can look for this co-operation but the nervous system; and in conformity with the conclusion to which we seem thus unavoidably led, while, on the one hand, both the known properties of the muscular system, and direct experiment, prove that it is incapable of any immediate co-operation in the maintenance of these functions; we shall find that all we know of the properties of the nervous system, as well as

direct experiment, evince that it is capable of this co-operation.

But before the knowledge we thus arrive at can be made fully available to the purposes of the practical physician, we must know whether the powers in question belong to the whole or particular parts of the nervous system; and if the latter, to what parts.

This question I had occasion to consider at length in one of the papers re-published in my Inquiry into the Nature of Sleep and Death, from the Philosophical Transactions for 1833, *On the Relation of the nervous and muscular Systems, and the Nature of the Influence on which it depends*, from which, as far as I am capable of judging, it appears that the brain and spinal marrow alone are the active parts of the nervous system, the office of the nerves being merely that of conveying, and, in the ganglionic system, combining, the influence of the different parts of these organs.

ONE of the most striking features of the nervous system is that the nerves are divided into two distinct classes,—the one proceeding directly from the brain and spinal marrow to the parts they influence; the other entering a chain of ganglions, from which nerves are sent to the parts influenced by this class; some of both classes proceeding from

the brain, and some from all parts of the spinal marrow. By the one class the organs of the sensitive, by the other those of the vital system, are supplied.

We cannot suppose that this arrangement is fortuitous; it must answer some important end. I made many experiments with a view to ascertain its objects.

As the one set of nerves go directly to the organs influenced, and the other to a chain of ganglions which receive nerves from various parts of the brain and spinal marrow, and from which nerves are sent to the parts influenced by this class; it seemed probable that the former parts are under the influence of the particular parts of these organs alone from which they receive their nerves, while the latter may receive the influence of many parts of them.

This question could only be determined by experiment; and it appears from many experiments published in the Philosophical Transactions for 1815, and afterwards re-published in my *Inquiry into the Laws of the Vital Functions*, not only that such is the case, but that, while the sensitive organs receive only the influence of those parts of the brain and spinal marrow from which their nerves proceed, it is from every part of these organs, from the uppermost surfaces of the brain

and cerebellum to the lowest portion of the spinal marrow, that the parts supplied by ganglionic nerves receive their nervous influence.

The heart, the vessels, the stomach, the lungs, were all found to be under the influence of every part of the brain and spinal marrow. Even the action of the vessels to their minutest ramifications, it was ascertained with the aid of the microscope, could be increased, impaired, or even destroyed, by agents, the operation of which was confined to any portion of a certain extent of either of these organs, for the most powerful agent fails to influence either the vessels, or any other vital organs, if confined to a minute portion either of the brain or spinal marrow.

The foregoing effects on the vessels, it was also ascertained, is direct, and not through the medium of the heart; for they were the same when, in the newly-dead animal, after throwing a ligature round the vessels attached to the heart, this organ had been removed. Nor is the influence either of the brain or spinal marrow conveyed to the vital organs through the other, as that of the brain in many instances is to the sensitive organs through the spinal marrow; but is equally observed from agents affecting either, when the other has been removed.

For what purpose is the influence of every part of the brain and spinal marrow thus bestowed on

the organs of the vital system? This question also is answered by the experiments just referred to.

There was an essential difference in these experiments in the manner in which the different vital organs were influenced by the brain and spinal marrow. While causes confined to either of them were capable of increasing, impairing, and even of instantly and almost wholly destroying the power of the heart or capillary vessels, the total removal of either or both produced no sensible effect on them; but with respect to the stomach and lungs, it appears from experiments, to which I have already had occasion to refer in considering the opinions of Dr. Alison, that whatever prevents the influence even of any, except very small portions, either of the brain or spinal marrow from reaching them, deranges, and of any considerable portion, wholly destroys their functions. It was evident, therefore, that although the heart and vessels could be influenced, and that to any degree, by causes confined to the brain or spinal marrow, their power is derived from another source; while to that of the stomach and lungs, not only the influence of these organs, but their entire influence, is essential. The removal of any considerable part of it immediately deranged the secreted fluids of both, and of any large portion wholly altered their properties,

and at length altogether destroyed the secreting power, no secreted fluid being formed; and it appears from the facts stated in a paper published in the Philosophical Transactions for 1827, and afterwards re-published in my Inquiry into the Nature of Sleep and Death, that similar observations apply to all their other assimilating functions; so erroneous is the opinion of M. le Gallois, that the power of all the vital organs depends on the same principle, and so erroneous that of Dr. Alison and Dr. Henry, that the brain and spinal marrow are only organs of the sensitive functions. In these experiments the sensitive functions remained uninfluenced. When the secretion of gastric juice was wholly destroyed by dividing and separating the divided ends of the eighth pair of nerves, the appetite, as long as there was any part of the gastric juice, previously, in the stomach, which remained disengaged, was as good, and to the last the desire to breathe as great after as before the operation. There was no symptom whatever of the impaired sensibility supposed by Dr. Alison. The assimilating functions alone were impaired or destroyed, precisely according to the degree in which their organs were deprived of the nervous influence; proving that the brain and spinal marrow include the organs on which these functions depend, as well as those of the sensitive system.

We thus see why it is necessary that the assimi-

lating organs should receive the influence of every part of the brain and spinal marrow; and as the nervous influence would be useless if the blood on which it operates in the assimilating functions were not supplied, and its functions deranged if its supply were not regulated by the same powers which regulate the supply of that influence, we also perceive why it is necessary that the organs of circulation, though deriving their power from another source, should be under the immediate influence of those organs which supply the agent on which the assimilating powers depend.

The assimilating functions, then, require the influence of the whole brain and spinal marrow,—a fact we shall find fully illustrated in actual practice; and it is bestowed on them through the ganglionic system of nerves, which, receiving supplies from all parts of them, and sending nerves to all the assimilating organs, is evidently well adapted to this office. It is at once evident from this arrangement, that although in the sensitive system, the organs of which receive their nerves directly from the brain and spinal marrow, it necessarily follows that certain parts of the general frame are found to correspond to certain parts of these organs; this cannot, as M. le Gallois supposes, obtain in the vital system, the organs of which receive their nervous influence from a chain of ganglions in

which the influence of all parts of the brain and spinal marrow are combined, and by nerves which convey this combined influence alone.

SUCH appears to be the importance of the ganglionic system in the animal economy, and such the anxiety displayed in the structure of our bodies to place it as far as possible out of the reach of injury, that some physiologists have supposed that it is an independent system, supplying nervous influence to the vital organs without the assistance either of the brain or spinal marrow; but I think it will be admitted from the facts I have had had occasion to refer to*, that its only functions are those just stated,—namely, to combine and convey the influence of every part of the brain and spinal marrow; and the cause of these functions not having been understood, is our having been unacquainted with the circumstances which render such functions necessary—namely, the vital organs being placed under the influence of every part of the brain and spinal marrow, and the influence of every part of these organs being required for the due performance of secretion and the other assimilating functions.

* See the paper above referred to in the Philosophical Transactions for 1833, and my Treatise on Sleep and Death.

Thus it appears that in the brain and spinal marrow reside the organs of assimilation; and on these organs, and the powers of the circulating system, all the vital functions immediately, and, with the exception of respiration, wholly depend.

How comes it then, that, in our reasonings respecting the nature of disease, of which derangement of the assimilating processes always constitutes a principal part, and sometimes the whole, so little reference is made to the functions of the brain and spinal marrow? If there be any truth in the statements which have been laid before the College, and their proofs are open to every one who will afford them the most cursory attention, it would be difficult to point out any other fact which so strikingly demonstrates the deficiency of our pathological views.

To the function of respiration it will be necessary to recur, and also to the co-operation of the powers of the blood with the other assimilating powers. But before I proceed to these branches of the subject, there is still another more immediately related to those we are here considering, that demands attention, and one we shall find intimately connected with the treatment of the diseases of assimilation.

OF what nature is the influence supplied by the brain and spinal marrow, on which the most important functions of the more perfect animals so immediately depend?

We have seen that the powers of the living animal are of two kinds—those it possesses in common with inanimate nature, and those which are peculiar to itself. Of which description is the influence in question?

It requires no nice powers of discrimination to perceive the line of distinction between the functions peculiar to the living animal and the operations of inanimate nature. We find nothing in the latter analogous to the functions of the brain and spinal marrow, or even to the contractile power of the muscular fibre, and the powers of living blood.

The powers of life, properly so called, can reside only in the organs and fluids to which they belong in the living animal; and in their functions none of the powers of inanimate nature can be substituted for them.

So evident is the truth of these positions, that it is perhaps the most striking instance of the force of preconceived opinions which could be adduced, that, self-evident as they are, they have been called in question; and a power capable of residing in other textures than those to which it belongs in

the living animal, and for which in all its functions we can substitute a power of inanimate nature, is still, by those who cannot disentangle themselves from their prepossessions, regarded as peculiar to the living animal. They admit, for the experiments have been too often repeated, and by men whose accuracy cannot be questioned, to allow of hesitation respecting their results, that the influence which proceeds from the brain and spinal marrow, and is sent along the nerves, may exist in other textures than those of the nervous system ; and that voltaic electricity is capable of all its functions ; and yet, with a degree of inconsistency which almost amounts to a contradiction in terms, they maintain that it is an influence peculiar to that system. They admit that it can exist elsewhere, and that a power which operates in inanimate nature can perform its functions, and yet maintain that it is peculiar to the nervous system of the living animal. I must leave such to the conviction which awaits them ; for surely to the unbiassed understanding these facts warrant the conclusion, that the nervous influence, like the mechanical powers to which I have had occasion to refer, is among those powers which the living animal possesses in common with the external world ; and we shall find that this inference is strikingly confirmed by the practice which is founded upon it.

If any doubts on the subject could have remained, the late experiments of Dr. Faraday, by which, I believe, it will be admitted that he has established his doctrine of electro-chemical equivalents, according to which all chemical changes are the effects of electric action, would have removed them. He has been so good as to assist me in my attempts to cause the nervous influence to affect the galvanometer, in which I have not yet succeeded. But this need not surprise us, as the electricity of electric animals is found incapable of affecting the common electrometer; yet who doubts that it is electricity, modified by the properties peculiar to living animals, on the same principle that we see it modified to a far greater degree by those peculiar to the magnet.

If the foregoing conclusions from experiments, not merely performed privately by an individual, but publicly repeated with the same results, both in London and Paris, be admitted—I say, if the foregoing conclusions be admitted, and I do not see the possibility of questioning them, the brain and spinal marrow include organs capable of collecting, and, through the nerves, applying voltaic electricity, which, modified in its effects by the properties of life, is the immediate agent of the assimilating functions; and that the nervous systems of animals is capable of collecting and applying,

even according to the dictates of the will, the electric power, is evident from the phenomena of electric animals.

A principal obstacle with which the truth has here had to contend, has arisen from the difficulty of drawing the line of distinction between the sensorial and nervous functions, properly so called. It is apparent, on the slightest consideration, that the nervous system includes more than one principle of action. It is impossible to class together the excitement of a muscle, or the formation of a secreted fluid, with sensation, volition, and other mental functions. The analogy which the one set of functions bear to the operations of inanimate nature is too apparent to escape the most careless observer; in the other it is at once evident that all such analogy is lost.

The difficulty of determining the line of distinction, in some operations of the animal economy, between these classes of functions, both of which belong to the brain and spinal marrow, has been a principal cause in the minds of those who have not been in the habit of considering with much accuracy the functions of the living animal—of obscuring the very simple inferences just stated. Can we, it has been said, suppose that electricity feels and thinks? Surely nothing more than the meaning of the terms is necessary to the reply; and no

man who in the least degree understood what had been done on the subject, could have asked the question.

It is equally the result of observation and experiment, that the stimulants on which the excitement of our organs depends belong to inanimate nature; and on what principle could we expect any other result? Are not these organs themselves composed of the same materials as the world which surrounds us? and on what principle could they be immediately impressed, but by stimulants of their own nature? With the relation of our organs to external agents, the principle of life no farther interferes than its own peculiar properties are concerned. The light impresses the eye, the air the ear, on the same principle that they impress other bodies. The peculiarity of the effects depends on certain properties of the eye and ear; and do the facts which have been laid before the College admit of any other inference, than that it is also an agent which operates in the external world that excites the muscular fibre? The peculiarity of the effect depends on the property of that fibre. Is it not excited by a thousand other such agents? Shall we maintain that the scalpel of the surgeon is capable of precisely the same effect as a vital power, properly so called?

It is true that we see in the animal economy

a set of functions not immediately dependent on the agents of inanimate nature, their organs being removed from the immediate effect of those agents. Mediatly, however, they are equally dependent on them. The sensorial functions are not more distinguished from the nervous and muscular by the difference of their nature, than by that of the agents which immediately excite them, for they can be excited only through the medium of other vital organs.

That the organs of the sensorial system, and those of the nervous system, properly so called, through which alone the former are excited, although both residing in the brain and spinal marrow, are distinct sets of organs, is proved from their different locality, from the one being often in the greatest degree deranged in disease, without the other being at all affected, and from all the nervous functions remaining after the sensorial have been finally withdrawn*.

Thus in the latter functions the agent which immediately excites, and the organ excited, are equally vital parts; and we know from the phenomena, that it is by their vital properties that they influence each other. Hence in them the

* *Inquiry into the Laws of the Vital Functions, and paper On the Nature of Death.*

loss of all analogy with the operations of inanimate nature. It is on the immediate intercourse between animate and inanimate agents that this analogy depends. Where the intercourse is between vital parts, and by their vital properties alone, it wholly and necessarily disappears.

Having been led, in a very early part of my investigations, to perceive the confusion which had crept into several departments of physiology, from the uncertainty of the line of distinction between the sensorial and nervous functions, I made many experiments with a view to ascertain this line. That I might ascertain it with the greater precision, this was attempted by two sets of experiments, conducted on different principles; the object of the one being to ascertain what functions remain after the sensorial power is withdrawn; of the other, what functions cease on withdrawing the nervous power.

By these sets of experiments, the coincidence of the results of which affords the best proof of their accuracy, an account of which will be found in my *Inquiry into the Laws of the Vital Functions*, and in papers in the Philosophical Transactions, it was ascertained that the following comprehend all the functions of the nervous system, properly so called: the propagation of impressions along the nerves; the excitement of the muscles of voluntary motion

in all their functions ; and in certain functions, of those of involuntary motion ; the formation of the secreted fluids from the blood, with the other processes of assimilation ; and the evolution from the blood of the caloric which supports animal temperature. These, and these only, are the functions of the nervous system which can be maintained by voltaic electricity, after the nervous influence is withdrawn ; and as far as we see, as perfectly maintained as by that influence itself.

Shall we suppose that there are two distinct powers capable of such complicated functions ? Where shall we find different principles of action capable of the same results ? And, on the other hand, do not, in many instances, the most dissimilar results only indicate modifications of the same power ? The more successfully we study the works of nature, the more their simplicity appears. Would it not require the strongest evidence to force upon us an inference so inconsistent with what we see in all her other works, as that the same phenomena may originate from different sources ; and where shall we look for *any* such evidence ?

IN attempting to draw the line of distinction between the sensorial and nervous powers, we are necessarily led to the study of the function

of respiration, which, next to the circulation of the blood, may be regarded as the most important in the more perfect animals—a function which equally claims our attention, whether we regard its agency in the healthy state of the system, or its influence on the nature and progress of disease. The difficulty in which M. le Gallois was involved respecting respiration, arose, we have seen, from his not being aware that this function partakes of the sensorial power; into the proofs of which I have, in one of the papers re-published in my *Inquiry into the Nature of Sleep and Death*, entered at considerable length; and, in other parts of the same publication, I have endeavoured to point out the manner in which the phenomena both of health and disease are so extensively influenced by this cause; both of which subjects the limits of these lectures preclude me from farther prosecuting here.

ON a review of all that has been said of the functions of the more perfect animals, the conclusion will, I believe, be found unavoidable, that, with the exception of respiration, which partakes of the sensorial power, all the vital functions are the results alone of the co-operation of the nervous influence and the fluids conveyed by the powers of circulation; and, when we con-

sider the diseases which form the object of these lectures, we shall find that on a disturbance of the processes resulting from this co-operation their nature depends, and, consequently, that on this knowledge must be founded all rational attempts to relieve them.

By the joint aids of anatomy and experiment, for the parts are too minute to render the nicest dissection alone sufficient, we ascertain that, with a few exceptions, every organ is supplied with blood-vessels and ganglionic nerves; the exceptions being only such parts as do not partake of the processes on which both the functions and structure of our organs depend. When an organ is deprived of any considerable portion either of its blood, or of the influence conveyed by the ganglionic nerves, its function immediately, and sooner or later its structure, is deranged.

When the blood alone is wholly withdrawn, the vessels are no longer excited, and the nerves have no longer the material on which they operate; the action of both, therefore, necessarily and immediately ceases. When the nervous influence alone is wholly withdrawn, the power of the vessels, being independent of this influence, and still supplied with their usual stimulant, continue to convey their fluids as usual; but these fluids no longer in any degree undergo the proper changes; and when

even small portions of this influence are withdrawn, these changes are deranged more or less according to the portion withdrawn; and the changes which take place in the structure of the secreting organ assure us that its other assimilating functions undergo corresponding changes, proving that exactly as the nervous influence fails, all these functions fail with it. Each of these points has been ascertained by experiments frequently repeated, and witnessed by many capable of correctly judging of their results, a detailed account of which will be found in the publications to which I have repeatedly had occasion to refer.

It has always been admitted,—for the proofs of the position are too evident to escape the most careless observer,—that the assimilating functions immediately depend on the powers of circulation; and this, we have seen, has led to the notion that they are effected by some mysterious operation of the vessels themselves.

If there be any truth in the positions which have been stated, we must admit the co-operation of another power in all of these functions, the organs of which reside in the brain and spinal marrow. The mystery is thus dispelled; for we find that this power is the same which effects the chemical changes (many of them precisely the same) in other parts of nature. Who can doubt that carbon and oxygen are combined by the same agency

in the blood as in the laboratory of the chemist? Is not the resulting substance in the two cases identical? And if the result take place in the living animal under circumstances which we cannot imitate, is not the same true of the results of all the other powers which it possesses in common with inanimate nature? Can we imitate more successfully the mechanical than the chemical part of circulation or respiration? Can we give to our springs a self-moving power? Why then should we question the identity of the chemical, more than of the mechanical, powers of the living animal with those which operate in the external world?

All the powers borrowed from inanimate nature are modified by the properties of life; but in no case are they so modified as to make it in the least degree difficult to recognise them.

THERE is still another subject to be considered before we can obtain a correct view of the influence of the nervous system in determining the nature and progress of disease. I refer to that effect on each other of the various parts of our frame, to which the term sympathy has been applied, and by which the progress of diseases and consequently their nature, particularly as regards the more protracted cases, are more extensively influenced than by any other cause.

ALTHOUGH much has been written on this subject by authors of great name, the meanings attached to the term sympathy have remained indistinct, and the phenomena arranged under it ill defined ; from which it may safely be inferred that we have not been in possession of all the facts on which these phenomena depend. It is necessary, before I enter on the practical part of the present treatise, to inquire how far the various experiments to which I have had occasion to refer, tend to throw light on them.

I shall not detain the reader by observations on what has been done by others on this subject, but immediately, by an appeal to the phenomena, endeavour to place its laws in what appears to me the only correct point of view.

It is not my intention to enter into any more extensive view of the phenomena of sympathy than is necessary to illustrate the principles on which it depends ; and still less into the various phenomena of disease dependent on it, farther than to obtain a distinct view of the causes, in consequence of which it exercises so extensive, and often so obscure, an influence over them.

It is necessary, in the first place, clearly to determine what we mean by the term sympathy, or, I should rather say, to point out the sense in which I shall employ it, for few terms have been

employed with less precision. We do not refer to what is called sympathy all the effects of distant parts on each other, although there are few of these which have not, by some writer or other, been referred to it. I shall not, for example, refer to sympathy the influence on each other of the parts concerned in any act of volition, nor the effects of injury done to the trunk of a nerve on the parts in which it terminates, nor the congestion, throbbing, or other effect, from a cause seated in a part, however distant from the part affected, increasing or obstructing the circulation in it (obstructed liver, for example, does not produce piles by sympathy); nor, in short, any instances in which distant parts influence each other, where the structure of our bodies at once points out the channels of communication.

But when a cause, for example, which makes its impression on the stomach, produces palpitation, I shall regard it as affecting the heart by sympathy, because it at once appears from the structure that there is no direct channel of communication between, apparently, the only parts concerned.

As it is evident, however, that no part can influence another between which there is not some more or less direct channel of communication, we may be assured that the phenomena of sympathy are produced, as in the case of all other phenomena

in which distant parts affect each other by the propagation of the impression along contiguous parts, the only difference being, that in the one class the channels of communication are evident, in the other obscure.

The term sympathy, then, may be defined, the influence of distant parts on each other, between which the mere structure of our bodies, compared with the phenomena, do not point out the exact channels of communication.

Two systems, the nervous and sanguiferous, with a few unimportant exceptions, pervade every part of the body. There are no other means of communication among all its parts. As the phenomena of sympathy then, we shall find, extend to all its parts, it must be through one or both of these systems that it operates. We know that it does not operate through the sanguiferous system alone, because many of its causes are such as are incapable of directly impressing this system; and many of its effects such as no unaided affection of this system could produce. It must, therefore, be more or less through the intervention of the nervous system that its phenomena take place; but it will appear that all its phenomena are such as may take place through this system alone. We thus arrive at the conclusion, that the channels of

communication here are through the nervous system, a position which has been almost universally admitted; and the phenomena of sympathy were long supposed to depend on the connexion formed by the nerves with each other, in their progress from the central parts of the system to the parts they influence.

The various parts of the living animal may be divided into active and passive. The belly of a muscle is the active, the tendon the passive part. In like manner, the brain and spinal marrow are the active, the nerves the passive parts of the nervous system, the latter possessing no power but that which they derive from the former*.

As soon as it was proved that the nerves are only the passive parts of the nervous system, it was evident that they could not be the medium on which the phenomena of sympathy depend, because these phenomena do not consist in the mere continuation of the impression from which they arise, the sympathetic effect being often of a nature wholly different from the immediate effect of that impression. The cause which excites pain

* See a paper in the Philosophical Transactions for 1833, re-published in my "*Inquiry into the Nature of Sleep and Death*;" "*On the Relation which subsists between the Nervous and Muscular Systems*," &c.

alone in the part on which it operates, may excite motion alone in that sympathetically affected, and *vice versâ*. Some portion of the parts, therefore, through which the impression is communicated, must belong to the class of active parts. It must be capable, on being impressed, of originating an effect of a nature different from that of the cause which impresses it, a function of which we know the nerves to be incapable. It appears, then, that the phenomena of sympathy take place through the active parts of the nervous system, and consequently that they depend on organs which belong to the central parts of that system—a conclusion amply supported by the direct facts, and to which, by a review of these facts alone, the most correct writers of the present day have been led.

What particular connexion of nerves exists between a vital organ and the skin which covers it, between the liver and ligaments of the shoulder, between the intestines and abdominal muscles, the stomach and cartilages of the ribs? &c. Why does inflammation of the membrane of the ribs spread as readily, indeed more so, to that of the lungs, which is only in contact with it, as to the parts in continuation with it, which are supplied from the same branches both of nerves and blood-vessels? The same question may be asked respecting inflammation of the membranes of the abdomen

and the head; for even the interposition of bone does not prevent this sympathy of neighbouring parts, of which the bone itself equally partakes. In inflammation of the bowels, we find contiguous parts partaking of the state of each other, although their distance is great, if measured by the course either of their vessels or nerves. That the phenomena of sympathy depend on changes in the central parts of the nervous system, would appear from the fact alone, that feelings continue to be referred to a limb which is lost, at whatever part the separation has taken place. Besides, we know that all nerves convey impressions to the central parts of the nervous system, and that these parts influence all their functions, facts capable of explaining the phenomena, without any supposed action of the nerves on each other.

HERE the question arises, is there a common centre of sympathy? Are the parts whose office it is to influence those secondarily affected, always the same, or are they different in different cases, so that there is more than one such centre? To answer this question, which we shall find of no small importance in the treatment of diseases, it will be necessary briefly to refer to the results arrived at in the papers published in the *Philosophical Transactions* for 1831, 1833, and 1834.

In these papers I have had occasion to refer to the sets of experiments, made with a view to draw the line of distinction between the sensorial and nervous functions, and determine the relation these functions bear to each other; from which it appears that the nervous bears the same relation to the sensorial, that the muscular bears to the nervous system. The power of the muscular, it appears from the facts there adduced, is independent of the nervous system, but always in some of its functions, and in all its functions occasionally, under its influence. In like manner it was found that the power of the nervous is independent of the sensorial system, all the nervous functions remaining after the final removal of the sensorial power; but that in some of these functions always, and in all of them occasionally, the nervous system is under the influence of that power.

Thus it appears that there is, in the more perfect animals, two sets of functions in a great degree distinct—those depending on the nervous and muscular systems alone, and those in which the sensorial system is included: the former constituting the vital functions, those by which we are maintained, the latter the sensitive functions, those by which we are connected with the world which surrounds us; and that both sets of functions are under the immediate influence of the active, that is, the central parts of the nervous system.

It further appears, from the facts referred to in my papers on the Nature of Sleep and Death, last year re-published from the Philosophical Transactions, that it is not with respect to their functions alone that these systems are entitled to be regarded as distinct systems. The parts of the brain and spinal marrow associated with the organs of the sensitive system, and those associated with the organs of the vital system, are distinct sets of organs, having different localities, and obeying different laws. It is quite evident, therefore, that if both the sensitive and vital functions in the various parts of our frame sympathise, it cannot be through the same parts of the brain and spinal marrow: as these functions depend on different sets of organs, their centres of sympathy must be different.

It will appear, on the other hand, from the facts I am about to state, that the phenomena of sympathy themselves lead to the same conclusion—that each system possesses its own centre of sympathy, and consequently that there is a centre of sympathy in a great degree independent of the sensitive system, and therefore of our feelings; on which, we shall find, depends one of the greatest difficulties which beset the practice of medicine, and which has led, and still leads, to errors of a fatal nature.

The sympathies of the sensitive system necessarily force themselves on our attention. When the feelings of disordered digestion, for example, are accompanied by pain or sensible derangement of function in a distant part, it is impossible for us to overlook the sympathy on which such symptoms depend. But the sympathies of the vital system, operating unconsciously, are often obscure. The vital functions of both the head and chest, for example, are not unfrequently affected by such a state of the digestive organs as does not, by any complaint of the patient, call the attention to the source of the evil; and unless it be so called by other means, if the case be of a serious nature, it necessarily proves fatal; for the consequence cannot be removed while the cause continues to operate.

Another circumstance which has contributed to keep us in the dark respecting such cases, is, that the centres of sympathy in the two systems not being identical, their sympathies are not, in all instances, most prevalent in the same organs. A vital organ may be an organ of dull feeling, and little capable of influencing other parts of the sensitive system, and yet, as far as relates to the other vital organs, of the most powerful and extensive sympathy; and thus an affection which neither betrays itself to any of the senses, nor implicates

organs the sympathies of which are, from their sensibility, the most prominent, may be undermining all the powers of life; and, I think, all conversant with the practice of medicine, will admit that it is here that it is at present most defective. Fatal cases are every day occurring, as appears from dissection after death, the progress of which might have been easily checked had we been aware of their nature before the secondary and more prominent affection had shown itself, and even after it had appeared and made some progress, had we been aware of the cause which was supporting and aggravating it; for few affections are, from the first, necessarily of a fatal nature.

There is no organ whose sympathies are absolutely confined either to the sensitive or vital system: all organs, more or less, partaking of the functions of both: but that the different species of sympathy prevail most in different organs, a thousand phenomena assure us; and we have ample proof that the vital often so little influence the sensitive sympathies, as neither to attract the attention of the patient or his medical attendant.

In no other organ are the sympathies of the sensitive system so powerful as in the stomach—an organ of the most acute sensibility; but the sympathies of the vital system are much more powerful in the liver, which, although of very dull

feeling, influences, and is influenced by, the vital functions of distant parts more powerfully (if we except the brain itself) than any other organ; and that, it will appear from what I am about to say, in a degree that admits of no comparison.

Hence it arises, that even when the secondary symptoms affect the same organ, if they originate from impressions made on the stomach, they are generally affections of the sensitive, if from impressions on the liver, of the vital system. Affections of the former, for example, produce headach and dyspnœa; those of the latter, often (without producing much sensible derangement either in the brain or lungs) gradually derange the assimilating powers of both. Of all our organs, therefore, the affections of the liver are the most insidious. They are the parent of many diseases which give little uneasiness till the organs secondarily affected are essentially diseased.

Disorder of the stomach hardly ever seriously and permanently disturbs the circulation, either in the head or chest, till it has spread to the liver.

I can say, from pretty extensive and long-continued experience, during which my attention has been directed to the subject, that no permanent disease affecting the vital functions of any distant part, in consequence of affections of the digestive organs (and all who are conversant with the

practice of medicine know how numerous a class this embraces), is ever established till the disorder of the stomach, if the disease originate there, has for some time, longer or shorter, according to the tendencies of the particular constitution, extended to the liver.

Thus it is that, in practice, we find the sympathies of the stomach, although more distressing to the feelings, much less formidable than those of the liver, in which chronic disease often lurks, and where it does not itself gradually assume a formidable shape, by its imperceptible but constant operation on some distant organ, not unfrequently lays the foundation of disease in its vital parts; which comes upon us unexpectedly, and after it has made such progress as defies our art.

It requires the whole attention of the physician to detect the nature of such cases in their early, and often only curable, stage. While disease is confined to the sensitive system—that system by which we are connected with the external world, but has no share in maintaining life—the sufferings and privations may be great, while the danger is trifling; but when to the vital system—to those organs which, having no immediate share in our intercourse with the world, neither require nor possess that quick sensibility which is necessary for the functions of the sensitive organs—the

sufferings often bear no proportion to the risk; and we are only able to ascertain the nature and extent of the disease by the results of long-continued and careful observation.

It was, for example, at once apparent that the headach of indigestion proceeds from the state of the digestive organs, but thousands of years elapsed before it was discovered that internal water of the head has the same origin; and before this was ascertained by comparing the symptoms with the appearances on dissection, it was ranked among incurable diseases; so unsuccessful were the only means employed.

Hence the importance in all serious diseases, and particularly those of long standing, of carefully examining the region of the liver, to which the feelings of the patient will seldom direct our attention, and using all other means in our power to ascertain the state of this organ; for on it, in not a few cases, the life of our patient depends. For more than twenty years, I have examined the state of the liver as constantly as that of the pulse, and often derived more important information from the former than the latter examination; a proof of the extent of the vital sympathies of this organ*.

* I have, at great length, entered into this subject in my *Treatise On Indigestion*, and that *On the Influence of Minute*

Many facts might be detailed which strikingly illustrate the foregoing observations. It has been customary, for example, to treat all species of pulmonary consumption in the same way, and under the same treatment all are equally fatal. But it appears, from what is said of the third stage of indigestion, in my treatise on that disease, that there is a species of pulmonary consumption which originates in derangement of the liver (of all its forms the most common in this country), which almost with certainty, in its early, and sometimes even in its advanced stages, yields to the means of restoring the due function of that organ.

I could refer to many instances in which I have had the satisfaction to see the ravages of this disease, in families, in which many individuals had, one after another, fallen a sacrifice to it, finally checked by these means; for it is a remarkable fact, that I never saw both the dyspeptic and original pulmonary consumption in the same family. If one of a family labour under the former species, we may be assured, that if the disease appear in any of the others, it will be in the same form; and nothing more is required to prevent its appearance

Doses of Mercury combined with the appropriate Treatment of various Diseases, in restoring the Functions of Health; and pointed out what appear to me the best means of detecting affections of the liver in their earlier stages.

than guarding against the continuance of what are called bilious complaints; which, in consequence of the sympathy that exists between the liver and lungs, prey on the latter organ, especially where it is more than usually disposed to disease; and to this sympathy thousands yearly fall a sacrifice in these kingdoms, all of whom might be saved by so easy a precaution. I have already had occasion to refer to the hydrocephalus internus, another disease having the same origin and illustrative of the same principles, for, in nineteen instances out of twenty, it may be prevented, and in its early stages cured, by the same means. We see the same sympathy operating in diseases of the brain of a different kind, which appear in advanced life, in gout, and many other cases; nay, even in diseases which, at first view, appear to be wholly of a local nature, as Mr. Abernethy has shown in his excellent treatise on their constitutional origin.

It is not difficult to perceive why the vital sympathies of the liver are so powerful and extensive.

It appears from experiments, to which I have had frequent occasion to refer in the preceding part of these lectures, that through the brain and spinal marrow we can directly influence all the vital organs; that the brain and spinal marrow do not merely include the organs of the sensitive

system,—not merely those by which we feel, will, and move,—but organs on which many of the functions of life immediately depend; and which are capable of immediately influencing the whole of these functions. It is evident, therefore, that whatever influences the vital organs of the brain or spinal marrow, may influence not only the circulation in whatever part, but all the other functions of life.

Now it appears, on the other hand, from a great variety of phenomena, that between the brain and liver there is a sympathy, which does not exist between the former and any other organ, for which no anatomical investigations would prepare us. Melancholy even derives its name from affections of the liver. Hence, also, the sick headaches and other affections of the head, which so generally attend what are called bilious complaints. The other abdominal and the thoracic viscera may be inflamed in any degree, the intellects remaining undisturbed even to the last; but delirium attends active inflammation of the liver, and more or less disturbance of the mental functions, all its affections.

Such is the influence of the liver on the sensitive, but its influence on the vital organs of the brain is, to the careful inquirer, still more striking. Not only chronic, but acute disease of

the brain, often has its origin in affections of the liver; and, on the other hand, the latter is more than any other distant organ influenced by the state of the brain. Even mental affections immediately influence its secreting powers; and when long continued, often wholly disorganise it.

When this intimate connexion between the brain and liver is compared with the results of the experiments just referred to, we at once perceive how ready a channel is opened, by which affections of the latter organ may influence the assimilating functions in the remotest parts of our frame; and it need not surprise us when we find that obstinate affections of the digestive organs (the obstinacy of which, it appears from facts I have had occasion to adduce in my treatise on Indigestion, and that on Minute Doses of Mercury, chiefly arises from the state of the liver), are capable of inducing any diseased action in any part, to which, by peculiarity of constitution or other causes, the patient happens to be predisposed; and that the disease thus produced proves unmanageable, if the affection of the liver, on which it depends, be overlooked. I have often seen diseases, which at first view appeared to have no connexion with the state of this organ, resist all the usual means, till its affection was detected and relieved, and then readily yield to them.

The intimate sympathy between the brain and

liver, however, powerful as it is, is not the only cause of the extensive influence of the latter organ in the vital system. In the last of the treatises just referred to, I have entered at length into this subject, and pointed out the various circumstances which contribute to render the influence of the liver so extensive, and bring the progress of disease so much under its controul; among the most important of which is the peculiarity of the circulation in this organ, which, independently of its sympathies, gives it an immediate influence over the whole extent of the alimentary canal; and from the intimate sympathy between this, which may be regarded as the internal, with the external surface of our bodies, over this surface also; the state of these surfaces more, perhaps than any other cause, influencing that of health.

To what cause but the extensive connexions of the liver, can we ascribe the fact that, in sultry climates, where the sympathies are most active, all diseases, whether acute or chronic, slight or severe, tend to its derangement; and its more severe affections, by a law of sympathy, which I shall presently have occasion more particularly to consider, relieving the affections of other parts, most serious diseases in such climates, and, indeed, all, I may say, of long continuance, terminate in permanent derangement of this organ; an important fact which has not obtained the consideration it deserves.

The attentive physician may observe the same tendency, though less marked, in the diseases of temperate climates; for even in such a climate as our own, in what serious disease, particularly if it be a disease of continuance, is not a disordered state of the liver a more or less prominent feature? but in temperate climates its affections, from the cause just mentioned, being neither so severe nor obstinate, more rarely become permanent, and consequently, for reasons I have explained at length in my treatise on *Indigestion*, are less apt to divert disease from other parts.

It must be reckoned among the circumstances tending to obscure the cases which depend on distant sympathies, that diseases of the part originally affected, not at all in themselves formidable, often, in consequence of a greater tendency to change of structure in other organs, excite the most formidable diseases in distant parts; and we are still farther perplexed, in consequence of the operation of the law just referred to, that, when disease is permanently established in one part, it is often diverted from others, on the same principle that an artificial disease excited on the surface often relieves an internal part.

Thus it is by no means uncommon for a disease, excited by a disordered state of the liver, to relieve the affection which caused it, when, as generally

happens in our climate, the latter has not gone so far as materially to affect the structure. In dyspeptic consumption, for example, the liver often resumes its healthy functions, while the disease is destroying the texture of the lungs; so that, on examination after death, the only traces of disease found in the liver are the consequences of affections which had existed in it, but been relieved by the supervening disease, and which are often so slight as to be overlooked by those not aware of the nature of the case.

THE liver being the organ in which the vital sympathies are strongest and most extensive, their effects are best illustrated by its affections and their consequences. But there is no organ to which, in a greater or less degree, similar sympathies do not belong. We can detect them in a striking degree in affections of the kidneys, bladder, uterus, &c., and in some degree in all parts of our frame; and consequently few diseases of long standing are confined to the parts in which they originate. Thus it is that, by continuance, disease is rendered doubly pernicious; obstinate by the power of habit, and by that of sympathy complicated; and many which, in their early stages, betray no formidable tendencies often, in their progress, involve all the powers of life.

Although in so many instances the most powerful sympathies exist between distant parts, it is between neighbouring parts that sympathy is universal. Hence it is that if it be our object to relieve an internal part by local abstraction of blood, or by exciting disease of the surface, these means must be employed in the neighbourhood; and they are the more effectual the nearer to the seat of the disease, and of little or no effect if confined to distant parts, unless a peculiar sympathy exist between them and the seat of the disease, or the artificial disease be of such continuance as to influence the general state of the habit. We see these observations strikingly illustrated in the phenomena of sympathy, above detailed.

We cannot trace the circumstances on which particular sympathies depend, but we may readily perceive some of those by which they are modified in different individuals. In all, the sympathies of the stomach in the sensitive, and those of the liver in the vital system, are the most powerful; but the part most liable to suffer secondarily is different in different cases. This evidently depends on certain parts in certain individuals being most inclined to disease. Those of consumptive parents, for example, are most liable to disease of the lungs; of gouty parents, of the joints. If an organ has been inflamed, it is for some time apt to be inflamed

again, when powerful sympathies are operating, &c. The cause which more or less affects the whole is felt most in the weakest part, and its effects on that part tend to withdraw its influence from others.

It would be easy, by multiplying instances, to shew how extensively the laws of sympathy influence the character and progress of diseases, modifying the most recent, and rendering the continued complicated and obscure; and consequently how essential to the beneficial treatment of both is the study of those laws, which, however modified in particular cases, are in their great outlines the same in all.

THE results which have been laid before the College afford an easy solution of the difficulties to which the experiments of M. le Gallois gave rise, as well as of those for the removal of which his experiments were undertaken. All these difficulties will be found to disappear under a due application of the first six of the following positions founded on the results in question.

1. The functions both of the heart and blood-vessels depend on a power which resides in themselves.

2. The functions of both are subjected to the influence of every part of the brain and spinal marrow.

3. The heart and vessels being subjected to the influence of every part of those organs, the effect on the heart and vessels of agents acting through them, is necessarily proportioned to the extent of the part of the brain and spinal marrow impressed by the agent*.

4. The functions of the stomach and lungs depend on a power which does not reside in themselves.

5. The functions of the stomach and lungs are not merely under the influence of every part of the brain and spinal marrow, but also depend on a power which resides in these organs, and not in any part alone, but the whole of them. Hence, although the removal of the brain and spinal marrow leaves the functions of the heart and vessels unimpaired, the removal of either, or even of any considerable part of either, destroys the functions of the stomach and lungs.

6. Although the spinal marrow is capable of all its functions independently of the brain, and the nerves of the muscles of respiration are supplied

* Hence it was that when M. le Gallois destroyed a certain part of the spinal marrow by small portions, little or no effect was produced on the heart; while the destruction of the whole part at once so impaired its power, that it could no longer support the circulation—a circumstance which appeared to him so unaccountable as almost, we have seen, to induce him to abandon the inquiry.

by the spinal marrow, respiration ceases on the destruction or removal of certain parts of the brain ; because this function partakes of the sensorial powers, which, in the more perfect animals, belong little, if at all, to the spinal marrow.

7. The brain and spinal marrow are the only active parts of the nervous system, all changes in this system originating in them.

8. The parts of the brain and spinal marrow associated with the vital, and those associated with the sensitive organs, are distinct sets of organs.

9. Hence it is that, a distinct sympathy belonging to the organs of each system, there are in the more perfect animals two centres of sympathy, one of which is in a great degree independent of the feelings; on which the obscurity that often attends the progress of disease chiefly depends.

Such are the conclusions at which it was necessary to arrive previous to entering on the consideration of the diseases, the nature and treatment of which are the objects of the present lectures ; and if it shall appear that they throw light on the nature of these diseases, and enable us essentially to improve their treatment, it will be admitted that these circumstances afford additional proofs of their accuracy. On this part of the subject I am now to enter.

CHAP. III.

THE APPLICATION OF THE FOREGOING RESULTS TO EXPLAIN
THE NATURE AND PROGRESS OF A CERTAIN CLASS OF
DISEASES.

FROM the nature of the observations I have had occasion to make in the physiological part of these lectures, it will probably appear to the gentlemen I have the honour to address, that the diseases above referred to arise from certain affections of the brain and spinal marrow; and that the obscurity in which they have been involved has proceeded from our having so imperfectly understood the functions of those organs.

As we have seen that on an agent supplied by the brain and spinal marrow the functions of assimilation, the most important of the animal economy, depend; it necessarily follows that the derangements to which their immediate organs are subject may be of two kinds: they may either be the effect of causes acting directly on the organs themselves, or on those organs which supply an agent essential to their functions; and this inference, from all that has been said of the assimilating

functions, we shall find amply confirmed by the course and consequences of their derangements.

As all discussions are the clearer the more definite they can be made, it will be the most distinct plan to consider, in the first place, the derangements of one particular organ, or set of organs; and when the principles are illustrated by the phenomena which attend and are consequent on them, their application to all other cases of the same kind will be easy; and I shall make choice of the digestive organs, both as those of the most powerful and extensive sympathies, and those the functions of which are most easily made the subject of observation.

In conformity with the results of the experiments above referred to, we find that all diseases, affecting any considerable portion either of the brain or spinal marrow, more or less derange the assimilating functions; and from the greater sensibility and more evident functions of the digestive organs, the effect is generally first, and to the greatest degree, perceived in them. Even a piece of bad news will instantaneously, either by its direct effect on the nerves of the stomach, or by producing a vitiated secretion of gastric juice, destroy the appetite; and mental causes, of a serious and permanent nature, sensibly derange the assimilating functions in every part of the

frame. We find similar effects from diseases or accidents affecting any considerable portion either of the brain or spinal marrow. These consequences are as certain as a vitiated secretion is the consequence of disease of a secreting organ. When such facts are considered, it seems surprising that, independently of all experimental research, it had not occurred to physicians, that in cases of chronic derangement of the assimilating functions, as in more acute affections of the brain and spinal marrow, the fault might sometimes be in those organs. But being prepossessed with the opinion that they were organs of the sensitive functions alone, it was only in the more striking cases that the truth was forced on their attention.

Another circumstance has greatly contributed to the same effect. It appears from what is said in the last Chapter, that the centres of sympathy in the vital and sensitive systems are not identical; the functions of these systems, although wholly in the sensitive, and chiefly in the vital system, depending on organs which belong to the brain and spinal marrow, not depending on the same organs. Hence we have seen it is, that there is a centre of sympathy independent of the feelings, many of the vital organs being parts of dull sensation; from which it appeared that the most important practical errors have originated.

FROM the nature of the investigations in which I have been engaged, and the importance of the digestive organs in the animal economy, my attention was at an early period directed to them; and particularly attracted by finding that cases of indigestion occasionally presented themselves, which, although on the whole similar to the usual forms of the disease, ran a very different course,—at first not differing in any remarkable degree from the more usual cases, but at length assuming a formidable shape, without any distant organ being implicated, which is almost always, in this country, the precursor of danger in ordinary cases of indigestion, and without any more formidable disease of the digestive organs themselves having made its appearance. Death seemed to arise from the failure of the digestive process alone; there was no prominent symptom that was not referrible to its organs, and the patient, emaciated to the last degree, appeared to die of inanition, in consequence of these organs, even where food could still be taken, being incapable of effecting the necessary changes on it.

It was in considering these cases, and comparing them with the effects I had witnessed from preventing a considerable part of the influence either of the brain or spinal from reaching the digestive organs, that I was led to suspect that the fault

might be in the central parts of the nervous system; and on examining the bodies of those who died in this way, I found the brain diseased, and particularly in the parts towards its base and the medulla oblongata, from which the vital nerves proceed.

These cases had often, in their more early stages, been treated as cases of simple indigestion, and the friends assured, that although, being more obstinate than usual, they would be tedious, there was no danger to be apprehended from them; and I have seen some of the most eminent of our profession surprised when I expressed an opposite opinion, in which, from the course of the disease, they themselves were at length obliged to join me.

I need not say that it is of essential consequence to be able to distinguish these cases from those of ordinary indigestion at an early period—the only period at which there is any hope of arresting their fatal course.

I shall, in the first place, point out the best diagnosis at which I have been able to arrive; for it will readily be perceived, from what has been said by those acquainted with the principles of our profession, that there must be great difficulty in such a diagnosis. I shall then give an account of the appearances on dissection, referring to those in other cases of a similar nature, but of

more general derangement, for the purpose of illustration; and, lastly, point out the treatment which has appeared to me most successful, and the principles on which it is founded.

IN the first place, of the diagnosis of the cases before us. It is evident, from all that has been said, that the organs of assimilation must not only be exposed to disease from causes operating on these organs themselves, but on those organs also of the brain and spinal marrow, on the agent supplied by which their functions immediately depend; but as in both instances the disease consists of symptoms indicating derangement of the organs in question,—the digestive organs, for example,—and a certain train of nervous symptoms, in the former case arising from their derangement, the intelligent physician at once perceives the difficulty of distinguishing them, the patient either never complaining at all of the head, or only of such affections of it as we are constantly meeting with, as consequences of common indigestion. Yet it is evident that these cases must require very different plans of treatment, because, in the one, if we restore the digestive organs, the nervous symptoms, the mere consequence of their derangement, necessarily disappear; but in the other there are no means of restoring the digestive organs themselves, unless

we can correct the disease of the brain or spinal marrow, or perhaps both, on which their derangement depends; for it appears, from the experiments above referred to,—and we shall find the inferences from them amply confirmed by the phenomena of disease, as well as by the treatment which relieves them,—that the affection of either or both may cause the symptoms we observe.

The difficulty is greatest, however, when the cause is confined to the brain, because the affections of the spinal marrow are generally attended with such local symptoms as necessarily call the attention to the seat of the disease. It is, therefore, to the diagnosis of the former cases that I shall, in the first place, direct the attention; and having considered the more difficult part of the subject, I shall treat of the cases in which the cause of the disease exists in the spinal marrow, which we shall find strikingly illustrate what I shall have occasion to say on the first part of the subject.

The nature of the cases in which the original cause of the disease is confined to the brain, precludes the possibility of deriving the diagnosis from any particular train of symptoms: it must be collected from a review of the whole circumstances of the case; from the nature of the remote causes, both predisposing and occasional, the general course of the symptoms, and the effects of the

means employed. I shall enumerate the circumstances which chiefly demand attention, and endeavour more particularly to point out the principles on which the diagnosis must be founded.

When the patient is not of a variable and hysterical habit, — when the occasional causes have been of a serious and permanent nature, and the nervous symptoms have not shown themselves for some time after the first application of such causes, — when there is not such derangement in the digestive or other organs chiefly affected as accounts for the severity of the nervous symptoms, — when the affections, both of mind and body, are less variable than is usual in what are called nervous complaints, and particularly apt to be referred to the same parts of the body, — when there is constantly a more or less general tendency to derangement in the secreting system, — when the heart is more irritable and the lungs less free, the nervous symptoms not yielding so readily as usual, the depression of spirits more uniform, and the pulse tighter than we should expect to find it from the other symptoms, — when either the recurrence of feverishness or a sense of chilliness and debility is more frequent than is usual in nervous complaints, — when the constitution seems more affected than usual by the continuance of the disease, the strength on the whole decaying, —

and particularly when the countenance assumes a sallow colour and an habitually irritable and anxious expression; when the usual means are not attended with their usual effects, our stomachic medicines being in a great degree powerless, and alteratives producing but a transitory, if any, improvement in the abdominal secretions; when these, or several of these circumstances, are well marked in what are called nervous complaints, I have been assured, by repeated observation, that they are not to be safely disregarded.

The diagnosis is much assisted by observing the nature of the nervous symptoms in the two cases. There is in our frame, we have seen, what may in a great degree be regarded as two distinct nervous systems—the sensorial and vital. The sensorial functions may be disordered for a great length of time without endangering life; the vital functions, with the exception of respiration, having no dependence on them, and respiration not being endangered till their derangement is extreme; but disorder of the vital system cannot go far without danger; and from our mistaken views of the functions of the nervous system it often happens, both where the disease has originated in its vital parts and where it has spread from the sensitive to the vital parts, that danger is frequently unsuspected till, in consequence of the failure of nervous

influence, disease is established in some vital organ; for by the vital parts of the nervous system (that is, the ganglionic nerves and those parts of the brain and spinal marrow associated with them) the assimilating functions, we have seen, on which the structure, as well as the functions, of all our organs depend, are maintained. It appears from experiments, an account of which is given in the Philosophical Transactions for 1827, that organic disease of the most formidable nature may be established in the lungs in a few hours by causes directly influencing their nerves alone.

Thus it is that, in all cases of nervous debility, it is necessary to examine with care the nature of the functions chiefly affected. If these be the mental functions, and we find that there is little or no affection of vital organs but such as is evidently the effect of their derangement, whatever be the sufferings of the patient (and these, from the chief derangement being in the organs of the sensitive system, are often greater than where there is more risk), we may be assured that life is little, if at all, threatened. If, on the contrary, the organs of life chiefly suffer, and that independently of mental affections (especially if the course of the disease be more uniform than that of nervous affections usually is), however

purely of a nervous nature the symptoms may be, and however little formidable either in appearance to others or to the feelings of the patient, danger is to be apprehended, and, if the pulse be decidedly tight, is not far distant. I have, in my *Treatise on the Preservation of Health, and particularly the Prevention of Organic Diseases*, entered at length into the nature, diagnosis, and treatment of such cases; the fatal termination of which I have often witnessed. Having been confounded with the less important nervous affections, their fatal tendency has frequently been so much overlooked, that when it at length shewed itself, either by a decided affection of some vital organ or unequivocal symptoms of fatal inanition, it has sometimes found the physician, as well as the patient, unprepared.

By a due attention to the whole of the foregoing circumstances, we may generally distinguish the disease before it is far advanced; and I have reason to believe, from many cases which have come under my care, often succeed in arresting its progress by the means I am about to point out. In the meantime, the nature of the disease will be farther illustrated by turning the attention to the appearances on dissection after death.

THIS part of the subject will be best illustrated by giving the appearances on dissection in two

cases, which, in their early stages, had been treated as common nervous and bilious complaints; in which I had stated to the other medical attendants, that, notwithstanding there were no symptoms referred to the head, we should find the brain organically diseased; and, by contrasting the appearances found in these cases with those presented when the effects of the disease of the brain were general throughout the system, no part having been very prominently influenced in consequence of the powers of the different organs having been so well balanced, that no one became so much affected, as by its affection (according to a general law of our frame) to withdraw the influence of the offending cause from other parts; and by its loss of function cut short the disease before the affection of the brain had time to run its course, and thus itself prove fatal.

The first case I shall mention is that of Mr. A., who was taken ill while pursuing his studies at Oxford. His case was regarded by the physicians of that city as one of common indigestion. His health not improving, he was brought to London, and placed under the care of two physicians well known to the profession here. After he had been in London a few weeks, I was called in, in consultation, and, guided by the circumstances which have been laid before the College, expressed

my fears of a fatal termination, and stated my opinion, in consultation, that although the stomach and duodenum were the organs most prominently affected, I believed we should find the origin of the disease in the brain; and on dissection after death, which happened in a fortnight or three weeks after I saw the patient, and appeared to be the consequence of inanition, the following appearances presented themselves.

The body was examined by Mr. Walker, of St. George's Hospital. In this and the following dissection the examination was made about twenty-four hours after death, and the body was free from fœtor. The following is his report:—

“On opening the cavity of the cranium, the membranes and the brain were found tolerably healthy, perhaps rather softer than usual, particularly as regards the cerebellum and base of the brain, which, together with the medulla oblongata and cerebral nerves, appeared reduced to a pulpy state; so much so that they would not bear the slightest handling.

“The viscera in the cavity of the chest presented no unusual appearances; the stomach larger than usual, from distension, and presented that appearance which is called the ‘hour-glass contraction’ of that viscus in a more marked manner than is usually met with; the pylorus much more vascular than usual, and the duodenum much more

dilated, vascular, and attenuated, than is natural. The whole of the small intestines were more distended with flatus, and much more gorged with blood, than in the healthy state, and of a very dark colour. The liver, spleen, kidneys, and pancreas, were healthy."

The following case was that of Miss C., which run the same course as the preceding, but was of longer duration, having been protracted for more than two years; and here also the patient appeared to die of inanition. Some surprise was expressed that I should wish the head to be examined, as none of the symptoms had been referred to it. The examination was made by Mr. Earle, and the appearances in the brain corresponded, in a remarkable degree, with those just detailed. The symptoms in these cases, as well as the termination of the disease, had been similar, and we find the chief organic affection of the brain of the same kind, and seated in the same parts. The following is Mr. Earle's account of the appearances:—

"In the head, slight effusion beneath the arachnoid membrane; substance of the brain very soft, particularly the crura cerebri and upper part of the pons varolii, which was quite pulpy. Blood-vessels in the substance of the brain large, and loaded with blood. In the chest, right lung greatly compressed by the narrowness of the

inferior margin of the ribs, from old adhesions between the pleura costalis and pulmonalis. Substance of the lungs firm and hepatised. Left lung more healthy than the right, but slightly hepatised at its upper part." This state of the lungs it may be remarked is peculiarly characteristic of a failure of nervous influence, as appears from those experiments in which the influence of the brain was prevented from reaching the lungs. The patient had been subject to cough and oppressed breathing; pulmonary symptoms, however, had never been a prominent part of the disease. "The heart," Mr. Earle proceeds, "was remarkably small. In the pericardium, about two ounces of water. In the abdomen, stomach and duodenum much displaced by the compression of the chest by the stays. Towards the pylorus, the stomach much thickened and indurated, the pylorus hard and contracted. The duodenum large and flaccid; the mucous surface very vascular, villous, and soft, readily breaking down on the slightest touch, and apparently approaching to a state of ulceration. Liver almost of a black colour, and gorged with venous blood: substance of the liver hardened. Spleen and kidneys small, but not unhealthy. Intestines generally of a dark colour, from venous congestion."

The circumstance of more general organic

disease being found in this than in the preceding case, I shall presently have occasion to explain.

Cases like the foregoing, in which the patient wastes without an apparent cause capable of accounting for the degree of wasting (for he sometimes takes a considerable portion of food), have been often ascribed to mesenteric obstruction, which dissection has disproved, but without throwing light on their real nature, because the necessity of examining the head has not occurred, none of the leading symptoms having been referred to it. And had it been examined, the appearances observed could not have been connected with the course of the disease, while the brain was regarded as the organ of the sensitive functions alone.

Such cases are not the consequence of the chyle being prevented from entering the blood, but of its not being formed, the processes by which it is formed having been suspended by the failure of nervous influence; for we have seen that the influence even of any considerable part either of the brain or spinal marrow being withdrawn, is sufficient to derange the process of digestion. Did the limits of these lectures permit, it would not be difficult to show that we have reason to believe, that slighter degrees of the same cause influence the course of many chronic diseases, which are

benefited by the means which give temporary vigour to the nervous system.

Such is the nature and course of that form of disease of the brain which, from peculiarity of constitution or other causes, chiefly shows itself by affections of the digestive organs and nervous symptoms, which greatly resemble those produced by original affections of these organs. These cases, however, constitute but one form of a numerous class of diseases of the same nature and origin.

MANY have attempted to arrange the diseases of the brain according to the different parts of this organ affected. How unsuccessful these attempts have in general been, will at once appear by recurring to them. Their want of success seems chiefly to arise from the great variety of functions which belong to the brain, the intimate sympathy which exists among many of its parts, and its being inclosed in an unyielding bony case, in consequence of which a disease or injury of one part may affect others, or all others, in a way that could not happen if its parietes were of a more yielding nature. But none of these causes present any obstacle to a classification of the diseases of this organ, founded on the nature and progress of their symptoms.

They may be divided into two great classes—those which betray themselves by such symptoms as are evidently referrible to the brain itself, and those which are only indicated by affections of distant parts, in consequence of derangement of the powers on which both their functions and structure depend.

The latter of these classes is that to which the attention is here directed. They may be divided into those more or less affecting the system generally, and those chiefly confined to particular organs, often assuming, as in the cases just laid before the College, so much the appearance of original affections of those organs, as to be with difficulty distinguished from them.

I may mention, as another example, one of the most frequent of these cases, a species of pulmonary consumption, which succeeds such a train of nervous symptoms as that above described, and arises even in those not peculiarly disposed to pulmonary affections, in consequence of the lungs being, of all our organs, most disposed to change of structure, and consequently where there is no particular weakness to direct the disease elsewhere, feeling most the cause which affects the whole. Of such cases, it is merely said that the long-continued state of bad health had terminated in

pulmonary consumption. As the cause of the bad health was not understood, the nature of its consequence could not of course be suspected.

In cases of long-continued wasting and nervous debility, but without any indication of a determination to the lungs, the patient, without an evident cause, begins to cough; a greater degree of dyspnœa on exercise than depends on the state of general debility, is observed, and all the symptoms of pulmonary disease rapidly supervene. It is needless to say that such an affection of the lungs, under such circumstances, is incurable. It proves fatal for the same reason that an animal dies from disease of the lungs induced by the removal of the lower half of the spinal marrow, or by the passage of the influence of the brain along the eighth pair of nerves being interrupted; and the friends of the patient wonder that a person, not of a consumptive family, and who had never in all his illness shown a tendency of this kind, should be cut off by a rapid consumption, and that supervening without any evident cause.

THERE is a case belonging to the same class (although no cases can differ more in their symptoms than it does from the preceding cases), to which I have already referred; the consideration of which is necessary to a clear understanding

of the nature of that class of diseases. When the powers of the different organs are so well balanced that no part becomes the seat of a very prominent affection, and thus, as it were, draws to itself the effects of the failure of nervous influence, acting on the principle of an issue, but much more powerfully with respect to other parts, and at length, by proving fatal, cutting short the disease, before that of the brain has had time to run its course ;— I say, where no part thus becomes the most prominent seat of the disease, the case necessarily assumes a very different form ; and if it be allowed to proceed, terminates by loss of power in the brain itself.

We may infer from what has been said, that we should find on examination after death in such cases, a general tendency to disease of the vital organs, the disease having run on, till the want of nervous influence was felt throughout the system ; and more or less general derangement of structure had consequently taken place, but none to such a degree as itself to prove fatal. It will best illustrate these observations to lay before the College an account of a case of this kind, with the appearances on dissection after death.

Mrs. W., a lady between forty and fifty, had from time to time been under my care for some years. She had, more or less, laboured under

indigestion, with occasional symptoms of derangement, sometimes referred to one part, sometimes to another, which were from time to time relieved; and on the whole, although debilitated and what is called nervous, she was for the most part capable of the ordinary duties of life. By degrees the symptoms referred to the head became a more prominent part of the disease. She had been absent from home for some months, during which the affection of the head had greatly increased, and returned in such a state that she soon became apoplectic, and only survived her return about a fortnight.

The body was examined by Mr. Jefferson, of Islington, and the following is his account of the appearances observed:—

“The skull was remarkably thin; in most places not thicker than a shilling. The coverings of the brain very turgid with blood (you would rarely see them more so in a complete case of apoplexy), with a deposition of serum and coagulable lymph between the arachnoid and pia mater. The substance of the brain itself was very firm, and much more vascular than natural; there was rather more water in the ventricles than usual, but no great quantity.

“The lungs were very unhealthy on both sides, being studded with small tubercles, many in a state

of suppuration, and others approaching to it. In the heart there was nothing remarkable; perhaps rather paler than natural.

“The liver remarkably firm in texture, and rather paler than natural, but no very morbid appearance in it; the gall-bladder rather larger than natural, and distended with thick viscid bile, and containing fourteen gall-stones, bigger considerably than so many large peas. There did not appear to be any of them in any of the ducts. The stomach was rather smaller than natural, the coats of which were much thickened; the internal, or villous, so firm that it could not be easily torn. The pyloric extremity shewed more vascularity, as if from the effect of recent inflammatory action; and it adhered for a considerable extent to the diaphragm and left lobe of the liver. There was nothing particular throughout the remainder of the alimentary canal. The spleen larger than natural: the bladder much distended, but no disease; the uterus remarkably firm, so as to give a cartilaginous feel upon cutting into it; the os uteri very vascular, with a small polypous excrescence from the neck.”

We here see a striking instance of the effects of long-continued defective nervous influence. The lungs were very unhealthy, and studded with tubercles, although the disease had never appeared in them in an active state. The secreting power

of the liver had been greatly deranged, and this organ was found diseased in structure. The same was true of the stomach, spleen, and uterus. The brain itself, also, was organically diseased, and the patient, none of the secondary affections proving sufficient to destroy life, died in consequence of such morbid distension of its vessels as caused a fatal compression.

The difference in the course of the disease in this and the preceding cases may have been influenced by the affection of the brain being of a different nature.

We see the same tendency to general organic disease in the second of the above-mentioned cases, which, like Mrs. W.'s, had been of long standing, but in which the disease of the brain was cut short by a total failure of power in the digestive organs. In the first case the organic disease was chiefly confined to the duodenum, its state being such as to prove fatal before the failure of nervous influence had had time to produce much effect in other organs less disposed to disease; this case having only lasted a few months, and the tendency to disease in the digestive organs, arising from peculiarity of constitution or other causes, tending to protect other parts.

THERE is still another state of the system which

may be regarded as belonging, at least allied, to the same class of diseases, and which has an extensive influence in determining the course of various local affections. When a debilitated state of any of the vital organs, the digestive organs or the lungs, for example, takes place from causes directly influencing them, in constitutions the nervous powers of which are less vigorous than usual, and frequently recurs, the debility of the organ originally affected spreads to that system, and its debility thus induced, influences the original seat of the disease, rendering its morbid state both more obstinate and apt to recur. Thus the same disease proves more or less obstinate in different habits; for I can say, from pretty extensive experience, that such is the cause of obstinacy in many cases of long standing, which, if they are neither relieved nor terminate in a fatal disease of the part originally affected, often at length produce a fatal debility of the brain itself, the patient in the last stage becoming paralytic or comatose. Such, for example, is not an unusual termination of long-continued indigestion in habits whose nervous systems have been debilitated by intemperance, or the effects of sultry climates; and we have reason to believe that in many, in whom pulmonary complaints have frequently supervened and proved severe, the fatal termination has at length been in a great degree

the consequence of debility induced on the nervous system, the tendency to organic disease of the lungs, keeping pace with the debility induced on it.

On the same principles debility of the nervous system, either original or induced by the existing disease, is often the cause of unusual obstinacy in various affections. Such is the cause of obstinacy in those cases of indigestion which are characterised by constant relaxation of the skin, or a constant feeling of chill, which I have considered at length in my treatise on this disease, and that on minute doses of mercury; and which will yield to no means but such as tend to invigorate the nervous system, in combination with the treatment of the original disease. We may trace the same cause operating in many similar cases, rendering the disease more or less obstinate, according to the degree in which the nervous system partakes of the debility, and more or less dangerous both according to that, and the nature of the original affection.

The intelligent physician will readily perceive how extensively the principle I am here endeavouring to illustrate must influence the nature of disease, particularly of chronic disease. In proportion as the central parts of the nervous system become affected, it is evident that the nature of

the case approaches to that in which the affection of those parts is the original derangement.

The prognosis, as well as the nature of the symptoms, in such cases is in a great degree determined by the following circumstance, which depends on peculiarity of constitution. All organs, we have seen, partake both of the sensitive and vital nerves, which have distinct centres of sympathy. Causes of irritation acting on any organ, therefore, necessarily influence the central—that is, the only active parts of both systems; but in certain constitutions they are more felt by the sensitive, in others by the vital nerves; so that the same affection which in one habit produces hysteria, and other affections of the sensitive system, in another may produce a more dangerous state of debility, characterised by the symptoms above referred to, indicating that the vital parts of the brain and spinal marrow are the chief seat of suffering.

These different tendencies of the symptoms are more remarkable when the original disease is seated in the digestive organs than in most other cases; these organs, on the one hand, possessing the most powerful sympathies, and, on the other, being, at least in this country, little subject to change of structure. Where the sympathies of the organ originally affected are less powerful, and the ten-

dency to change of structure greater, the disease is cut short without the different tendencies of the secondary symptoms becoming equally apparent. Slighter degrees of these effects modify, without changing, the nature of the case; causing, however, a marked difference in the symptoms, as well as prognosis, according as affections of the sensitive or vital parts of the nervous system prevail.

When all that has been said, founded on the facts which were laid before the College in the first part of these lectures, and the phenomena of disease, is carefully compared; the extensive influence of the nervous system in regulating these phenomena cannot fail to be apparent; and as soon as the facts just referred to were ascertained, might have been foretold.

I HAVE already had occasion to observe, that when the disease of the central parts of the nervous system is confined to the spinal marrow, we have, in most cases, the advantage of knowing what parts are affected, and we see more clearly how they operate in producing the symptoms of the disease. While the bones of the spine alone are affected, the curvature or other affection of them not being sufficient to impede the functions of the spinal marrow, the disease is a mere local affection; but in proportion as they begin to have this effect, we

find the consequences precisely such as we are led to expect by the experiments, the results of which have been stated. Indications of failure in the assimilating functions begin to show themselves; and when any considerable part of the spinal marrow has lost its powers, both the thoracic and abdominal functions are, in proportion to the extent of the injured part, deranged.

We shall find this view of the subject strikingly illustrated by the effects of the plan of treatment suggested by it; for as soon as the assimilating functions are seriously impeded, the case is no longer a simple one, but of that complicated nature which is so unfavourable to recovery, where the different parts of the disease necessarily tend to aggravate each other. Here, as the failure of function in the spinal marrow impedes the assimilating functions throughout the system, their failure, both by influencing the state of the diseased parts in the same way in which it influences all others, and by the general debility it causes, aggravates the original disease.

CHAP. IV.

THE PRINCIPLES ON WHICH THE TREATMENT OF THE
FOREGOING DISEASES DEPENDS.

HAVING laid before the College many of the results of the long-protracted investigations in which I have been engaged, and their application to explain the nature of an extensive class of diseases, which, I think, it will be admitted, from what has been said, has been involved in much obscurity; I am now to lay before it the plans of treatment suggested by these results, which have appeared to me the most successful, and which, it is now acknowledged by many members of our profession, often succeed, where the usual means have proved unavailing.

I shall offer, as an introduction to this part of the subject, some observations on a position which I have considered at length in my *Inquiry into the Laws of the Vital Functions*, and on which in a great measure are founded the plans of treatment I am about to propose.

All agents capable of affecting the moving powers of living animals may act either as stimulant or sedative,—that is, either as an invigorating or en-

feebling power,—according to the degree in which they are applied; the stimulant arising from the less, the sedative effect from the greater application of them; and this position applies equally to the nervous and muscular systems.

I shall here offer only a very cursory illustration of it, referring to the treatise just mentioned for its fuller consideration. It is equally true of the agents which directly affect the body, and those which make their impression through the mind. Electricity, for example, we find the most powerful stimulant both of the nervous and muscular fibre; but its excessive application impairs, and if still increased, destroys the power of both, without previous excitement. Tobacco is a powerful sedative, but in minute quantity it acts as a stimulant. Joy, the most exciting of the passions, has, in excess, immediately destroyed all the powers of life; and grief and fear, the most depressing, have, in their slighter degrees, roused to exertions, of which the individual would have been incapable in calmer moments. The same is true of every other agent: the nervous influence itself forms no exception to this law. We denominate an agent by the term stimulant or sedative, according as it is better fitted to produce the one or other effect; but in every instance we find each in a greater or less degree capable of both.

From all that we know of the assimilating functions, it follows that they depend on the moving powers—those of the nervous and muscular systems. The muscular system conveys the living fluids—that is, fluids endowed with properties found only in the living animal; the nervous system supplies the agent, on the co-operation of which with these fluids all those functions depend. Now disease always more or less consists, and in some instances wholly consists, in a failure of one or both of these powers; for states of morbidly increased excitement, if they attend at all, necessarily form but a part of disease; and where the cause is in the fluids, it operates by deranging, and can only be permanently corrected by restoring, the moving powers. It is, therefore, more or less, in all diseases, the object of the physician, and in some his sole object, to restore them. By the stimulant, that is, the invigorating effect, of his means, this is accomplished. By their sedative, that is, their enfeebling effect, the evil is necessarily increased. I speak exclusively of the moving powers; for the advantage, in many instances, of impairing the sensitive powers, is familiar to every physician.

It appears, from what is said above, that when the digestive, or any other vital organs, are deranged, the case may be of two kinds, which,

although so nearly resembling each other in their symptoms as to be with difficulty distinguished, are yet of a wholly different nature, and require different plans of treatment: in the one class, the original disease being in the organs most prominently affected, and all the symptoms more or less directly depending on their affections, and consequently ceasing when their vigour is restored; in the other, the original cause not being in these organs themselves, but in others, from which they derive an essential part of their power. On the treatment of the former of these classes, I shall not here enter: I have very carefully considered it as far as relates to the digestive organs, in a treatise which has been long enough before the public to be now in the seventh edition. It is to the treatment of the latter class that I wish to direct the attention of the College.

It will at once be apparent that, however similar the symptoms, the treatment, like the prognosis of the first of these classes, must in many respects be inapplicable to the other. It is in vain to endeavour to restore the digestive organs, for example, by means directed to them alone, when the cause of failure is in a distant part. The only means which can succeed must include those which give vigour to the central parts of the nervous system, in which the immediate cause exists.

As soon as it is ascertained, from the diagnosis above pointed out, that the disease has originated in the brain, however prominent a part of it the affection of any particular organ may be, we may be assured that it is a disease more or less affecting the whole system, that the danger is great, and that if we cannot check its progress, the termination must be fatal.

Disease of function, particularly when confirmed by habit, always tends to disease of structure, this tendency being greater or less in different organs. I have already had occasion to observe that it is greatest in the lungs, and we may perhaps say in the stomach and bowels least. When derangement of function is seated in them alone, we often see it continue for the greater part of a long life, without change of structure taking place; and here we see another mark of distinction between the original disease of these organs and that symptomatic of the state of the brain. In all the dissections above detailed, we find the stomach or duodenum organically diseased; and I believe, in the cases I am considering, more or less derangement of structure will always be found in the organs secondarily affected, as well as in the brain itself, the one being the necessary consequence of the other; and where the disease has been of long standing, as exemplified in two of the cases above detailed, it

will be found that the change of structure is not confined to the parts most prominently affected; and that such would necessarily be the case, might easily have been foreseen from the statements which have been laid before the College.

It was remarked, and, indeed, follows, from what has been said, that although I have, for the sake of perspicuity, particularly considered those cases in which the digestive organs are the chief parts secondarily implicated, similar observations apply to all cases in which the functions of the brain have been originally deranged, whatever may be the part most prominently affected — a circumstance which is determined by constitution, and various accidental causes, debilitating, and consequently producing a greater tendency to disease in particular parts. It is to be observed, however, that from the importance and extensive sympathies of the digestive organs, whatever be the part that suffers most, their affections almost always form a more or less prominent part of the disease.

In considering the treatment, it will be the most distinct, as well as concise, plan, to keep in view such chronic affections of the brain as tend to derangement of structure in this organ, without reference to what other organ may be affected; because the treatment, rendered necessary by the affection of the brain being determined, it is easy

to combine with it that adapted to the affection of any other organ arising from it.

In addressing such an audience, it would be impertinent to enter into the details of practice, nor do the limits of these lectures admit of it; I shall therefore confine myself to the general principles on which the proper treatment appears to me to depend.

As the brain is capable of influencing, and being influenced, by every other part, a general failure of the various functions, although existing in a slight degree in each part, and consequently producing little derangement in any one, may indicate considerable derangement in the brain, if in it exists the cause of the whole; and to this circumstance the obstinacy and insidious nature of certain affections, tending to derange its structure, which at first view appear of a trivial nature, may, in a great measure, be ascribed. They often betray themselves by no very marked derangement of any of the functions; but the derangement of each, by the laws of sympathy, tends to support and aggravate that of the others.

As the derangement, at first, is formidable rather from its extent than from the degree in which any one part suffers, there is little room for powerful measures; and as it is habitual, little chance of advantage from any that cannot be employed for

a considerable length of time. The diseased state, being an habitual one, requires an habitual remedy.

In the cure of all diseases, the object is to restore the healthy functions of the parts concerned ; and it is only in proportion as this is effected, that the tendency to disease of structure is corrected. Now the functions that are more or less disturbed, in the case before us, are the whole functions of the system : on the one hand, those of life, the assimilating and excreting functions ; on the other, the no less varied functions by which we are connected with the world around us ; for in whatever part of the brain the disease be seated, the sympathy of its different parts is such, that all more or less partake of it. Thus the case often at first assumes the appearance of a general, but by no means severe disease, without any symptom to direct the attention to the seat of the original derangement.

If the appetite be not impaired, which is frequently the case, the digestion and assimilation of the food, we have seen, and the due separation of those parts of the circulating fluids which have become useless and consequently noxious, are never perfect ; the countenance at length becomes languid and sallow ; the patient gradually, however slowly, loses his flesh, or becomes full and bloated, according as the organs of supply or those of waste are most debilitated ; the voluntary powers are

impaired, and the mind becomes anxious, unsteady, often fretful, and always incapable of its usual exertions.

The objects are to soften the skin, which is generally dry, sometimes parched; or brace it, if morbidly relaxed, equally a symptom of impaired vigour; to restore the healthy functions of the thoracic and abdominal viscera (for an attentive observer will always perceive more or less derangement in them); and to soothe the feelings, divert the attention, and, within certain limits, excite the mental energies.

Such affections of the brain, it appears, from what I have already had occasion to say, have been confounded with what are called nervous complaints, which chiefly affect the functions of the sensitive system, and depend, for the most part, on the derangement of other organs, the brain being only secondarily affected, and in a more variable manner, and on both these accounts less liable to change of structure; the risk of which is always better measured by the kind and uniformity, than the severity of the symptoms. Every remission gained is a step towards a cure; for it is the permanency of the derangement which leads to serious evil.

In consequence of the cases before us having been confounded with other affections, no appro-

priate treatment has been attempted in them; and thus it is that they so generally have a fatal termination; for I could adduce many cases of this kind, in which the means I am about to point out have proved successful, where there was every reason to believe that organic disease of the brain must otherwise have ensued, and where all other means employed for years had failed.

The first object, in the treatment of all diseases, is to remove the occasional causes, and prevent their re-application. It is here necessary, therefore, as far as possible, to remove all causes tending to disturb the functions either of mind or body; for here so varied and extensive are the causes.

It is necessary, as far as we can, to divert the patient's mind from his sufferings by change of scene and such occupations as amuse without fatiguing; and if we succeed in restoring the healthy state of the mental functions, a great step is made towards the restoration of all the others; for however varied the symptoms, they all depend on the different parts of the same organ, among all of which a powerful sympathy prevails.

The means chiefly directed to the mind, however, if trusted to alone, will generally fail, except in the most favourable cases, and where they can be employed to the greatest extent; and we should

have little hope of frequent success, if we were not possessed of others both more powerful, and more under command.

It appears from all that has been said, that the various digestive and other assimilating functions, which are always in such cases the most important, because they are the most constant of the nervous functions, and therefore best indicate, and must influence, the state of the brain; I say, it appears from the facts which have been adduced, that these functions are the immediate results of changes effected in the extreme parts of the nervous and sanguiferous systems. It is in the capillary vessels and extremities of the nerves that all the great changes of our frame take place. It is there the vessels so distribute the blood, as to expose it to the operation of the nervous power; and consequently, it is there that this power effects all the chemical changes on which life depends; for these changes no less deserve that name, that the chemistry of the living animal is modified by its vital powers.

In attempting to relieve the disease before us by medicines, then, we are not to look for such as powerfully affect any particular part, but gently influence the whole. It is not with a violent but a general state of disease that we have to contend, and which, from the sympathy of the various parts,

is obstinate in proportion as it is general; for, after it assumes its more severe forms, it will almost always be found incurable.

We possess two medicines, in large doses capable of the most powerful effects on individual parts, and in small doses of the most gentle and salutary effects on the whole system—mercury and antimony. By these medicines, properly administered, we can, without any sensible effect, excite the assimilating organs, and often in the case before us, if it be not rendered obstinate by its depending on a local cause, over which we have no power, gradually restore the various functions of the brain and spinal marrow, when all other means which our art affords have failed.

Many circumstances must be attended to in their employment, and other medicines occasionally combined with them; for although no other can be substituted for them, there are many which occasionally aid their effects, and some necessary to obviate the inconveniences which occasionally attend their employment.

I have, in my Treatise on the Effects of Minute Doses of Mercury, endeavoured, with the aid of the experiments above referred to, to trace the steps by which organic disease is established, when, as is most frequently the case, it is merely the consequence of long-continued derangement of function

It appears from what is there said, as indeed might be inferred from the facts laid before the College in the preceding part of these lectures, that under such circumstances, derangement of structure is always preceded by a failure of nervous power and a debilitated state of the capillary vessels in the part; the tendency to change of structure being proportioned to the degree in which the capillary vessels are debilitated—that is, to the degree in which the inflammatory diathesis prevails; because it is only in proportion as the vessels are affected, that there is any tendency to disease in the part itself, the failure of nervous influence in it depending, not on the state of the part, but on that of the central, the only active, parts of the nervous system. Thus it is that the tendency to derangement of structure from derangement of function is generally correctly measured, other circumstances being the same, by the degree in which the pulse is tightened.

THE first observation I shall make on the use of the medicines just mentioned—the most powerful we possess for relaxing the surfaces, and thus lessening the tightness of pulse—and which may be regarded as the most important, is, that it is from small and undebilitating doses alone that permanent advantage is to be expected. This is a necessary inference from what has just been said of the nature

of the vital functions, compared with the effects of all the means which influence them. The stimulant effect, we have seen, the effect of the less, the sedative of the greater application of those means ; and if the tendency to organic disease be the effect of the debilitated functions of the extreme vessels and nerves, it is evident that whatever excites their powers must relieve, and whatever farther depresses them, add to the evil. However salutary in many instances the means of subduing the sensitive powers, those of reducing the moving powers below the standard of health must always, except under very peculiar circumstances, be pernicious. Precisely as they have this effect they increase the tendency it is our object to correct. Hence the mischief done by excessive doses of mercurial and other powerful medicines.

But great as is the advantage of keeping within the limit of the stimulant effect of the medicine, it is not the only advantage of the minute dose ; there is another, which is not inferior to it. As large doses of active medicines cannot be frequently repeated without rendering the remedy as pernicious as the disease, and sometimes more so, the effect of each dose, particularly in cases confirmed by habit, is generally lost before the next can be given without too great a call on the strength, so that we have only temporary advantage to compensate for its debilitating effects ; whereas,

with respect to the minute doses, trifling as the effect of each may be, the next coming before it is wholly lost, the beneficial effect accumulates. The diseased part is gradually, however slowly, brought to resume its healthy functions; and I have had the pleasure of seeing in others the same surprise which I experienced myself on first observing from what states restoration may occasionally take place, in consequence of the patient and steady employment of such means—states in which I may say, not from my own only, but general experience, all our other means are unavailing.

ALTHOUGH the effects of mercury and antimony in several respects resemble each other, in others they are very different; and there are no cases in which this difference is more striking than in those before us.

It appears from what has been said, that when we find that, in nervous affections particularly influencing the vital organs, the symptoms are little variable, and particularly when they are little influenced by avoiding causes of irritation, and by the medicines termed nervous, we may suspect that the state of the brain itself, in some of the ways which have been pointed out, has a share in the cause of the disease, and that there is more or less tendency to disease of structure in that organ.

Of all the medicines we possess, mercury and antimony are the most powerful in exciting the extreme vessels, on the debility of which we have seen the tendency of functional derangement to terminate in disease of structure depends. One of the most important differences in the effects of these medicines is, that those of antimony are chiefly confined to particular organs, while the effects of mercury are more general ; but this, as I have endeavoured to point out in the treatise last referred to, is not the only, nor, indeed, the chief cause of the power of mercury in relieving cases of long standing.

I have had occasion to point out the great influence of the liver in determining the course of disease, which, although most remarkable in sultry climates, the careful observer may readily perceive in all climates. Now the influence of mercury in controlling the affections of this organ being such, that no other deserves to be mentioned in competition with it, experience has taught us almost wholly to rely on it in sultry climates ; and, even in such climates as our own, brought it into more general employment than any other medicine.

It is remarkable, that notwithstanding the long continued and general employment of this medicine, we have not been aware of the effects of

minute and frequently repeated doses of it—that is, of such doses as are decidedly within the stimulant range of the medicine—although it is now acknowledged by those who have made the trial, that on them depend many of its most valuable effects, and perhaps the only part of its effects which can be obtained without any risk of injury.

In my Treatise *On the Influence of Minute Doses of Mercury*, together with the preceding chapter of this treatise, I have pointed out at length the principles on which their efficacy appears to depend, and consequently those on which their employment should be regulated. For many circumstances relating to their exhibition, and the means which either aid the effects of mercury thus employed, or tend to obviate the inconveniences which occasionally attend them, the limits of the present lectures oblige me to refer to that treatise.

ALTHOUGH antimony is less generally applicable in the cases before us, and, compared with mercury, of much inferior power, it is capable of certain effects which do not belong to the latter, and therefore applicable under circumstances in which it is unavailing. In those affections of the head itself, which frequently attend such cases, particularly a sense of tightness and other inflammatory symp-

toms referred to the head, and depending on the determination of blood to it being increased by the obstructed state of the digestive organs, considerable advantage is often derived from combining with the other means the tartrate of antimony, and occasionally increasing it till some degree of nausea is produced. The same observation applies to those cases where the surfaces are more bound up, and the pulse harder than usual, and to those where the increased heat of skin does not readily yield to the usual cooling means.

In the occasional attacks of extreme nervous irritation, the soothing effect of a combination of tartrate of antimony and henbane, given in the dose of two or three grains of the latter, and as much of the former as can be borne without nausea, generally from the eighth to the fourth part of a grain in the liquid form, much exceeds any other means the effect of which I have witnessed. I have seen states of the greatest agitation allayed by it, sometimes in a few minutes, generally within half an hour, which had resisted all other means. If this effect does not take place within half an hour, the dose may be repeated till a degree of nausea comes on, which favours the composing effect. In this way composure may generally be obtained, even in maniacal cases; but here the dose

of the tartrate which produces nausea is often that of several grains, and nausea is generally required to produce composure.

It is almost unnecessary to observe, that in the cases we are considering it is of great importance to support the strength. All means which tend to reduce it should be as much as possible avoided; but with respect to directly strengthening means, it unfortunately happens, as in other cases where the pulse is tight, that the most efficacious are very ill borne. The continued use of iron, or the bark, is, as far as my experience goes, uniformly injurious, even when, on first using them, they seem to do good by the temporary vigour they afford. Sooner or later, generally in a few days, and sometimes even from their first employment, they cause restlessness and oppression, and, if persevered in, an increase of all the symptoms; and these effects are generally, as might be inferred from what has been said, greatest when the tendency to organic disease is so, the inflammatory habit being then most prevalent.

The more pure stimulants, however, whose effects are more transitory, particularly the ammonia, are often employed with advantage. We have no other medicine which excites the nervous, with so little disturbance to the sanguiferous sys-

tem, as the carbonate of ammonia *, but in many instances even the mildest stimulants increase the tendency to heat and restlessness.

In these cases, saline medicines are always more or less necessary to allay the inflammatory tendency, which, more than any other state, opposes the beneficial effects of the alterative. The same causes which render tonics injurious, render saline medicines not only beneficial, but, in many instances, so grateful to the patient's feelings that it is sometimes difficult to prevent such a use of them as adds to the debility. They are only useful as far as they relieve that degree of excitement which would debilitate more than the means which relieve it.

With those which influence the system generally, it is, of course, requisite to combine whatever local means are necessary to relieve particular trains of symptoms which arise from certain organs, more than others, partaking of the diseased state which affects the whole. These are always more or less of an inflammatory nature, and more or less indicate a tendency to organic disease. The proper treatment depends on the nature and degree of the symptoms, and the nature of the part

* I beg to refer to what is said in the section on this medicine in my Treatise on Indigestion.

affected; a subject of too great extent, even in the most cursory manner, to be attempted in these lectures.

With respect to the general treatment, it may on the whole be observed, that the principle here being to support the action of the extreme vessels, and to restore the vigour of the nervous system, too much or too little excitement is equally injurious,—we must assist the constitution to maintain that moderate degree which alone is consistent with health, and recollect that we have no other means of restoring the brain but that of regulating the functions of the whole system; for, with the exception of the function by which the blood is conveyed, they are all, more or less, functions of that organ.

With regard to the effects of local measures, directed to the brain itself, the result of my experience is, that unless a greater than usual determination of blood to this organ has taken place, they are less beneficial than in any other local disease; and although I was not prepared to find this so much the case as it is, when we consider that the state of the brain is influenced by, as well as influences, every other part, it is a result for which, in its more chronic affections, we might be prepared.

In acute disease the principles of treatment are,

in many respects, different from those which obtain in chronic cases. In the former, the cause is so powerful as more or less to obscure the effects of all concurrent causes, the effects of which are felt in chronic disease; which is often so modified by them as to require very different plans of treatment in different individuals. Among the chief of these causes is the effect of distant parts on each other, either by sympathy or the more direct channels of communication. Thus it is that the brain, from its extensive connections, being so much under the influence of the general state of the functions in chronic cases, the secondary affections always re-acting on the original seat of the disease, the local measures directed to this organ itself are in a great degree counteracted.

THE fact that while the vital principle remains unimpaired, voltaic electricity is capable of all the functions properly called nervous, naturally suggested it as a remedy in the cases before us; and, in a paper published in the Philosophical Transactions for 1817, the reader will see with what success it may, under certain circumstances, be substituted for the influence on which these functions depend.

We cannot, however, expect, from our clumsy application of it, in all respects the same effects

which are the results of its employment in the natural processes. The chief inconvenience we experience is, that, not being able to regulate its application with precision, we find from it a constant tendency to excite an inflammatory state in the parts to which it is chiefly directed; and thus to maintain, throughout the system, that tendency which is most to be feared where organic disease is threatened. On this account, its employment in the more advanced stages of the cases we are considering, requires great caution; but in their earlier stages, in which the general failure of the functions indicates that debility of the vital organs of the brain which may be regarded as the first stage of the disease, the stage which, analogous to the first stage of indigestion, considered at length in my treatise on that disease, precedes the inflammatory stage, I have repeatedly seen it successful where all other means had failed. The observations I am making will be illustrated by what I shall have occasion to say of the treatment of those cases which originate in affections of the spinal marrow.

THE obstinacy of the diseases I have been considering, depends much on the nature of the occasional cause. When it has originated in a local weakness in other parts of the system, its

obstinacy, if it has not made much progress, greatly depends on that of the original disease. It is, of course, impossible permanently to relieve any disease if the cause continue to be applied.

According to my experience, the most favourable case is that which originates in indigestion. I have never seen a case, decidedly of this nature—that is, where the disease which threatened the structure of the brain had arisen from the long-continued irritations of indigestion, and such cases are far from being rare—that did not yield to the proper treatment continued for a sufficient length of time, except where the disease of the brain had gone so far as to threaten an apoplectic state; in which, as I have already had occasion to point out, it frequently terminates, particularly in those in whom the nervous system has been weakened by mental suffering, intemperance, or the effects of sultry climates.

If we except cases in which the whole powers of the brain have been impaired by excessive intemperance, there are none so obstinate as those which gradually come on without derangement elsewhere, or any other evident cause; many such cases depending on local affections of the brain, which, after they have advanced to a certain stage, we have no means of arresting. But even here, there are many reasons for believing that

such cases are seldom incurable in their early stages, and, even in the latter stages, the due regulation of the functions, as far as it can be effected, often gives considerable relief, and always, I believe, retards the progress of the disease. The great cause of organic disease is continued derangement of function; the great preventive, the re-establishment of the healthy function; and when this cannot be perfectly and permanently effected, the more it is effected the more the evil is relieved and its progress retarded. In my Treatise on the Means of preserving Health, and particularly the Prevention of Organic Disease, I have entered into the particulars of the treatment, the general principles of which I have here endeavoured to explain.

OF the remaining part of the subject, my limits will only admit of a very abridged consideration; nor, in the general view of the subject, which is all I have here attempted, is any minute consideration necessary. As far as affections of the spinal marrow produce the same state of the system as those of the brain, the same principles of treatment are applicable; and the treatment of the local symptoms belongs to the surgeon.

There is one part of the treatment of these cases, however, to which I wish particularly to call the

attention, because it can, in some respects, be better illustrated when the disease is seated in the spinal marrow than the brain, in consequence of our being able, in the former case, more clearly to perceive the manner in which the derangement operates, from our being able more accurately to ascertain its extent and the changes it undergoes.

I shall beg leave to close these lectures by the following quotations, respecting the subject here referred to, from a paper which the Editor of the Journal of the Royal Institution did me the honour to publish in the 25th, 26th, and 27th numbers of that work.

“THESE experiments led me, more than six years ago, to the employment of voltaic electricity in diseases which arise from a defect of nervous power, particularly habitual asthma and indigestion; and it is admitted by those who witnessed its effects, that in the former disease, and under certain circumstances of the latter, it is the most effectual means of relief we possess.

“In its employment, we must constantly guard against the inflammatory tendency, both because it tends to produce it, and because the diseases which it relieves have the same tendency. To one case of considerable importance I beg leave particularly to direct the reader's attention. Mr.

Earle, some time ago, asked me if I thought voltaic electricity a probable means of relief in the dyspnœa and indigestion which arise from disease of the spinal marrow. I did not hesitate to recommend a cautious trial of it, referring Mr. Earle to what I had said of such cases in the third part of my Inquiry into the Laws of the Vital Functions; and I am happy to say the result of the trial fully answered our expectations, as appears from the following letter, which Mr. Earle did me the favour to address to me:

“George-Street, August 4, 1822.

“MY DEAR SIR,—I have much pleasure in transmitting to you the following account of the trials with galvanism at St. Bartholomew’s Hospital. The first case is that in which you witnessed its first application.

“Elizabeth Pepperall, aged 17, of fair complexion and light hair, was admitted into St. Bartholomew’s Hospital in August, 1821, in consequence of an affection of the spine, which had existed for about a year and a half. At the time of her admission, it appeared that almost all the dorsal and lumbar vertebræ were affected. She had nearly lost all power over her lower extremities and pelvic viscera, and she complained of very severe cramps at the pit of the stomach,

and acute pain in the course of the costal nerves, which was much increased by pressure on the ribs, or any attempt at a deep inspiration. Her general health was much deranged. Her pulse was very rapid, with occasionally severe palpitation of the heart, and constant dyspnœa. Her digestive powers were greatly impaired. She had no appetite, and could only digest a small portion of stale bread and some milk and water. Even this meal was always followed by uneasy sensations at her stomach, and an increase of headach, from which she was hardly ever free. Her bowels were obstinately costive, and the urine was scanty, and deposited large quantities of lithate of ammonia.

“She was placed in one of my invalid beds, which enabled her to remain in a state of uninterrupted rest; and after the repeated application of leeches, issues were made on either side of the dorsal spine, and subsequently in the lumbar region. The issues were kept actively open, and the strictest attention was paid to her general health. The spine very gradually became less sensible, and the power over the pelvic viscera and lower extremities slowly returned; still, however, her stomach was incapable of digesting any other food than bread and

milk and water; her headach remained nearly unabated, and her breathing was habitually difficult. She was in this state when you saw her, and the galvanism was first administered. (Dec. 19.)

“A trough containing plates of about three inches was employed. The positive wire was applied to the nape of the neck, the negative a little below the pit of the stomach. No sensation was at first produced by twenty plates; but after the sensation was excited, she could not endure more than twelve. The first sensation she experienced caused her to take involuntarily a sudden and deep inspiration. The galvanism was applied for about a quarter of an hour, at the end of which time her breathing became much freer than it had been for many months. Of this she repeatedly expressed herself perfectly certain; at the same time she felt considerable uneasiness at the stomach. She was slightly hysterical, in consequence of the agitation she had experienced, but her breathing was tranquil during the whole evening.

“With a view to remove the tenderness in the epigastrium, leeches were applied to the region of the stomach, and the whole plan of treatment adapted to the second stage of indigestion was

resorted to. When the tenderness had somewhat abated, the galvanism was repeated, with more decided relief to the breathing, and without causing much uneasiness at the stomach.

“After several applications of it, the relief she experienced in her breathing lasted several days, and at length it was only necessary to repeat it occasionally. The effect of its administration was uniformly the same—a most sensible and speedy relief from a state of anxious breathing, to perfect ease and repose. Its beneficial effects were not, however, confined to the respiration; the powers of her stomach greatly improved, and she was able to digest a small quantity of meat, or the yolk of an egg, without pain. As her stomach improved she lost the distressing headach which had so constantly attended, as at one time to lead me to apprehend the existence of disease in the brain, having met with other cases in which scrofulous affection had existed in the brain and spine at the same time. Her progress from this time was uniform, and far more rapid than it had been before; and in about two months the catamenia, which had been suspended from the commencement of the disease, returned.

“The patient was sufficiently recovered to leave the hospital, and return to her friends at Dart-

mouth, early in July, at which time she was able to walk with very little assistance, and without experiencing the least pain in her back.

“On reviewing the circumstances of this case, I have not the least hesitation in stating my decided opinion of the great benefit which was derived from the employment of galvanism, not only in affording temporary relief to the breathing, but in improving the secretions, and thus materially contributing to the ultimate recovery of the patient. I feel particularly happy that the patient was in a public hospital, and that the means were employed in the presence of many intelligent medical friends and pupils, who were all equally satisfied with myself with the essential and permanent benefit which she derived from the administration of the galvanism.

“It was employed in two other similar cases in the same hospital, those of Ann Baillies and Maria May, in which it produced similar good effects, except that in one of these the improvement of the general health, although not less than in the other cases, did not appear to have the same beneficial effect on the disease of the spine. It was tried in another case of spine disease, which was attended with fits of spasmodic asthma. These, as I was taught to expect from the observations you have published on this subject, it failed to relieve. It

is remarkable, that in Ann Baillies, in which the pulse was from 140 to 150, and very weak, the use of the galvanism always rendered it stronger, and brought it down from 30 to 40 beats in the minute.

“ From observing the good effects of galvanism on the secretions of the stomach, I was induced to make a trial of it in a case of deafness, accompanied with a total want of secretion of cerumen in the right ear. Its first application produced a watery secretion, which, by perseverance, gradually assumed the taste, and all the other characters of cerumen. The hearing was greatly improved in both ears; but how far this was to be ascribed to the restoration of the secretion, is rendered doubtful in consequence of a tumour having at the same time been removed from the tympanum of the left ear by the repeated application of caustic.

“ The foregoing facts you are perfectly welcome to make any use of, should you think them deserving of notice; and I am, my dear sir, very sincerely yours,

“ HENRY EARLE.”

It appears from the foregoing statement, that in disease of the spinal marrow, voltaic electricity is not only capable of supplying the function of the diseased part of this organ, thus restoring the healthy

state of the assimilating functions, and greatly mitigating the patient's sufferings, but that it also, as might be expected, by improving the general health, indirectly contributes to the cure of the spinal disease. With regard to the last case, in which the secretion of cerumen was restored, this, it is evident from what has been said, can only be the effect of voltaic electricity when the fault is a defect of nervous influence, not a diseased state of the vessels.

Comparing what is here said with what is said in the paper above referred to in the Philosophical Transactions for 1817, may we not hope that, if in so few years such have been the results of the employment of voltaic electricity in disease, on the principles above laid down, a more ample experience will extend the advantages derived from it. In certain cases of general nervous debility, it has succeeded where all other means had failed; and in some species of fever, and other cases attended with deficient nervous influence, we have reason to believe it will be found a valuable remedy.

WHEN all that has been said in the preceding lectures is duly considered, I think it will be admitted, that neither in our reasonings respecting the nature of disease, nor in the indications on

which our practice is founded, have the functions of the nervous system obtained the place which belongs to them; and, consequently, that both will be essentially improved by keeping in view the important part in the maintenance of the vital functions, performed by the brain and spinal marrow.

THE END.

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