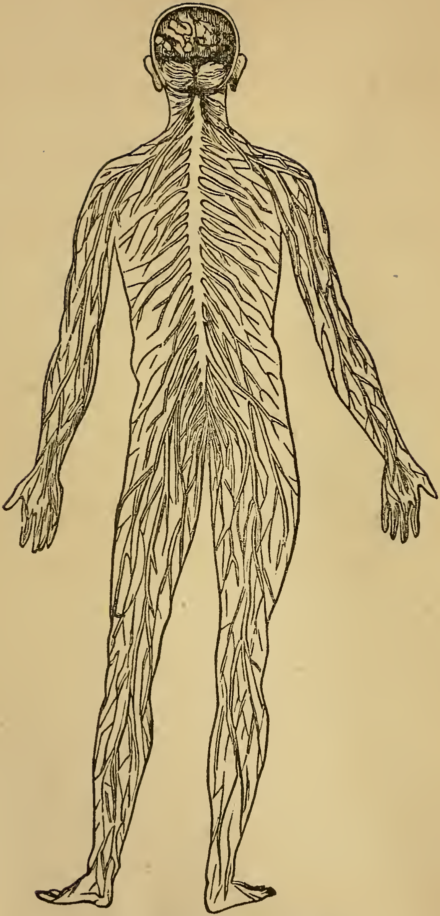

THE NERVOUS SYSTEM.

THE

NERVES AND THE NERVOUS.

A PRACTICAL TREATISE

ON THE

ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM,
WITH THE NATURE AND CAUSES OF
ALL KINDS OF

NERVOUS DISEASES;

SHOWING HOW THEY MAY OFTEN BE PREVENTED,
AND HOW THEY SHOULD BE TREATED. INCLUDING
ALSO, AN EXPLANATION OF THE

NEW PRACTICE

OF

NEUROPATHY; OR, THE NERVE CURE.

INTENDED FOR POPULAR INSTRUCTION
AND USE.

BY DR. F. HOLLICK,

THE AUTHOR AND LECTURER.

Illustrated by 40 Engravings,

AND NUMEROUS REMARKABLE CASES.

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PREFACE.

It is now over twenty-five years since I commenced, by public lectures, and by books, to popularize the study of human anatomy and physiology. The success which has attended my efforts has been far greater than ever I anticipated. Had I time, I could lecture constantly, to crowded audiences, so great and growing is the desire for knowledge on these subjects; but my professional engagements no longer allow me sufficient leisure. The circulation of my books has been unexampled, and is steadily maintained year after year, as will be seen in the detailed account of them at the end of this volume.

Hitherto these books have been exclusively upon marriage, and the natural relations of the sexes to each other, as these were the subjects upon which information seemed most needed, and most difficult to get. I have, however, been constantly requested to write a book on the nervous system, and its diseases, similar in character and purpose to the others. Such a book I have therefore finally determined to publish, after writing, and re-writing it many times over. The publication has been delayed year after year, from a desire to first see the result of some most important investigations, and experiments, on the nervous system; and also because I desired to first have full experience of my own, on all the important matters treated upon. As it now stands, I believe it gives a faithful and true account of what is known, at the present day, on the nervous system and its derangements, with all the new views and discoveries in full. The *cases* given, both from my own practice and that of others, are all selected, with a view to illustrate the various special topics treated upon, and to make the explanations more clear.

The style of this book, like that of all the others, is *popular*, so that all can understand it, but at the same time it is strictly *accurate* and *scientific*! The object has been to make it both *instructive*, and *practically useful*, so that the *student* and the *nervous sufferer* can both derive advantage from its perusal. The time has gone by for such knowledge to be thought *dangerous*, or *useless*, except to professional men; and society at large begins to recognize the fact, from dear-bought experience, that popular ignorance, upon such matters, is a fruitful source of many and serious evils. Human beings are able to live rationally, so as to avoid suffering and disease, just in proportion as they understand themselves, and their relations to the material world in which they exist.

Perhaps on no other subject has there been so much popular ignorance, and misapprehension, as upon the *nervous system* and its functions; and the consequences of that ignorance have been many of the worst evils that afflict humanity.

In giving the necessary explanations, it has been unavoidable that many old and revered opinions, and beliefs, should be totally dissented from. The progress of modern science makes these opinions and beliefs, now, untenable, and it is both vain and useless to try and make them agree with obvious and opposing facts.—Especially it has been requisite to show that *mind*, in its broadest sense, is entirely a result of organic action, and is totally dependent, as far as we *know*, upon the existence and proper action of the *brain*. Whatever *belief* any one may entertain we have no *knowledge* of *mind* except in this way. Nor does it seem likely that we ever can have! No one, however, is justified in saying there *is not*, or *cannot be*, such a thing as *mind*, *spirit*, or *soul*, distinct from *matter*, merely because it cannot be explained, or comprehended.

There may be many things of which we are in ignorance, simply because we have not the *capacity* to understand them. It must be admitted, however, that at present at least, the separate and independent existence of mind is a matter only of belief, and not of *knowledge*! Nay, farther, —it is of no use shirking the fact,—all the knowledge we posess, upon the subject, seems utterly to *disprove* the separate and independent existence of mind; and this is fully admitted by many who still continue to *believe*, even in direct opposition to what they know.

The truth is that *knowledge* and *belief* have no necessary association; nor should they be expected to agree with or confirm one another. Belief is an individual matter, but knowledge concerns all, and should be sought for, and disseminated, regardless of all belief or opinion whatever.

This explanation is made here so that the reader may be prepared for what follows, and may see, from the start, that the object of this book is to state *facts only!*—As a celebrated modern writer well observes, it should be universally known that for every fact of *mind*, there is a corresponding fact of *matter*, and the two, so far as we know, *always go together*. We are not justified in saying that they *can*, or *cannot* exist separately, because we do not *know*—no matter what we *believe!*—It is best therefore, to leave belief alone, and devote all our efforts to extending knowledge, of which we can never have too much.

DR. F. HOLLICK.

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NOTICE.

Any persons wishing to communicate with Dr. H. by Letters, can address to

"Dr. F. Hollick,
Box **3606**, Post Office,
New York City, N. Y.,"

and they will be promptly replied to.

All Letters asking an opinion, or advice, must be full and plain in their descriptions, so that a correct judgment can be formed, and they must always contain the customary fee of *Five Dollars*, or they cannot be attended to.

N. B.—Persons visiting New York can always find Dr. H.'s office by sending a note to his P. O. Box.

PART I.

INTRODUCTORY.

GENERAL VIEW OF THE HUMAN ORGANIZATION.

CHAPTER I.

ORGANS AND FUNCTIONS.

General Description of the Human Body.

The human body, like the bodies of other animals generally, is composed of a number of different parts, called *organs*, each performing a different kind of work or *function*, for which it is specially adapted.

These organs and functions may be classed under two grand divisions, one of which is solely occupied in preserving the individual's own existence, and the other in perpetuating the species.

In the first of these divisions we recognize two different classes of functions, *vegetative*, called also the *organic* or *vital*, and the *animal* functions.

The *vegetative functions* in man are analogous to the ordinary functions of plants, and comprise all the processes of *nutrition*, by which the body is nourished. Digestion, assimilation, the circulation of the blood, and breathing, are all stages in the process of nutrition. And just as the plant absorbs the material for its growth and sustenance from the air, water, and soil, so does man asborb them from his food and drink, and from the air he breathes.

The human body, from the moment of its birth, is in a constant state of change—no part remaining long composed of the same material. A special set of organs are constantly occupied in taking up and carrying away the particles of the body that have served their turn; while the nutritive organs are equally busy in putting new particles in the place of the old ones thus removed.

Both these processes—waste and repair—must go on uninterruptedly, or life cannot be maintained. If the old matter is retained too long, the body is *poisoned* by its own refuse, for the rejected matter becomes truly a poison. If, on the contrary, the process of renewal does not take place as rapidly as that of destruction, the body wastes away.

During growth, renewal is more active than destruction, and, when growth is completed, the two processes, in a state of health, ordinarily balance each other.

The animal functions are superadded to the merely vegetative functions, and this addition distinguishes the animal from the plant. The animal functions consist, essentially, of consciousness, sensation and voluntary motion. Except something like sensation in a few plants, there are no functions like these among vegetables.

Plants, so far as we know, have no consciousness, special sensation, nor voluntary motion; but animals have, and therefore these functions are called the animal functions.

There is a difference in the character of the organs employed in these two classes of functions which is interesting and important to note. The vegetative organs are all single and irregular in form. Thus there is one stomach, one heart, one liver and one length of intestine. The lungs, though apparently double, are really but one organ, the two dissimilar parts being connected by the bronchial tubes.

The organs that perform the animal functions, on the contrary, are nearly all perfectly *double* and symmetrical. Thus, there are two brains, two sets of limbs, two eyes, two ears, and so forth. The body can, in fact, be divided into two equal and similar parts, as far as the organs of animal life are concerned; but it is not so with the organs of vegetative life—they are not double, nor can they be equally divided between the two sides of the body.

The vegetative functions may go on quite independent of the animal functions, though they are much influenced by them. Thus the stomach can digest, the blood can circulate, and all the other auxiliary functions can co-operate with them, though the individual may be quite unconscious, and devoid of feeling or power of motion. Children have been born without brains, and yet have digested food, and lived for a considerable time. In these children, the stimulus of the food, when it was placed at the back of the mouth, caused the muscles of the throat to grasp and swallow it; and the digestion went on as in other human beings.

Similar cases will be referred to in the course of this work; but they are brought in here to show that the mere *vegetative* functions can act independently of the animal functions, although, as will be shown further on, they can be, and usually are, much influenced by them.

The animal functions, on the contrary, are entirely dependent, in one sense, on the vegetative functions; for if the body be not duly nutrified, so that the organs are kept in perfect condition, they cannot act. If the brain is starved or diseased, there can be no healthy consciousness, or thought; and if the nerves and muscles are not maintained in a state of perfect vigor, there can be no effective voluntary motion.

In short, the vegetative organs can live without the animal organs, but these cannot live without the vegetative; or, in other words, body may live without mind, but mind cannot exist without body.

It must be observed, however, that mind is still necessary for the preservation of the body, either directly or indirectly; the animal is not rooted to one spot, like the vegetable, but must either go abroad to seek its food, or have it brought; so that the child born without a brain must be fed by some other person who has a brain.

All that is meant by what has been stated is that the body, or the vegetative organs, can maintain themselves, if the necessary conditions exist, without the concurrence of the animal organs or functions. The real connection between the two, and their mutual influence, will be shown further on.

The sexual or reproductive organs are not concerned in the maintenance of the individual's own existence, nor are they necessary in any of the functions of vegetative or animal life, as far as the individual is concerned, although, as will be explained, they exert indirectly a powerful influence on both, and are much influenced by them in return. The essential use of these organs is to produce a new being, to continue the species. They may be said, in one sense, to be both animal and vegetative. The individual can live without reproductive organs, but with an imperfect development.

Every part of the body is thus formed or organized for the purpose of performing some special *function*, and that function is concerned either in maintaining the individual's own existence or in perpetuating the species.

For convenience, we associate together the different organs that co-operate in one process, and call them a *system* or *apparatus!* Thus the jaws, teeth, tongue and cheeks constitute the *masticating or chewing apparatus;* and the stomach, liver, pancreas and other connected parts, constitute the *digestive apparatus.* In like manner we have the *system* of the blood-vessels, by which the blood is circulated, and the pulmonary apparatus, by which we breathe, and so on.

The sexual system, or generative apparatus, is solely for the purpose of propagation.

All the different organs of the body co-operate together in the work of maintaining the existence of the individual and of the species. No part is useless, nor can any important part, of the vegetative system, at least, be dispensed with. Life, or mere vitality, may be continued, in an animal organization, without a *brain*, but not without a stomach or heart.

Digestion, assimilation, the circulation of the blood, breathing, absorption, secretion, excretion, and all the other vegetative functions, are but steps in the processes of nutrition and change; each one follows the other and results from it. Arrest one step and you arrest all.

The Nerves and Nervous Centres.

Every part of the body is traversed by certain white cords or threads called the *nerves*, which are connected with certain great masses of nervous matter called the *nervous centres*, of which the brain and spinal marrow are the principal ones. The nervous power is produced in these great nervous centres, and the nervous cords convey it to all parts of the body according as it is needed, just as the wires of the telegraph convey the electricity from one place to another. Every organ, in this way, receives the nervous influence, and cannot act without it any more than the engine can move without steam. Cut the nerves which connect any part with the nervous centres, and it at once ceases to act, and loses all feeling and power of motion.

We see, hear, smell, taste, and feel, all by the agency of the nervous power. Take the most perfect eye that ever was formed, sever the nerve which connects it with the brain, and it becomes instantly useless, though just as perfect as before. Destroy the little nervous cords leading to the limbs of a giant, and those limbs at once become powerless, not because the muscles are not as perfect as ever, but simply because he can no longer control them through the nervous influence from the brain.

This primary fact must be thoroughly comprehended before the part which the nervous system plays, in health and disease, can be at all appreciated. It must be distinctly understood that every organ is enabled to act or perform its special function only by the influence of the nervous power, which it receives *through a nervous cord from one of the great nervous centres.*

This is the use, then, of the nervous system. It is the origin or source of that mysterious power, force, or energy that keeps the body working as a living organization. It controls, influences and directs, and is the essential animal agency.

But, besides being the living stimulus of all the vital organs, the nervous system has certain other functions peculiar to itself. It is the seat of *sensation, thought, or mind.* The brain, the great nervous centre, elaborates *thought,* just as the stomach secretes gastric juice. or as the liver secretes bile. Without a stomach sufficiently perfect in action, we cannot digest food; and without a brain in a sufficiently perfect condition, we cannot *think.*

Every animal, from the highest to the lowest, has some form of a nervous system, through which it moves, feels and lives.

In the simply formed animals, with few organs, the nervous system is simple also, and it becomes more complicated and perfect just in proportion as the being rises in the scale of organization. But even the *animalcule*, which we have to magnify hundreds of times before we can see it, possesses a nervous system, as perfect, for its simple organization, as that of the human body.

Some physiologists, indeed, have contended that the nervous power is not essential to all bodily action, but that some of the vegetative functions, at least, may be, to a certain extent, originated without it. The organs of these functions, it is said, will always act under the influence of proper stimuli, independent of any nervous influence. Thus, when food is placed in the empty stomach, it causes it at once to secrete the gastric juice, and so begins the process of digestion. And, in like manner, the presence of blood in the heart causes it to contract; and so on with many other processes.

In all such cases, however, the nervous power is probably still the primary force, only it acts indirectly. The impression caused by the food is, probably, first made upon the nerves of the stomach, and by them is conveyed to the proper nervous centre, from which comes back the power which causes the gastric juice to be secreted. The blood also, probably, causes nervous action upon the heart in the same way.

This explanation will, it is hoped, make sufficiently clear the nature and uses of the nervous system, and its connection with the other parts of the body. It will be necessary now to describe the nervous apparatus itself, and to explain its structure and mode of action as far as understood.

It has never been shown, conclusively, that any of the vegetative organs can act, to the slightest extent, when entirely cut off from all nervous influence. At the same time, it is well known how powerfully that influence acts upon them all, both directly and indirectly, and how intimately they sympathize with each other, and with the rest of the system, by means of a special set of nerves called the sympathetic.

All the animal functions — consciousness, sensation, and voluntary motion, for instance, are obviously caused, directly and entirely, by nervous influence alone.

Practically, therefore, we may say, that the nervous force is what keeps up the action of the whole system, animal and vegetative, as the steam keeps up the action of the engine; and it is, therefore, very important to know the nature of this force, how it originates, and the way in which it acts upon every part of the system, and in all circumstances.

In some of the lowest organizations there are no special parts which perform the nervous functions only, nor, indeed, any other; but every part is alike, and performs equally every function essential to the animal's life. Thus every part can act as nerve, muscle or stomach, indifferently. But, in the higher animals, the principle of *differentiation* comes into play, and we find various parts or organs, each one performing a different function, one for which alone it is adapted. Hence arises the classification of organs already given. It is probable that, in the lower organizations, the nervous matter is disseminated through the whole substance of the body, so that it is not to be distinguished separately; while, in the higher organizations, as in man, it is simply aggregated into the nervous cords, and the ganglionic centres, constituting the nervous system. In other words, it is *differentiated*, and constitutes an *apparatus* by itself, the structure and mode of action of which will now be described.

CHAPTER II.

THE STRUCTURE OF THE DIFFERENT PARTS OF THE NERVOUS SYSTEM, AND NATURE OF THE NERVOUS SUBSTANCE.

Structure of the Nervous Apparatus.

On examining the nervous system we find that its substance is arranged in two different forms, or structures, connected with each other.

First, we have certain large masses of nerve substance, of different forms, called the *nervous centres.* These are the *brain,* contained in the skull; the *spinal marrow,* contained in the spine or backbone, and certain roundish masses of nerve matter, found in different parts of the body, called *the ganglions.*

Secondly, we find certain cords or threads of nervous matter of various sizes and lengths. These are commonly called *the nerves,* and they connect the *nervous centres* with each other, and with every other part of the body.

The nervous cords ultimately ramify and divide into branches and branchlets, so numerous and so fine, that it is impossible to trace them any further. They penetrate everywhere, and no part of the body, however minute, is without them. The point of the finest needle, as is well known, cannot be applied to any part of the body without being felt, which shows that it has touched a *nerve.* No change can take place in any part of the body but some *sensation* informs us of the fact. By its nervous connections the brain is informed of all the bodily wants, and at once originates, also through the nerves, the necessary actions to supply these wants.

In short, if all the rest of the body were taken away, and the nervous substance alone left, it would make up the bodily form by itself.

The great central nerve masses are found only in certain parts, but the nervous threads reach everywhere, so that by means of them all parts are connected with the centres.

In the frontispiece plate it will be readily seen how the nerves are connected with the *spinal marrow*, which is contained in the backbone, and run from thence all over the trunk and limbs, branching out, and becoming smaller the further they go. They ramify to the extremity of the toes, as they do to the extremities of the fingers, and to every internal part; in short, they go everywhere.

The upper part of the spinal marrow, it will be seen, joins the lower part of the brain, so that these two great nervous centres are directly connected.

The nerves from the brain, and the ganglionic nerves, will be shown further on.

The use of the nervous centres, the brain, spinal marrow, and ganglions, appears to be that of manufactories, or magazines, of the nervous power. The use of the nervous threads or cords is simply to convey this power where it is wanted, and to connect the centres with each other.

To give an illustration—the *nervous centre* is a *battery* which engenders the galvanic current, and the *nerves* are the *wires* which conduct it where it may be wanted.

As already explained, if the connection between any limb and the nervous centre be broken, by cutting through the nerves that connect them, that limb immediately loses all power of motion and feeling. If it be a vital organ, as the heart, for instance, it can no longer perform perfectly its peculiar function of propelling the blood, but either ceases to beat altogether, or does so imperfectly.

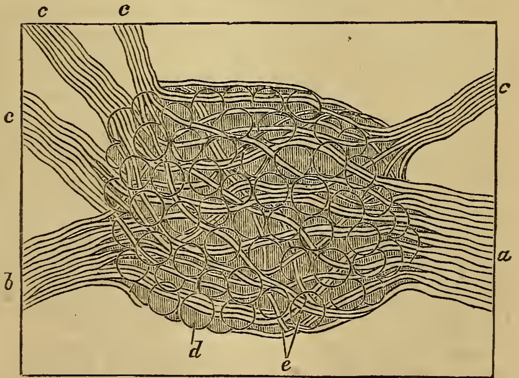
Now, this is strictly analogous to what occurs with the magnetic telegraph connecting two cities. The batteries and recording apparatus may be perfect, in both places, but if the connecting wire be cut they can no longer communicate with each other. The current must flow from the battery at the place from whence the message is sent, along the conducting wire, to the corresponding apparatus at the other place. Cut through this wire and the two places have no communication.

If, however, a proper instrument be connected with the wire at the place where it is cut, there can at once be communication from there to the place from which the message was sent. And just so it is with the nerves. If the nerves of the arm are all cut through at the elbow, the lower part of the arm loses all power of motion and feeling, but the upper part still feels and moves, because it is still connected with the nervous centre.

The different structure of the ganglion, or nervous centre, and the nerve trunk, or cord, is shown in the following plate:

Plate II.

PART OF THE SYMPATHETIC NERVE OF A MOUSE, MUCH MAGNIFIED.



The large central mass is a ganglion composed of nervous threads (*c*), and of round vesicles (*d*). Proceeding from the ganglion, in different directions, are nervous trunks or cords (nerves *a*, *b*, *c*,) the separate threads of each cord all interlace together in the ganglion, and the round vesicles are enclosed amongst them.

The nervous centres, as will be seen further on, are somewhat differently formed, each from the other, and the power emanating from each acts in its own peculiar way. Thus the spinal marrow is concerned in ordinary sensation and motion, while the ganglions regulate the functional power of the heart and other organs, and the brain is the seat of thought and of special sensations, such as seeing and hearing.

The globular vesicles or cells are found only in the ganglions or central nerve masses, and not in the threads or cords.

The Nervous Matter or Substance.

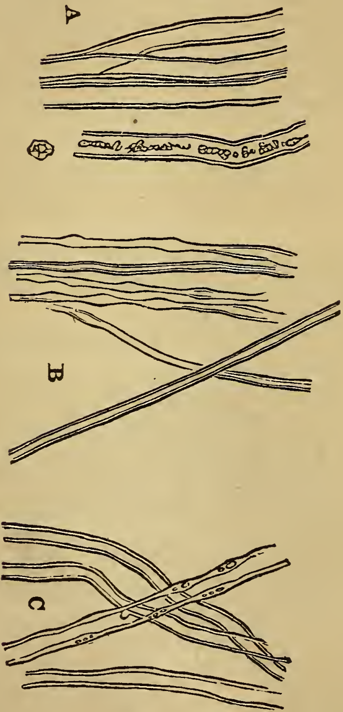
A *nerve,* or nervous cord, is composed of a number of smaller cords, each of which is made up of still smaller threads called the *nerve fibres,* analogous to the separate threads which compose a rope.

Every one of these little ultimate fibres is a *tube,* filled with a peculiar substance called the *nervous matter.* This *tube,* called the *neurilema* or nerve coat, is extremely delicate and quite transparent. No blood-vessels penetrate it, and each fibre is kept by it entirely unconnected with all the others, though bound up with them. The nervous substance, therefore, in each tube is a direct prolongation of the nervous centre, from which it originated, or, in other words, it is a portion of the nervous centre *stretched out,* and protected by the tube or *neurilema.*

The nerve *substance,* contained in the tubes, is a thin, clear fluid, so that when one of these tubes is examined with the microscope it looks almost like a rod of glass. This appearance, however, is only while it is *fresh,* for very soon after it is taken from the body it undergoes a change. The clear fluid becomes thick, and partly opaque, and the wall of the tube itself is also seen then to be *double,* or composed of two parts, with a space between. This is shown in A, plate 3. In the largest tube the central substance is seen coagulated in small grains, and the tube walls are double.

Plate III.

TUBULAR NERVE FIBRES.



(A) Shows some of the nerve tubes much magnified. (C) shows some magnified still larger. (B) Shows some tubes in a *varicose*, or swelled state. In the walls of the *cross* one at (C) are seen some little nuclei.

The very centre of the tube is still occupied, however, with a substance that remains transparent, and which is called the *axis cylinder* or primitive *nerve band.*

These different parts of the nervous substance are composed of different materials, some being albuminous and some fatty, the proportions varying under different conditions. It is probable that these slight variations may depend upon the state of the individual's health, and that they may be of great importance in many circumstances.

It is quite conceivable that a minute quantity, more or less, of fat, or albumen, in the nerve substance, may seriously affect its conducting power, and thus lead to imperfect functional action in the organ on which it acts.

The nerve tubes are very delicate and small, being ordinarily not more, in man, than from *the twelve to the fifteen thousandth of an inch in diameter!* In some parts of the brain, and the sympathetic nerve, they are even less than this, decreasing to the *eighteen thousandth* of an inch, or less.

The tubes are liable to swell out in some parts, and become narrower in others, just like *varicose veins,* owing to the nervous substance being pushed out of some parts and piled up in others. This is more especially the case with the tubes in the brain. The real cause of this seems to be a difference in the cord itself, it being less firm in some parts than in others, and therefore giving way at those parts.

It is very possible this may be the case in some nervous diseases. and some persons may have a constitutional tendency to *swelled nerve tubes*, as others have to varicose veins. (See B, plate 3.)

Besides the ordinary nerve tubes above described, there are found some of another kind. These are much smaller, and do not possess a double appearance when viewed microscopically. The substance they contain is also different, being more uniform and jelly-like, and the nerves formed from them are of a yellowish gray color, while the ordinary ones are white. They are usually called the *gray* or *gelatinous* fibres, and are more abundant in some parts of the body than in others, especially in the smypathetic nerves.

All these little peculiarities, though they may seem trivial, are, no doubt, of immense importance. A man's experience of pleasure or pain, his state of health or disease, his mental power, his moral disposition, and even the duration of his life, may often depend upon the form or structure of a few of these little tubes, or upon the composition of the substance they contain. The result may often depend upon the presence, or absence, of a portion of some peculiar matter, so small that we could not detect it with the most powerful microscope.

The Ganglioniv Globules or Vesicles.

The structural difference between the ganglions and the nervous cords has already been alluded to. The peculiar element of the ganglionic substance appears to be made up of *cells* or *vesicles*, like minute *bladders*, which contain a substance made up of fine grains or granules.

These cells are usually called the ganglionic globules, and they are generally globular in shape, though subject to great variations, being sometimes very irregular, as will be seen by the cut on the following page:

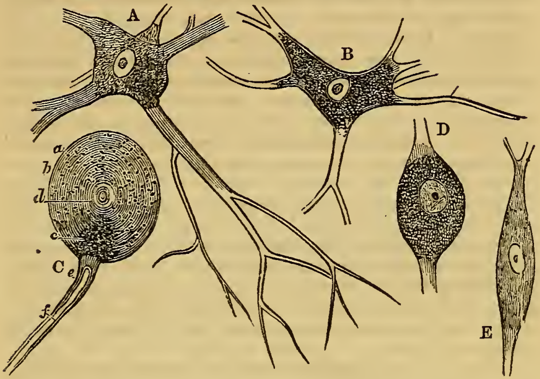
The large arms or prolongations, seen in the star forms, sometimes reach from one vesicle to another, and unite them together, and, at other times, they stretch out into the minutest threads and appear to join the nervous substance of the fibres or nerves, especially with the gray or gelatinous fibres. They are found in all the nervous centres, and generally have coloring matter enough to give them a reddish or yellow brown appearance.

This coloring matter resembles the coloring matter of the blood, and is most abundant in the vertebrate and warm-blooded animals. In reptiles and fishes there is much less of it than in the mammalia; and in animals not vertebrated, there is apparently none. The color granules cluster more especially round the nucleus, and thus make it distinct.

There are many other peculiarities of form in the

Plate IV.

VARIOUS FORMS OF THE GANGLIONIC VESICLES.



(A, B) Star-shaped vesicles, with prolonged arms, from the gray matter of the spinal cord, (C), nerve cell with its connecting fibre, (*a*), the cell wall, (*b*), the granular contents, (*c*), the coloring matter, (*d*), the nucleus, (*e*), the prolongation of the wall forming the sheath of the fibre, (*f*), the nerve fibre. (D), nerve cell. (E), smaller cell from the spinal cord; magnified 350 diameters.

vesicles, but as they are not constant, but only exceptional, it is not necessary to describe them all.

The globular vesicles or cells vary in diameter from the *one thousand three hundredth* to the *eleven thousand two hundred and fiftieth part of an inch.*

These ganglionic globules or vesicles make up a large portion of the brain, spinal marrow and ganglions. They are massed together and surrounded by a fine granular matter, which is traversed in all directions by minute blood-vessels. This constitutes what is called the *cortical* or *cineritious*, or gray nervous matter, to distinguish it from the *white* or *medullary* matter, which also forms the nerve fibres and a large part of the brain and spinal marrow.

In the brain, the *cortical* or gray matter *incloses* the white or medullary matter, but in the other nervous centres the reverse is the case. In the ganglions of the invertebrate animals also the gray or vesicular matter is internal, or contrary to what it is in man.

In fact, these names are apt to mislead. *Cortical* means merely the gray *outside* portion of the human brain which envelopes the internal part, like the bark of a tree envelopes the wood. *Medullary* has the same meaning as *marrow*, and is used to designate the inner *white* part of the human brain. Now, the outer part of the human brain is composed of the *vesicular* nervous substance, and the interior portion is composed of the same white matter which forms the nervous cords. In other beings, however, and in the other nervous centres of the human being, the vesicular matter is inside, and the fibrous white matter outside; so that either substance may be the *corticus* or *bark*, and either may be the *medullary* or marrow, according as they are placed.

The only way to distinguish the two kinds of nervous substance, in fact, is by their *structure*—the true *ganglionic matter* being always made up of *vesicles*, and the cords or *nerves* of *fibres*.

It is not correct to distinguish them by accidents of color, for the ganglionic matter, though usually reddish gray (cineritious), is sometimes quite pale, while the nerve fibres, though usually white, are sometimes yellowish gray.

It is certain that the vesicular or ganglionic matter is the most essential part of the nervous apparatus, because it is in the nervous centres, which are mainly made up of this matter, that the nervous power is generated, while the fibrous substance merely conveys that power where it is needed—the ganglions are the *batteries* and the fibres are the *wires*.

The way in which the nerve fibres unite with the ganglions is not fully known. Some of the fibrous tubes seem to expand and become ganglionic vesicles, and the prolongations of some of the star-shaped vesicles seem to lengthen into fibrous tubes, and, perhaps, the union is *generally* effected in one or the other of these ways. Many of the vesicles, however, seem not to be connected with fibres at all, and many of the fibres appear totally unconnected with vesic'es, but merely pass around and amongst them. They are apt, however, to be *varicosed*, or to swell out, while passing through ganglions, as hown in plate 3.

It is probable that the ganglionic vesicles may be evolved or developed from the fibres, and the fibres from the vesicles, reciprocally. They are only modifications of the same material.

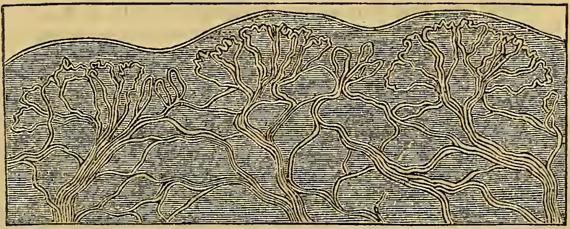
The Way the Nerves Terminate.

The nervous fibres, as before explained, ramify and divide more and more the further they go, till finally they become so fine as to be lost to sight. Many of them, however, have no proper *ending* at all; and this is especially the case with the nerves of *motion*. If we take any of those going to the muscles, for instance, we find that, at their extreme ends, they are *looped*, or, in other words, the fibre bends round and returns upon itself. And so with many others.

This is well shown in the following cut:

Plate V.

THE NERVES OF TOUCH, AT THE END OF THE HUMAN THUMB. THIS IS AS THEY APPEAR WHEN A VERY THIN SECTION OF THE SKIN IS PLACED UNDER THE MICROSCOPE.



The peculiar *looped* endings of the nerves are very well shown here, and the way they distribute in the lower layer of the skin.

Sometimes, however, the fine ends of a number of nervous fibres terminate in a kind of cone-shaped vesicle, or corpuscle, called a *nervous papilla,* without being looped; and in some cases the nerve thins out finer and finer, till at last the sheath or tube quite disappears, and only the *gelatinous nervous substance* is left. This continues still further, becoming more and more attenuated, and finally fades imperceptibly away, mingling with the substance in which it is distributed.

There is also another way in which the nervous fibres sometimes terminate, in certain parts of the body. There are certain bodies, called the *Pacinian corpuscles,* attached to the branches of the nerves in the hand, foot, and other parts. They are a kind of bag or sac, usually oval-shaped, formed of a number of separate sacs, one over the other, like the coats of an onion. Inside is a transparent fluid, apparently albumen. Into each of these corpuscles there proceeds the end of a nerve fibre, which gradually loses its sheath, or tube, in passing through the various coverings of the corpuscles, and finally terminates in the fluid in the interior. It is then composed only of the nervous substance, without any tubular cover, and ends either in a kind of a knot, or divides into two or three branches, each a little thickened at the ends.

This is shown in the cut on next page.

In the adult, the Pacinian corpuscles are from one-fifteenth to one-tenth of an inch in diameter, and from one-twenty-sixth to one-twentieth of an inch broad.

There are, however, so many curious peculiarities in the nervous structure that it is impossible to note them all—though, doubtless, each serves a purpose not yet discovered.

Chemical Composition of the Nervous Substance.

It might be supposed that a part of our organization so important, and so peculiar in its action as the nervous apparatus, would be composed of different materials from other parts; but such is not the case to any great extent.

Plate VI.

HUMAN PACINIAN CORPUSCLES.

(A) A single corpuscle very highly magnified; (*a*) is the stem by which it is attached to the nerve fibre ; (*b*) is the terminal nerve fibre entering the corpuscle ; (*c*) the outer coat ; and (*d*) the inner coat of the corpsucle ; (*e*), the nerve fibre in the transparent fluid, now become thinned out, and deprived of its tube or sheath ; (*f*) shows the way in which it divides at the end—in this case into two branches.

(B) Shows a branchlng portion of the nerves of the finger, with the pacinian corpuscles attached, like small fruits growing on the branches of a tree. This is little less than the natural size.

Most of the materials forming nervous substance are the same, essentially, as those which compose other parts of the body, but they are peculiarly combined; and there is one element, *phosphorus*, which seems to belong especially to the nervous matter and to be necessary to it. So much so, in fact, is this the case, that many physiologists think phosphorus is the *life of the brain*, and that without it the brain would be useless. In fact, one celebrated German has laid it down, as an axiom—"*No phosphorus, no thought!*" and many others are of opinion that a man's mental vigor depends, in a great measure, upon the proportion he possesses of this element. It is quite possible that the man of genius may owe his lofty thoughts and far-seeing insight, merely to a few grains of phosphorus, while other men are of feeble mind merely from the want of it.

This idea is, in fact, borne out, to a great extent, by chemical analysis, as the following table will show:

Composition of the Nervous System.

	Infants.	Youths.	Adults.	Old People.	Idiots
Water	82.00	74.00	72.00	73.00	70.00
Albumen	7.00	10.00	9.00	8.00	8.00
Fat	3 00	5.00	6.00	4.00	5.00
Ozmazome and Salts	6.00	8.00	10 00	12.00	14.00
Phosphorus	0.80	1.65	1.80	1.00	0.85

This is the percentage, or proportions in 100, but omitting unimportant fractions.

It will be seen that, in healthy adults, phosphorus constitutes nearly *two per cent.* of the nervous matter, while in idiots it constitutes only a little over *two-thirds of one per cent.*, or about the same as in infants.

The phosphorus is chiefly combined with the fatty matter, forming two peculiar acids, called the *cerebric acid* and the *oleophosphoric acid.*

In the dried brain there is found about *three and a-half per cent* of salts, chiefly phosphates and carbonates of soda, potash, and magnesia.

The cortical, or vesicular matter of the brain, is, however, somewhat different in its composition from the white or medullary matter. The cortical has *eighty five* *per cent*, of water, while the medullary has but *seventy-three.* There is also in the cortical three and a half per cent, of a peculiar red fatty matter, of which we scarcely find a trace in the medullary matter. On the other hand, there is a peculiar white fatty matter in the medullary, which is almost entirely absent in the cortical matter.

The *phosphorised fat* seems to be the chief element in the peculiar semi-liquid, transparent, portion of the nervous substance found in the centre of the tubular nervous fibres, called generally *the white substance of Schwann.* It also forms a large part of the ganglionic vesicles.

The amount of phosphorus is certainly greatest at the period when the brain is most vigorous. It is small in infancy, and decreases in old age, while in idiots it is seldom over *one-half* what we find it in people of ordinary intellect.

CHAPTER III.

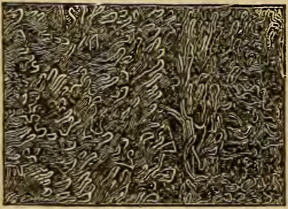
NUTRITION OF THE NERVOUS SYSTEM. PROBABLE NATURE OF THE NERVOUS POWER, AND THE WAY IT ACTS.

Blood-vessels of the Nervous System.

THE whole of the nervous substance is abundantly nutrified by blood-vessels, which vary, in form and manner of distribution, according to the part to which they are sent. In the case of the nervous *fibres* the blood-vessels run side by side with them, following their course in a straight line. At the ends they also *loop*, just as the nerves do.

Plate VII.

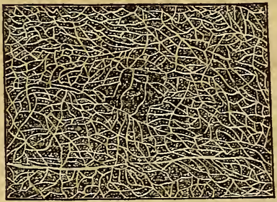
LOOPED CAPILLARY BLOODVESSELS ON THE SKIN OF THE FINGER.



In the vesicular ganglionic substance the blood-vessels form a kind of *net-work*, in the spaces of which lie the vesicles. This is shown in the following cut:

Plate VIII.

NET-WORK OF CAPILLARY BLOOD-VESSELS OF THE NERVOUS CENTRE.



The human brain, it has been estimated, receives about *one-sixth* of all the blood in the body, and yet its weight is only about one-fortieth of the whole body. It, therefore, receives far more blood than any other part which contains the same amount of solid matter.

This large amount of blood is needed both in feeding or nourishing the nervous apparatus itself, and also in producing the nervous *power*.

The nervous apparatus wastes away, and is re-formed constantly, the same as the muscles, and every other part, and it is probably the chemical processes connected with this change that produce the nervous power.

A close inspection of the cortical substance of the brain shows that the fully-developed vesicles are continually decaying, or breaking up, and that new ones are being constantly formed. They may be seen at all stages, from the primary granule (apparently) to the perfect vesicle.

It is the same also with the tubular fibres, in which, and in their contained nervous substance, similar changes are constantly taking place, though not so rapidly, nor extensively, as in the ganglionic structure, because they do not *produce* power, but only *convey* it.

Nervous power, like galvanic power, is a product of chemical action ; and just as chemical action is exhibited in the oxidation of the zinc in the battery, so also is it exhibited in the oxidation of the tissues of our bodies. And, just as the battery wears out, and is renewed, more rapidly than the conducting *wires*, so do the ganglionic centres wear out, or change, more rapidly than the conducting nerve fibres.

It has already been stated how essential the nervous power is, to the due performance of the most important functions of the body; without it there is neither sensation nor motion, and any part deprived of it is, so to say, *dead!* And this is true of the nervous apparatus itself. For not only must it be nutrified by blood-vessels, as already shown, but it also needs *its own power* to carry on its own nutrition.

If a nerve be completely divided, there is seen a difference in the two parts. That portion still connected with the ganglionic centre acts as usual, and is nutrified by its blood-vessels. The other part, however, ceases to act, and also begins to *waste away,* for though it still has its blood-vessels, they give it no nourishment. The nervous current must flow in the nerve, not only to cause those parts to act to which it is distributed, but also that the nerve itself may receive nutrition.

Origin of the Nervous Tissue.

The nerve tubes appear to originate in simple granules, or minute grains of matter, which unite together and form a kind of gelatinous thread, around which the tube seems to condense.

The ganglionic vesicles also develop in a similar way. First there is a simple nucleus, or mere spot as it were, around which the granular matter concentrates, and ultimately the investing membrane, or capsule, condenses on the surface.

The formation of all the parts of the body is nearly on the same plan. The material first forms into little grains, or granules, like seeds, and these unite together, either as threads or globules, and become covered with a sheath, or capsule. From this primary organization the largest and most complicated parts are gradually built up.

The primary granules, with their *nuclei,* much resemble *eggs* or *seeds.*

Regeneration of the Nervous Tissue.

If a nerve be cut through, unless a long portion be removed, it will gradually grow together again. New granules are thrown off, at each end, which unite and extend, in the form of the nerve they sprang from, till the two extremities meet, and a perfect union is again formed. This perfect union is necessary, for a nerve cannot conduct the nervous power unless it be perfectly unbroken.

This is shown, in a very interesting manner, in many surgical operations. A piece of skin, or flesh, is often transplanted from one part of the body to another, to cover a wound, and of course it contains the severed ends of the nerves that went to it. It soon begins to grow in its new situation, if the operation be successful, like a graft on a tree. Very often, however, after it is perfectly united, there will be no proper feeling in it for some time, because the fragments of nerves in the grafted piece are not in perfect connection with the nervous centre. After a time, however, these fragments of nerves, in the grafted piece, unite with the nerves nearest to them, and thus re-establish the connection, and then the grafted piece becomes again sensitive.

Sometimes it is required to make a *new nose;* and, to effect this, a piece of skin, on the forehead, is cut into the shape of a *flattened* nose, and carefully dissected off. It is not, however, completely detached, but a little neck of skin is left at the top of the nose. The *flap* is then twisted round at this neck, brought down, and shaped over wax, in its new position, the cut edges being *let in* down the sides of the cheeks. Such a nose will grow when it is thus transplanted, and be very satisfactory, both in use and appearance.

If, however, such a nose be touched, the sensation will, for a time, appear to be on *the forehead,* where it came from, because its nerves are still connected with those of the forehead, through the neck of skin which still unites them. In the process of time, however, the nerves of the new nose unite themselves with the nerves belonging to its new situation, and the connection with the forehead by the little neck becomes extinct; then when it is touched, the feeling is experienced in the proper place.

Sometimes the connection with the forehead becomes extinguished first, and then, for a time, the nose will have no sensation at all, till it becomes perfectly united with the nerves in its new position, and so obtains proper local sensibility.

The end of a finger or nose may be cut, or bitten off, and if it be re-applied promptly, and kept in its place firmly, it will perfectly unite again. Generally, in such a case, the part so attached is destitute of feeling at first, but the cut nerves re-unite, and sensation may become as perfect as before.

M. Brown Sequard has shown that a large nerve may be divided—like the one leading to an animal's limb—so as to destroy all power of motion and feeling in the limb, and yet, in some months, it will perfectly re-unite. And not only will it re-unite, but the power of sensation and motion will return, and if the animal be killed and examined, no trace of the cut may be found.

M. Brown-Sequard went even farther than this, for he divided, in a pigeon, the *spinal çord* itself. All the parts below the point of separation became at once *paralyzed,* and utterly without feeling or power of motion. In the course of a few months, however, even the spinal marrow began to mend itself, the same as a simple nerve would do, so that sensation and the power of motion came gradually back, and by the end of fifteen months all traces of injury had nearly disappeared, the bird walking, running and flying nearly as before.

The Nervous Circle—Nerves of Feeling, or Sensation, and Nerves of Motion.

A nervous system, in its simplest form, is composed of a ganglionic or nervous centre, and two sets of nerve fibres connected with it. One of these sets, called the *afferent fibres*, commences on the *surface of the body* by a network of fine threads, which, after uniting together, proceed to the ganglion or centre, and are united with it. The other set, called the *efferent* fibres, commences *in the ganglion* or nervous centre, by one trunk, which proceeds to the muscles on the surface of the body, and here divides into what is called a *plexus.*

Such is the *nervous circle,* and it acts in this way. Suppose a man, unintentionally, puts his hand on a hot iron, instantly some of the *afferent* nerve fibres feel the heat, convey the sensation to the brain, and the man *feels* he is burnt, and instantly also the *will* sends a nervous current down the *efferent* fibres, to the muscles, and they promptly *move* the hand away. All seems to be done instantaneously, and yet there is a certain portion of time needed, both for the sensation of heat to reach the brain, and for the order to the muscles to *move,* to come back.

In this case, then, the *circle* is as follows; from the surface of the body to the brain, and back from the brain to the surface.

Neither of these sets of nerves can perform the function of the other. The one conducts *to* the brain, and the other *from* it. In the case of the man referred to, if the *afferent* nerves were cut through, he could not feel when he was burnt, because no knowledge of it could go to the brain, and if the *efferent* nerves were cut, he could not take his hand away when he did feel it burn, because the *will* could not be sent to the muscles. If *both* were cut, he could neither move the hand nor feel when it was injured.

The difference between the two kinds of nerves will now be understood. They are sometimes called the nerves of *sensation,* and the nerves of *motion,* and were first fully demonstrated and described by Sir Charles Bell.

It is sometimes the case in disease, that persons lose only the power of motion, or only the power of feeling, in different parts of the body, and sometimes they lose both.

A sailor, Francisco Cesario, at Rio Janiero, fell from a scaffold twenty feet high, and was at first quite unconscious. On recovering, it was found that the two sides of his body were paralyzed in different ways. The left side, from the shoulder down, lost all power of *motion,* but could still *feel* as well as ever; the right side, on the contrary, could *move* perfectly, but had *no sensation!* Even when a sharp instrument was plunged deep into the flesh, he felt no pain. From the middle of his neck upwards, both feeling and the power of motion were as perfect as ever, and the line between this perfect part and the paralyzed parts below, was so sharp that it could be covered by a thread.

In some animals a simple circle, of a ganglionic centre, and two cords form the whole nervous apparatus. In others there are many distinct circles. Thus in the *star fish*, there is a *circle* of ganglions, round the mouth, which is in the centre, and one of these ganglions belongs to each arm, or ray, along which run afferent and efferent fibres connected with that ganglion.

Each arm, therefore, has its own nervous circle, but still they are all connected together, so that an injury done to one is at once felt by all the others,

The higher the animal is in the scale of organization, the more complicated becomes the nervous system. Thus in man we have the brain, the spinal marrow, and numerous ganglions, each being an independent centre of nervous power, connected with particular organs, and yet all are more or less connected together. The simple circle is seen in voluntary muscular action, as shown in the case of the man burning his hand ; but, in the performance of the various bodily functions, the different organs are so connected together, directly or indirectly, that usually one excitation of nervous power leads to many others, and the process becomes obscured.

There are afferent and efferent nerves proceeding from the spinal marrow, as well as from the brain, and also from many small ganglions lying outside the spine. Now some parts are connected, by their nerves, with these ganglions only, and may be excited to action from them without any consciousness, or true sensation.

Reflex Nervous Action.

When an action is thus excited without sensation, or ordinary feeling, and without *conscious* respondence, but only in unconscious response to external stimulation, it is called a *reflex action*, or sometimes *exciti-motor*.

Reflex is not a good term to employ, however, because, in one sense, all actions are reflex which result from the operation of a nervous *circle*, whether there be sensation and consciousness or not. The external impression is conveyed to the nervous centre, and is *reflected back* in all muscular action, as in the case of the man with the burnt hand.

In cases where action is excited by nervous influence, without sensation or consciousness, *exciti-motor* is a better term, but *reflex* is commonly employed.

The simple nervous circle, such as is found in animals of a low type, chiefly serves to bring the different parts of the organization into relationship with each other, and to make them act co-operatively.

And in these beings most nervous actions are simply *reflex* or *exciti-motor*.

Velocity of Nervous Impressions.

Mr. W. F. Barrett communicates to the *Intellectual Observer* for June, 1866, a paper "On the Velocity of Nervous Impressions," from which the following are extracts:

"What, then, is the result of the investigations of Helmholz, on the velocity of the nerve force? It is one which, at first sight, is most astonishing; for the rate of propagation, compared with other forces, is extremely slow. The velocity of light is about 190,000 miles a second, and of electricity, even more; but the velocity of the nerve force is only 90 feet a second, one-twentieth of the velocity of a cannon-ball, about one-thirteenth of the velocity of sound in air, and about equal to the speed of an express train. No sensible difference was found between the velocity in the nerves of a man, and in those of a frog, and other animals. In a creature so long as the whale, the rate of nervous transmission becomes very perceptible, when the extremities have to be moved.

"The fact of a harpoon having been thrust into the tail of a good-sized whale, would not be announced in the brain of the creature till a second after it had entered; and, as it would take a little more than another second, before the command to move its tail would reach the appropriate muscles, a boat's crew might be far away before the animal they pierced began to lash the sea.

The nervous force travels more slowly when the nerves are submitted to a low temperature, than when they are influenced by a high one. Besides the time required for the transmission of a stimulus through the nerves, the mind takes a certain period to form a conception, and then to prompt the limbs to act accordingly. This time, measured by a similar method, has been found to be about one-tenth of a second. The passage of a rifle bullet through the brain would not occupy more than one-thousandth of a second, a stroke of lightning would pass through the body in much less time, and thus a person killed, by either of these means, would die without consciousness having time to be produced. The placid aspect of those who have thus died, goes to prove that no pain was felt, prior to the insensibility which followed the shot."

The speed of the nerve current being greater when the body is warm, than when it is cold, explains why extreme cold benumbs—it completely stops the nerve current. It also explains why the current is slower in winter than in summer.

Specific Nervous Centres.

In the higher order of animals, however, and especially in man, there are certain masses of ganglionic nervous matter, distinct from those concerned in simple reflex action, although connected sympathetically with them. The *brain* is the type of these specific centres, and its function is to elaborate *thought*, to originate *consciousness*, and excite voluntary motion. The product of its action, in short, is *mind*, in the widest acceptation of the term.

The brain is connected with every other part of the nervous apparatus, and exerts a controling, guiding, and directing influence over all. The ordinary ganglionic nervous circle may exist, even in human beings, without any brain, and all the vegetative functions may be carried on without it, but there can be no *consciousness*, nor voluntary motion exhibited when the brain is absent.

Human infants have been born without brains, as before stated, and have lived for some time, simply by the action of the vegetative organs.

Although the brain thus plays such an exalted part in the life process, still there is nothing remarkable in its structure or connections. It is merely a mass of ganglionic nervous matter, with afferent and efferent nerves going to and coming from it, the same as any other ganglion. Its more exalted power probably depends upon its larger size, and more perfect development, and, perhaps, upon a more perfect organization.

The Special Senses.

Directly connected with the brain are the organs of the special senses—sight, hearing, smelling, tasting and feeling. Afferent and efferent nerves connect each of these organs with the brain, making a complete nervous circle, and it is only by their action that we gain our ideas of the external world.

To give a familiar illustration—a ray of sunshine suddenly strikes the eye, and makes an impression, which the afferent nerves convey at once to the brain. The brain takes cognizance of the sensation, and sends down the efferent nerves a message to the muscles of the eyelids, which immediately close to shut out the sunshine. If the afferent nerves were cut through, no sensation would be conveyed to the brain; and if the efferent nerves were cut, no message could go to the eyelids, and they would remain open.

All the other senses act in the same way, by a simple nervous circle, which connects the brain with the special organ.

Similarity of the Nervous to the Electric Power.

Of the *nature* of the *nervous power* we know nothing certain. It, however, presents many analogies with electricity, and many eminent physiologists have considered them to be identical. Many well-known facts lend great probability to this theory, though there are some that seem opposed to it. An electric current sent along an afferent nerve excites sensation in the brain, whether it be sent from the terminal fibres or from the middle of the trunk. In like manner, if an efferent nerve, (nerve of motion,) be disconnected with the brain, and connected with an electric battery, the electric current will cause contraction, in the muscles which that nerve goes to, just the same as if it were still connected with the brain, and receiving the ordinary nervous current. And, if either of the vital organs, the stomach, for instance, be weakened in its action, by having its proper nervous influence cut off, an electric current sent along the proper nerves will cause it to act just as the nervous current did. The electric current, therefore, performs the work of the nervous current, and in the same way. Even after death, as is well known, the electric current will restore all the functions of the body, in almost their full power. Under its influence the dead man opens his eyes and his mouth, and moves his limbs, his heart contracts, his lungs breathe air, and the secretions take place as in life. Whether there be consciousness, or sensation, we do not know, but there seems good reason to suppose that there may be.

Conversely to this, the brain can be so disposed as to act the same as a galvanic battery, and produce a real electric current, which can be used for chemical decomposition, or for sending messages by telegraph.

To a great extent, therefore, the nervous and electric currents resemble each other, and may be made, reciprocally, to do each other's work ; but whether they are really *identical*, we do not certainly know.

It may be remembered further, as bearing upon this point, that the electric current always results from chemical decomposition, and the nervous current, in all probability, does the same. The constant decomposition, and recomposition, of the material of the body, which is perpetually going on, especially in the great nervous centres, is a chemical process, as truly as the solution of the zinc in a battery. If these changes are arrested. there is no nervous power; if they take place rapidly, the power is evolved so much the more rapidly ; just as the power of the galvanic battery is increased, or decreased, by the slow or rapid decomposition of the zinc.

Spontaneous Nervous Action.

In all animals without brains, or who have them merely rudimentary, the actions are entirely reflex, and result from the action of a simple nervous circle. Some stimulant excites the afferent nerves, (nerves of sensation)—the sensation is sent to the ganglion, and the reflex action comes back through the efferent nerve, (nerve of motion). And this is the case, as before explained, in many instances, even in the human being.

Where there is a brain, however, and consequently consciousness, thought, and emotion, we may have *voluntary motion,* and direct nervous influence, without any reflex action whatever. Thus a man feels an impulse to do many things, and does them, merely from a mental impression, a thought, or an emotion. He simply *wishes* to do a thing, and does it. The impulse is then in the brain itself, and does not originate directly from any external impression. There has been no sensation conveyed by an afferent nerve at all, so far as can be ascertained, and yet the influence has gone from the brain down the motor nerve, the same as if there had been.

In such cases the act seems spontaneous, and we see that, in animals with brains, the nervous influence may be caused to act on the different organs in two ways, namely, by external impression, or by internal spontaneous impulse, mental or moral; that is, either by *thought* or *emotion!*

This shows how mere mental action or powerful emotion may affect the vital organs; and explains the effect of over-study, of mental trouble, fear, and other powerful emotions. The mere directing the thoughts to any organ will frequently excite it to action, as is well known in regard to the sexual organs. The *thought* may excite the organ; and, conversely, a certain condition of the organ may excite the thought. In beings without brains, if there be such, there can be no spontaneous nervous action, but everything results from external impulse only. This is apparently the case also with ourselves, in the early stages of our existence, and always so with complete idiots, in whom the brain is too imperfect to originate thought. It is a question, however, if any perfect animal, even among the lowest, is entirely brainless. On the contrary, as will be shown further on, there is every reason to believe that all have brains, but different in size and development. Insects, and even animalcules, have apparently brains, and consequently *mind*, as will be shown.

It should be remarked, in conclusion, that mental, and emotional impulse, though apparently spontaueous, in all probability result from changes in the brain itself, or from some influence affecting it from without which we are not yet able to detect.

CHAPTER IV.

DEPENDENCE OF THE NERVOUS POWER UPON CHEMICAL ACTION—NECESSITY FOR SLEEP OR REST.

The Nervous Power and the Blood.

ALL manifestations of nervous power are entirely dependent upon the blood, or, in other words, upon *nutrition!* Every part of the apparatus forming the nervous circle may be perfect in *structure,* as far as can be ascertained, and yet it may be totally inactive. If there be not a sufficient supply of pure arterial blood circulating in the blood-vessels of the nervous system, there will be no nervous power.

The reason of this will be obvious from what has been before explained. Nervous power results from chemical changes in the nervous substance; such changes resulting from the decay of old vesicular and fibrous matter, and the formation of new. The more active the nervous system is, the more rapid will be the waste and re-formation, and, consequently, the more regular and perfect must be the nutrition.

As before stated, however, the change is not so great nor so rapid in the conducting *fibres,* as it is in the vesicular ganglions, because these produce the nervous power, while the fibres merely conduct it; but still, with both, there is needed the constant presence and active circulation of pure arterial blood.

The amount of blood needed by the great nervous centres, and especially by the brain, is enormous, and any stoppage of the supply is immediately followed by the most serious consequences. If the circulation of the blood through the brain be stopped, for a moment only, the person becomes insensible—losing all consciousness and power of motion—nor can restoration take place till the blood again circulates through the brain.

Sir Astley Cooper showed this fact by an experiment on a dog. He tied both the carotid arteries, which take the blood to the brain, and at the same time made a pressure on the large vessels passing down the spine. Insensibility came on immediately, the dog falling down powerless, but with some convulsive movements. The brain was completely paralysed, but the spinal marrow only partially so. On removing the ligature, and allowing the blood to circulate again in the brain, consciousness returned, and voluntary muscular power, so that the dog stood on his feet again. The spasmodic motions also ceased. This was proof of the dependence of nervous power on the circulation of the blood through the nervous centres.

In ordinary *fainting* or syncope, the heart fails to act with sufficient force, and consequently the blood is not propelled to the brain, and spinal marrow, in sufficient quantity. The consequence is, that there is a more or less complete loss of consciousness and power of motion, constituting what is called a fainting fit. Directly the heart begins to act with more force, and the blood circulates through the brain and spinal marrow more quickly, the swoon or fainting fit passes off.

The familiar accident of one of the limbs *going to sleep*, as it is termed, when pressed upon in a certain position for a long time, is another illustration of this fact. The continued pressure prevents the circulation of the blood in the small vessels, which nutrify the ultimate fibres of the afferent nerves; and, in consequence, they have no power to convey any sensation to the brain. While the limb is thus asleep, it may be pinched, or cut, without causing pain, because the afferent nerves have no conducting power. But immediately the circulation recommences, the feeling returns, because the nerves again receive their proper nutrition.

The opposite condition, or a too rapid circulation of the blood through the nervous centres, causes a nervous state exactly the reverse of fainting, or unconsciousness. Thus, in *congestion of the brain*, or *determination of blood* *to the head,* sensation becomes more acute, and the mind restlessly active, till delirium sets in. If the spinal marrow be congested also, there will be great excitement of the nerves of motion, causing *convulsions.*

People of *sanguine temperaments* are more restless, and energetic, than others, because with them the circulation of the blood through the brain is naturally more active. Exciting emotions will drive the blood to the brain, causing *heat,* and subsequent exhaustion, or headache. Intense mental application does the same, and hence the great injury that is often done to children, by making them study too long, or too hard, while the brain is young and imperfect. By such a practice its growth is stimulated, out of all proportion with that of the rest of the system, and its development consequently is forced, and imperfect, entailing mental feebleness in future years, and probably disease and suffering, if not untimely death. Thousands are yearly sacrificed in this way, through the ignorance of teachers and parents, or to gratify a foolish vanity. People who would denounce the *cruelty* of forcing a child to try to carry a man's burden on its *back,* will, nevertheless, try to force it to carry a man's burden in its *head,* which is both harder to do, and more hurtful.

It must be remarked further that not only must the nervous system have a constant and abundant supply of blood, but that blood must be in a state of *purity,* or it will not serve the purpose. *Impure* blood, instead of stimulating and strengthening the nervous system, deadens and weakens it, and will finally destroy its power altogether.

When a person is suffocated, death results mainly from the circulation of impure blood through the brain. The process of healthy breathing removes, from the impure venous blood, the poisonous carbonic acid with which it is charged, and which is peculiarly hurtful to the brain. But when breathing is prevented, this poisonous carbonic acid is, of course, retained, and death results from it just the same as if the individual had breathed the fumes of charcoal. The *poisoning* takes place in the one case from *taking in* the deadly matter, and, in the other case, from preventing its being taken out—the result is the same in both cases.

The first symptoms of poisoning by carbonic acid are, usually, a gradual deadening of consciousness and sensation , which, if pure air be not now breathed, increases till total unconsciousness results, with loss of all sensation—a state of temporary death, in fact.

This is always felt, more or less, by those who breathe the air of crowded or ill-ventilated rooms. First, there is felt a dull, heavy sensation in the head, with inability to attend to, or understand what is going on. Soon the limbs begin to feel tired, and the power of motion is lessened, till finally fainting comes on. This all results from breathing carbonic acid, given off by the breath of those present, and is often met with in badly arranged schoolrooms, as well as in churches and public halls.

The more active the brain is, the more blood it needs, and the purer it should be. In a school, therefore, this is especially important, and yet is too generally neglected. It is common enough to see the poor children with heated faces, aching heads, languid limbs, and dull brains, yet compelled to *study*, and punished for not being bright and ready at their work. It is just as absurd to expect the brain to be capable of proper effort, in such circumstances, as it would be to expect a man to labor hard, who had been kept a long time without food, and forced to take weakening drugs at the same time.

In fact, the evil from breathing impure air is twofold —the brain is both poisoned and starved. It is deprived of the pure blood, which it needs for nutrition, and is supplied with noxious matter instead.

In several diseases also, poisonous matters are found in the blood, and, by being carried to the brain, produce symptoms similar to those described above.

Thus, when the *bile* is in too large quantity, or is not properly used up, it is apt to pass into the circulation, and so reaches the brain, giving rise to symptoms very similar to those which result from breathing impure air. This is why *bilious* people are dull, lethargic, and drowsy ; their brains are oppressed by the poisonous biliary matter.

The same thing also may result from some forms of *kidney disease*, in which the hurtful matters that should pass away in the urine, are retained, and pass into the blood.

Some of these poisons mostly affect the *brain*, and, according to their nature, either cause simple unconsciousness, or wild excitement, with delirium or furious mania. Other poisons affect the cerebellum or spinal marrow most, causing either perverted sensations, and convulsive excitement of the muscles, or total insensibility and utter powerlessness.

It is more than probable that a large number of nervous diseases, and those of the most troublesome kinds, are caused either by deficiency of pure blood in the nervous system, or by the actual presence in it of poisonous matters.

These poisons, it must be borne in mind, may not be taken into the body, but engendered in it, by natural processes, by the action of disease, by improper food or drink or by imperfect digestion, assimilation, and secretion.

Chemical Action the Source of Nervous Power.

The quantity of blood circulating through the nervous system, and especially through the *brain*, is much more than is needed for the mere purpose of ordinary nutrition. The mutual changes which are effected between this blood and the elements of the nervous substance are, in fact, active *chemical reactions*, similar in character, as stated before, to those that take place in a galvanic battery. The elements of the nervous tissues are, in fact, rapidly oxidized, or burnt, by the oxygen of the blood, and this oxidation is the source of the *nervous power* ; just as the oxidation of the zinc, in the battery, is the source of galvanic power.

The circulation of the blood through the nervous system serves, therefore, a double purpose ; it both keeps up the necessary nutrition of the nervous substance, and also engenders the nervous power, by the active oxidation which it causes in that substance.

The two processes, waste and repair, or destruction and reconstruction, are perpetually going on ; and it is from the process of *destruction*, (or oxidation,) that the nervous power results.

A man with an active mind, therefore, works up a large amount of brain; and if his nutrition is not correspondingly active, he must decline, both in substance and in vigor.

Mind means *brain*, and brain results from pure oxygenated blood, which is the product of good and abundant food, good digestion, and the breathing of pure air.

Yes! talk as we may about the *exalted mind*, it all comes down to good food, pure air, and a healthy stomach at last.

It is of the utmost importance that human beings should recognize the fact, and act upon it, that *mind* is merely a *function* of the *body*, and is, in no sense whatever, independent of it. Just as good *digestion* depends upon a *healthy stomach*, so does good *thinking*, and all other mental operations, depend upon a healthy *brain!*

"Pure Air and Exercise.—Thus, the oxygen of the hills wisely breathed; the food of the hills wisely eaten; the waters of the hills wisely, that is, sparingly, drunk, but freely used as plunge and douche, in lake and cataract; the light and warmth of the sun; the muscle's action and the brain's repose, lift a man from the very sediment of life to this moral and æsthetic height, and even tap the closed springs of religious emotion. Blessed are the uses of Materialism! Wise men know this, and act upon their knowledge. During the last session of Parliament, for example, a statesman whose bared head Phidias, in passing, would have turned twice to look upon, practiced daily upon the bicycle. There was a mystic value in this morning rite—it was a fresh illustration of the connection of Physics with Intellect, Will and Emotion. We begin here with mechanics, and from the rhythmic motion of a pair of legs and treadles, pass on to the expanded chest, the quickened circulation, the freshened brain; and thence in unbroken sequence to those finer essences which descend as sweetness and light on the House of Commons, or fall, like the honey from Chrysostom's lips, in the presence of a deputation. Thrice blessed, surely, in this case, for us and him, are the uses of Materialism! Mind, like force, is known to us only through matter. Take, then, what hypothesis you will—consider matter as an instrument through which the insulated mind exercises its powers, or consider both as so inextricably mixed that they stand or fall together ; from both points of view, the care of the body is equally important. The morality of clean blood ought to be one of the first lessons taught us by our pastors and masters. The physical is the substratum of the spiritual, and this fact gives to the food we eat and to the air we breathe a transcendental significance. Boldly and truly writes Mr. Ruskin, ' Whenever you throw your window wide open in the morning, you let in Athena, as wisdom and fresh air at the same instant ; and whenever you draw a pure, long, full breath of right heaven, you take Athena into your heart, through your blood ; and with the blood into thoughts of the brain.' No higher value than this could be assigned to atmospheric oxygen."—*Professor Tyndall, in the "Fortnightly Review."*

Correspondence between Mental Work and Heat.

It has long been known, even as a familiar fact, that muscular exertion causes heat, and we habitually exercise to warm our bodies. In this case motion is transformed into heat. It is not so generally known, however, that *mental* work causes heat, as certainly as muscular work, but such is the fact, and Dr. J. S. Lombard has proved it by direct experiment. He adapted to his head some specially arranged, and very delicate instruments for measuring temperature, and then set himself to observe. The result was that the heat, in the head, was always in proportion to his mental activity. When perfectly quiet, torpid, and not thinking, the temperature fell, and rose again directly anything engaged his attention, and set him thinking. If agitated, or excited, the temperature rose much higher, showing that emotion affected it even more than mere thought. In short, his experiments proved, as might have been anticipated, that the amount of heat produced is in direct proportion to the activity of the brain ; and thus we see that mental work, as well as muscular work, is changed into heat, as a result of chemical changes in the blood.

Conversely to this, if the brain become heated from organic changes, as in fever, it sets actively to work, and may be excited even to delirium. In this case the heat causes, or is changed into thought, or mental work; being first caused itself by chemical action.

The headache, burning brows, and bloodshot eyes of the too close student, or worrying man of business, are thus easily accounted for; the excessive mental work is changed into heat, and the brain may be literally consumed, by the fire which its own intense action has kindled and fed.

Necessity of Rest to the Nervous System.

In a state of mental activity, the process of oxidation of the nervous substance,—or, in other words, its chemical decomposition,—from which the nervous power results, is more rapid than the process of *nutrition;* and if there were not some way of compensating for this, the nervous apparatus would soon be exhausted. This exhaustion is, however, prevented by a spontaneous tendency to *rest*, at regular intervals, by *sleep!* the tired brain gradually ceases acting, and becomes torpid, during which state but little waste, if any, takes place, but the process of nutrition still goes on. On waking, therefore, the brain is restored again to its old state, and can work for another period, till exhaustion comes on again, and another period of rest is required.

Some parts of the nervous system, however, never rest, but, in a state of health, constantly waste, and repair, exactly alike. This is the case with the nerves and the ganglions which act upon the *breathing apparatus*, for this must never stop, but go on always the same, whether we are sleeping or waking. In every part of the nervous system, also, where this constant action is needed, the waste and repair are always equal, and no rest is called for.

The brain is not thus needed to be in *constant* action, because none of the vital organs are entirely dependent upon it; and therefore it can, when necessary, pass into a state of perfect repose, without any of the vital processes being, in consequence, interrupted. This necessity for rest to the brain, in the form of sleep, is experienced with tolerable regularity about every sixteen hours, and the time spent in sleep averages from five or six to eight or nine hours out of every twenty-four.

This necessity for regular rest to the brain need not be wondered at, when the work it does is understood, and the destruction of nervous substance which that work causes.

Not only does the brain originate all the busy thoughts that fill the mind, during the working hours, but it also has to take cognizance of all the sensations, to attend to all the bodily wants, and to find power for all the voluntary motions that are performed. In short, it is never at rest for a moment while the individual is awake, but is all the time attending to a number of different things at once, each one requiring more or less expenditure of nervous power.

Now, this incessant action of the mind,—this incessant giving out of nervous power,—all results from the actual destruction of the *substance* of the brain, by the chemical process of *oxidation!* Every thought that springs up, every sensation that is felt, and every voluntary motion that is performed, each and all *burn up*, or consume, more or less of the brain matter! This matter, it is true, is replaced by the process of *nutrition*, but not so rapidly as it wastes. In some fifteen hours, on an average, the waste has so much exceeded the repair that the brain begins to be exhausted, or worn out, and sleep is required.

During healthy sleep the brain entirely rests,—thoughts are not produced, except imperfectly, sensation is dormant, and there is no voluntary motion. The waste of the brain matter is therefore suspended, *but nutrition goes on*, and now gets ahead of the waste; so that, on waking, the individual finds his brain restored to its original state, and he can again think, feel, and move, as before. Sleep is required, therefore, to give opportunity for restoration of the nervous substance, which has been exhausted during the waking hours. Some parts of the nervous apparatus, as before explained, are always at work, and never need rest, because with them the waste is small, and is exactly made up by nutrition, so that they never need *go to sleep!* This is the case with those parts that influence the vegetative or vital organs, because these must never stop, but go on with their work all the time, sleep or awake.

Rest, or sleep, therefore, is required especially by those parts of the nervous system connected with the *animal functions*, with sensation, thought and voluntary motion, all of which consume the nervous substance with great rapidity,—but particularly intense thought and strong emotion.

Every one is aware how exhausting mental work is, when too long continued, and how it necessitates prolonged sleep. The same effect also follows any powerful emotion, if long sustained.

Mental Work and Bodily Work Compared.

Prof. Houghton, of Trinity College, Dublin, has studied this matter, in order to find out which *kind* of work exhausts the most; and the result of his computations is, that *two hours* of hard mental work take away, from the human system, as much vital strength as is taken away by *a whole day* of mere *bodily* work! This shows how careful men should be, in working their minds, not to over-do it. And it also shows why they should combine bodily work with mental work, and alternate them.

When the term *working-men* is made use of, by demagogues, or by the laborers themselves, it is assumed that the only workers are those who work with their hands, but this is a great error, as the above will show. Many work harder with their brains, and exhaust themselves more, than any laborer can do by using his hands only. There are, however, very great constitutional differences in this respect in different people. Some need very much sleep, and feel exhausted with very little mental or emotional excitement. Others, on the contrary, can endure violent emotions, or continue powerful mental efforts, for a long time with but little sleep, and yet feel little effect from it. The old Napoleon was a remarkable instance of this kind. He could attend, for days and nights at a stretch, to the most complicated military, social and political affairs, all at once, taking a short nap now and then, *when he willed it*, and waking up to work again in an instant. This he could do, day after day, and night after night, without a sign of fatigue or mental weariness.

To most people sleep is an overwhelming necessity, and any attempt to do with less than is needed, by forcing the nervous system to work when weary, is sure to result in great injury.

The nervous system is sure to suffer if kept on the strain too long, with insufficient rest, in the form of sleep, especially in the young. Its *nutrition* is then imperfectly performed, and its *waste* becomes greater than its *repair*, in consequence of which it loses, in actual substance, and consequently in power. As a rule, children should sleep *all they are inclined to;* and should never be *roused up!*

In acute mania we often see astonishing mental activity, kept up for a long time with little or no sleep; but such a state is always followed, sooner or later, by a period of corresponding exhaustion; and, if this occurs too frequently, complete mental imbecility is sure to result.

Great and prolonged exhaustion of the nervous system, especially by powerful emotions, or by intense mental effort, is also frequently indicated by certain matters in the *urine.* On examining this fluid, in such circumstances, it is often found much loaded with certain salts,—*the Alkaline phosphates;* the bulk of which come from the nervous system, and they show that it is in a state of *decomposition.* Any great *worry,* or *wear* of the mind, is apt to be followed by this peculiar urinary loss, and it is always a serious indication. Men immersed in business, students, authors, and others whose minds are *hard driven* at certain times, will nearly always be found to thus lose nervous matter in the urine, at those times. Men addicted to sexual, and other excesses, also suffer in the same way, and thus arise numerous cases of softening of the brain, and mental imbecility.

In many cases when the brain has become weak, and the mind uncertain, complete rest alone, with plenty of sleep, will effect a recovery, but any attempt to use the brain *too soon,* in such circumstances, is nearly sure to be followed by discharge of the phosphates in the urine.

Directly this is seen, mental effort must cease at once, and strong emotion must be guarded against. Most acute diseases of the nervous system are followed by this loss of the phosphates in the urine, and the amount of the loss is usually proportionate to the intensity of the disease.

Hard work of the nervous system, especially of the brain, necessitates increased nutrition equally with hard muscular work. And when a man works prudently with a healthy brain, he needs food in proportion to his work, just as much as a man laboring in the fields does, in proportion to *his* work. All good healthy brain workers are hearty feeders, and generally good sleepers.

No man can long maintain prolonged mental effort on insufficient or poor food. Meagre diet makes meagre thought, and a brain merely *stimulated*, by alcohol, or coffee, for instance, may give out a few bright flashes, but is incapable of steady solid work.

Some substances, such as *tea*, and especially the *coca* plant, have the peculiar property, apparently, of arresting nervous waste; so that, while taking them, a man may do without food, and yet labour, mentally and bodily, without exhaustion. It is certain, however, that this cannot be done, to any great extent, without evil consequences following, as many have found out who have used such articles too much.

The same remarks apply to opium, and other narcotics, which act in a peculiar manner on the brain, but they will all be referred to more fully further on.

I regard the urinary deposits as very important indications, in Nervous Diseases, and always make a thorough examination of the urine, in all doubtful cases.

PART II.

DETAILED DESCRIPTION OF THE STRUCTURE, AND USES, OF THE DIFFERENT PARTS OF THE NERVOUS SYSTEM, AND OF THE WAY IN WHICH THEY ARE CONNECTED WITH EACH OTHER, BOTH ORGANICALLY AND FUNCTIONALLY.

CHAPTER V.

THE SPINAL CORD AND MEDULLA OBLONGATA.

Development of the Spinal Cord.

The spinal marrow, with the parts accessory to it, called sometimes the *spinal axis*, is described first, because it is really the foundation, as it were, of the nervous system. In some beings it is the chief ganglionic centre, and though in the higher animals the brain is superadded, yet still, even in them, the spinal marrow is most intimately connected with all the vital functions, and any injury to it is more serious, vitally, than an injury to the brain itself.

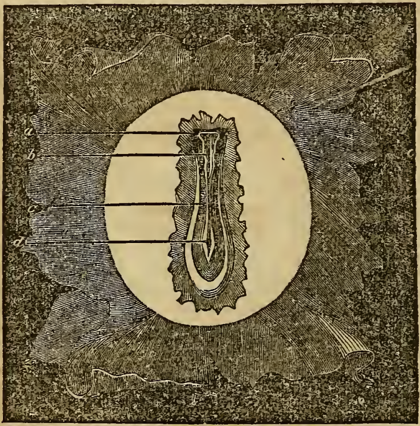
In studying the development of the nervous system, in the embryo, we find that the spinal marrow is the first part formed, and the other parts seem to grow upon, or from it.

Immediately after the female egg is impregnated, there forms in it, from the yelk, a globular body called the *germinal vesicle*, which is surrounded by a membrane, or skin, called the *germinal membrane*, and this eventually divides into two layers, one called the *animal*, or *serous layer*, from which originates the spinal column and nervous system, and the other called the *mucus*, or *vegetative layer*, from which originates the whole of the nutritive organs. The first indication of development is seen in the serous layer of the germinal membrane, in the form of a pale white line, called the *primitive trace*, which is the beginning of the spinal marrow. At first this is only a simple line, but soon the upper part thickens a little, denoting where the brain will be.

This is well shown in the following cuts:—

Plate IX.

THE PRIMITIVE TRACE, MAGNIFIED EIGHT TIMES.



(*a*) is the transparent portion of the impregnated germ, called the area pellucida; (*b*) is a thin membrane, called the dorsal laminæ; (*c*) is the primitive trace, or line denoting the very commencement of the spinal marrow.

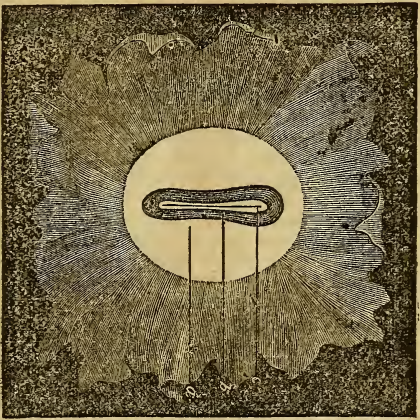
In the last plate it will be seen that the walls of the membrane, called the dorsal laminæ, are coming close together, and eventually the edges join, so that it forms a tube, which is the beginning of the spinal column, or backbone, in which the spinal marrow is enclosed.

As the rudimentary spinal marrow develops, it is seen to divide into four parts, or separate cords, and several globular vesicles appear on the upper part, which are the rudiments of the brain, medulla oblongata, and the organs of sight, hearing, and smell.

At first, the nervous substance is only like a thin

Plate X.

THE PRIMITIVE TRACE AT A LATER PERIOD; COMMENCEMENT OF THE BRAIN, MAGNIFIED EIGHT TIMES.



In this plate it will be seen that the upper end of the primitive trace, or spinal cord, is enlarging; at (*a*), showing the commencement of the brain; at (*c*), rudiments of the bones of the spine, or vertebræ; (*d*) is the lower end of the spine, or sacrum.

transparent fluid, but gradually it thickens, and then forms round each part a kind of skin, or membrane, which becomes, at a later period, the nerve tube, or vesicular capsule.

The parts above described are the rudiments or beginnings of the nervous apparatus, the other parts growing out of them, by degrees, as development progresses. The different parts of the brain, the sympathetic nerves, the ganglions, and the nerve fibres, all appear in succession, the spinal marrow being first.

The different stages of development of the nervous system, in the human embryo, correspond to the perfect states of the nervous system in the different orders of inferior animals. So that, at one period or other of its growth, the rudimentary human being resembles, in its nervous system, every kind of animal below it. At one period it has the nervous system of a fish, and at another that of a reptile, and so on.

In all the classes of vertebrate animals the nervous system commences in the same way, and the after-differences result from some animals stopping at one stage of development, while others go on to another stage. Thus some have, apparently, only a spinal marrow, and nerves connected with it, while others have an imperfect brain. In man the brain is more perfect than in any other animal, some parts being developed in it that are not found in the others at all, while some other parts, though common to other beings, are more fully developed in man.

The mental superiority of one human being, or of one animal, over another is entirely a result of brain development. In many animals, however, if not in all, there are portions of the brain merely *rudimentary*, but which are capable in extraordinary circumstances of being developed. Thus domestic animals have faculties developed in them, by breeding, and training, that they never show in a wild state, and this could never be done if they had not such rudimentary parts of the brain to act upon.

In the brain of man himself there are parts of which we do not know the use, and which, in fact, seem to be, at present, superfluous. These may be the rudiments of organs yet to be developed, and which, when in action, may make the future man as far above the most intellectual one, now known, as he is above the lowest ape.

Structure of the Spinal Cord.

Having traced the growth of the spinal cord, we will now proceed to describe its structure when fully developed.

The spinal marrow, or cord, is placed within the tube formed by the bones of the spine; it is oval, or elliptical in form, and is composed of two different kinds of matter; one white, which is the outside, and the other grey, which is in the interior. At the upper part it is connected with the brain, and in the fœtus it extends nearly the whole length of the back bone, but in the adult it terminates at what is called the first, or second, lumbar vertebræ, or just below the loins; the rest of the bone below, forming the sacrum, being then solid, is called the *Cauda Equina*, or horse's tail.

The cord itself does not quite fill up the tube, or space in the back-bone, but is rather suspended in it, as it were. The rest of the space, however, is not unoccupied, but contains the roots of the nerves, the sheath of the cord, some ligaments and blood-vessels, and also a peculiar liquid.

The subjoined figures will show the peculiarities of the form of the spinal cord:

FIG. 1. FIG. 2. FIG. 3.

Plate XI.—DIFFERENT VIEWS OF THE SPINAL CORD.

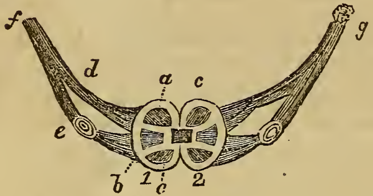
FIG. 1. A front view of the spinal cord.
FIG. 2. The hind view.
FIG. 3. This is intended to show how the cord is composed of two parts, or strands, which start from opposite sides, and cross each other, where they separate. Down each of these parts extend two *furrows*, which divide it into three parts, called the anterior, the middle, and the posterior columns; as may be seen in the figure.

It has already been explained that the outside of the spinal cord is composed of the *white* nervous matter, and the inside of the *grey*. The following plate will show the relative proportion of each, and how they are placed.

The cord, as already stated, is in two portions, one on each side, and these again are divided each into three, as will be shown by the plate.

Plate XII.

THE SPINAL MARROW CUT ACROSS.



(1, 2,) Are the two equal halves of the spinal cord—the right and the left. (*a*) is the anterior, or front column; (*c*,) the posterior or behind column—the middle, or lateral column being between them. The other side corresponds to this.

(*d*) is a nerve of *motion*, or *efferent* nerve, proceeding *from* the front or anterior column, and (*e*) is a nerve of *sensation*, or *afferent* nerve, proceeding *to* the posterior or behind column. They both unite at (*f*),—on this nerve of sensation is a *knot* at (*e*), which is a *ganglion*. The nerves on the other side correspond.

All the spinal nerves have these two roots, one anterior and one posterior, because they all have *sensiferous* fibres, and *motor* fibres.

The cord is enclosed in three sheaths, or membranes, the outer one called the *dura mater*, the middle one the *arachnoid*, and the inner one the *pia mater;* they exactly correspond to the three that enclose the brain.

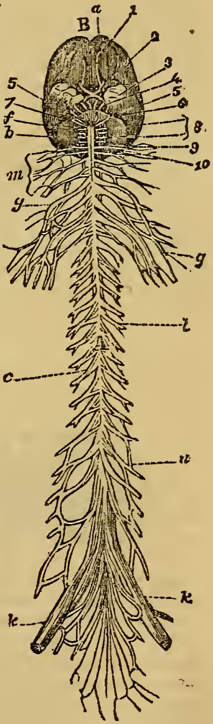
As before stated, the spinal nerves are all in pairs, and in each pair one is *sensory*, and the other *motor*. There are *thirty-one* of these pairs on each side of the spine, distributed to corresponding parts in the two like halves of the body. All the organs of animal life, as before explained, are symmetrical, and double, and the nerves connected with them are the same. The nerves connected with the vegetative organs, as will be shown further on, are irregular, both in form and manner of distribution, like the organs themselves.

Plate XIII.

THE BRAIN AND SPINAL MARROW, WITH THE NERVES PROCEEDING FROM THEM.

(A) the spinal marrow; (B) the brain; (*c*, *l*, *n*.) are spinal nerves, given off in pairs, on each side, from the spinal marrow. They are cut off short, but it can readily be conceived how they radiate all over the body, as shown in the frontispiece. (*g*, *g*,) are those nerves which proceed to the arms; and (*k*, *k*,) those that proceed to the lower limbs—the *figures* 1, 2, etc., indicate different parts of the brain.

At the very top of the spinal marrow, where it is connected with the brain, a number of nerves are to be seen which may be supposed connected with both; and which probably are so.



The white portion of the spinal cord is continuous with the white matter of the brain, and is composed, in a great measure, of the fibres of the spinal nerves, which are connected with it. but there are also independent fibres proper to the cord itself.

It was formerly thought that every one of these nerve-fibres continued straight up the cord to the brain, but this view is not fully supported by modern research. It seems more probable that they unite with the grey, or vesicular, matter of the cord itself, which is but a continuation of the vesicular, or grey matter of the brain.

The above plate shows the manner in which the spinal nerves proceed from the cord, and the way in which that is connected with the brain. The frontispiece also shows the same thing.

There are a few nerves, also in pairs, the origin of which cannot be exactly ascertained, and which are, by some physiologists, thought to be connected with the spinal cord, and by others with the brain ; so that the spinal nerves are sometimes reckoned at forty-one, and sometimes at thirty ; but usually at thirty-one pairs.

The regular spinal nerves all project horizontally from the spinal cord, or crosswise to the body, and none of them run lengthwise to it. They are usually reckoned at being *eight cervical*, or *neck* ; *twelve dorsal* or *back* ; and five or six *sacral*, or *pelvic*.

On inspecting the separate bones of the spine, in any vertebrat d animal, it will be seen that there are small round holes in every one ; and it is through these holes that the spinal nerves pass, from the spinal cord, to be distributed over the body.

Plate XIV.

PART OF THE SPINAL CORD, SHOWING THE NERVES PROCEEDING FROM IT.

This, being a front view, shows only the roots of the anterior nerves. From about 11 upwards is the medulla oblongata, which connects the cord with the brain.

(1.) The pons varolii, (2), roots of the fifth pair of nerves; (3,) the sixth pair of nerves; (4,) the facial nerve ; (5,) the auditory nerve, or nerve of hearing; (6,) the intermedian nerve; (7,) the glosso-pharyngeal nerve ; (8,) the pneumo-gastric nerve ; (9,) the spinal accessory nerve; (10,) the hypoglossal nerve; from 11 to 11, the eight cervical nerves ; from 12 downwards, the dorsal nerves ; (20,) the dentated ligament, which separates the anterior and posterior roots.

Most of these nerves will be shown better further on, when describing the brain.

Special Action of the Spinal Cord.

It has already been stated that each part of the nervous apparatus has some distinct use, or performs some particular function, though all the parts are connected, and co-operate together.

The spinal cord conveys to the brain any impressions made on the surface of the body, and also conveys back from the brain the influence by which the muscles are put into action. If a hot iron touch the body, in any part, one of the nerves of sensation at once conveys the sensation to the spinal cord, by which it is sent *up* to the brain; the brain then sends a message back, *down* the cord, which is transmitted, by one of the nerves of motion, to the muscles, which move the part away.

A familiar illustration of this may be given in the case of a mosquito bite. One of these insects alights on a man, and inserts his venom in the wound he makes, causing a *smarting sensation*, which is instantly conveyed along a nerve of sensation to the spinal cord, and by that up to the brain. The brain then instantly sends a message down the spinal cord, and from thence along a nerve of motion, to the muscles of the arm, which is immediately raised to crush the offender, or drive it away.

If the nerves of sensation around the bitten part were cut through, the bite would not be felt. And if the nerves of motion going to the arm were cut through, it could not be raised to drive the mosquito away, though its bite might be felt acutely.

There is no fact in physiology more interesting than this, of the double nature of the spinal nerves, and there is no fact better demonstrated. All the *anterior* nerves, or those coming from the *front* part of the cord, on each side, are nerves of *motion*, and all the *posterior* nerves, or those coming from the *back* part of the cord, on each side, are nerves of *sensation*.

If the spinal cord be cut through, or seriously injured, in any part, as before explained, all the parts *below* the injury lose their connection with the brain, and, consequently all *feeling* and power of voluntary motion; while the parts *above* the injury can still feel and move as before, because they are still in connection with the brain.

In such cases, however, the part of the cord cut off from the brain still exercises an influence, through the nerves, on many of the vital organs, and can even cause *motions*, but they are quite involuntary, and unconscious, because the brain has nothing to do with them. *Reflex* action occurs in such circumstances.

If one half of the cord only be injured, it may affect only that side of the body, and the injury may be such as to destroy only sensation, or only the power of motion, or both. And it may even happen that sensation, or feeling, may be lost on one side, and the power of motion on the other, as in the case of the sailor, described in another place.

In *paralysis* there may be loss of motion, or feeling, or both, either on *one side* of the body, (Hemiplegia) or in *the whole* of the body, from some point in the spine downwards, (Paraplegia). And such an affliction may arise either from injury, or from changes in the spinal cord itself, from disease, or from the pressure of a small *clot*, or swelling, in one of the blood-vessels.

The spinal cord also transmits impressions *across* its substance, as well as up and down it. Thus, if it be cut half through on *both sides*, with some distance between the cuts, impressions may yet pass along the intermediate part, probably by means of the vesicular matter.

It appears also that sensations usually pass *crosswise* along the spine; that is, if an impression is made on any part of one side of the body, the resulting sensation reaches the brain by the *opposite* half of the cord, and not by that half on the side where the impression was made. Owing to this peculiarity, if the spinal cord be injured on one side, so as to destroy sensation, the loss of sensation is experienced, not on the side of the injury, but on the *opposite side.* The same is the case with the brain, the effects of such an injury being felt in the opposite side, and not in the side injured.

Impressions may be sent to the spinal cord, and motions may be excited by it in return, without the brain being concerned in them at all, as before explained. These are called *reflex* actions, and they are essentially unconscious. The act of swallowing is an instance of this kind. When a portion of food touches the top of the throat, it makes an impression, which is conveyed, by sentient nerves, to the spinal cord; and from thence comes back, instantly, the influence which sets in motion the muscles that accomplish the act of swallowing. All this is quite involuntary, and may take place unconsciously—it is simply a reflex action. We masticate the food and send it to the back of the mouth, *voluntarily* and *consciously*, but when it once gets there the swallowing muscles act *involuntarily*, by reflex action, and we could not call the food back if we tried, when it gets to a certain part of the throat.

Breathing is also an involuntary, or reflex action, and cannot be prevented, for any length of time, by an act of the will. There is also much constant, necessary muscular action, in many of the vital organs, that is purely reflex,—involuntary, and unconscious. The constant peristaltic motion of the bowels, and the perpetual contraction of the sphincter muscle, are instances of this.

There are also some motions that may be either voluntary or reflex. Thus, the generative organs may be violently excited, by licentious thoughts, and they may also be involuntarily excited, by reflex action, from the testicles being overcharged with semen,—from the influence of drugs,—or even from a full bladder.

In this case the involuntary reflex action may react upon the brain, excite a libidinous consciousness, and lead to voluntary gratification.

In some cases actions that are usually thought to be only voluntary, may be performed from reflex action only. Thus, if a frog's head be cut off, he will stand up on his legs as before, and will shrink away if his skin be irritated. And if a chicken be beheaded, it will often run a considerable distance afterward. Now, these motions are caused solely by reflex action from the spinal cord, the brain, of course, having nothing to do with them; they are therefore involuntary and unconscious,—there can be no knowledge of them, nor any sensation with them.

Many cold-blooded animals exhibit these reflex actions in a remarkable degree, but they also occur in human beings. Thus, if the finger be pressed on the palm of a sleeping child, it will often grasp it instantly, and firmly, without waking,—the action being simply reflex.

Natural reflex operations of the spinal cord, such as breathing, never cease during life, but they never cause fatigue. All voluntary actions, however, which occur through the brain, cause fatigue, sooner or later, and can only be kept up for a time, after which there must be rest, and sleep, to give the exhausted brain time to replenish its power.

In some cases of disease, and under the influence of certain drugs, the cord may be unduly excited, so that the resulting reflex motions may be of the most violent character. Thus, in lock-jaw, (tetanus), an injury to some part of the surface of the body may so excite the spinal cord as to cause the most forcible muscular contraction, especially of the jaws, so that the patient cannot open them. Strychnine will also act in a similar manner, and cause most violent convulsions.

All such actions are simply reflex, and though they are usually confined to the cord, yet the brain may also become affected, as in hydrophobia.

It should be observed here that the anterior, and posterior, columns of the spinal cord partake of the nature of the nerves connected with them; that is, the anterior, or front column, is motor, and the posterior, or rear column, is sensory. If the anterior portion of the cord be irritated, it causes *motion* in all the parts below, which receive spinal nerves; and if the posterior portion be irritated, it causes *pain* in the same parts.

If the posterior part of the cord be cut through and the two parts irritated, it will be found that pain will be felt only from the *upper* portion, because that is the only one connected with the brain, and the course of influence is *upward* in the posterior column.

If the anterior portion of the cord be cut through, and both portions irritated, motion will take place only in the *lower* part, because the nervous influence only proceeds *downwards* in the anterior column.

Usually, however, in such experiments, motion and sensation, to some extent, occur together, probably from reflex influence in the cord itself.

From these explanations it will be seen that the spinal cord is, in some relations, a primary source of nervous power, and is independent of the brain. But still they are so connected that each influences the other, and especially the brain influences the spinal cord.

So much so is this the case, that many of the spinal-functions can be controlled, or influenced, at will, through the action of the brain. There are some animals that have no brain, or only a merely rudimentary one; and, of course, in them all the functions are carried on by the action of the spinal cord alone, but they are merely vital, or vegetative functions. In sound sleep it is the same in man. The brain is then perfectly inactive, but all the vital functions still continue, through the influence of the spinal cord.

This explains how a fœtus may be born, and live, without a brain. Such a being has no consciousness, nor conscious sensation, but lives like a vegetable; needing no other nervous influence than that from the spinal cord.

The Medulla Oblongata.

Between the brain and the spinal cord is a peculiar body of nervous matter called the *Medulla Oblongata*, which is connected with the cord below and with the brain above. It is composed of the medulla proper, and of a number of variously-formed bodies, all connected together, the special functions of many of which are not known. These different parts are represented in the following plates, which represent the medulla, and the connected parts, from different points of view.

It is quite possible that some of these bodies, and some others in the brain, whose uses are unknown, are rudimentary organs, which may yet be developed, and evolve *new faculties* in man, different from, and superior to, any he now possesses.

It is probable that man has thus been developed from some inferior animal, by the gradual evolution of organs which inferior beings possess, but only in a rudimentary state.

There are many questions in which man now feels a deep interest, which he is utterly incapable of comprehending, any more than a horse can comprehend mathematics. The future man may, however, comprehend them, and even matters still more abstruse than any we now puzzle over. It is only a matter of *brain*, and as the brain of man is merely a more complete development of that of the ape, so may the brain of the future man be only a still more complete development of the present human brain.

The medulla oblongata proper commences at the fissure (8) in Fig. 1, (Plate XV.) and goes downwards, till it insensibly passes into the spinal cord. All the other parts are placed on the top of the medulla.

Special uses of the Medulla Oblongata.

The medulla oblongata may be considered as the termination of the spinal cord, or as the connecting link between it and the brain. The general functions of some of its parts are the same as those of the several portions of the cord. Thus, the anterior pyramids, and the olivary tracts, are like the anterior portion of the cord, and convey from the brain the influence that causes motion. The posterior pyramids, like the posterior portion of the cord, convey only sensation.

The medulla is, however, a nervous centre itself, and from it originates the nervous power that influences breathing and swallowing. Experiment has shown that the brain may be removed from an animal, and even the spinal marrow destroyed up to the neck, without causing death, providing the medulla oblongata be uninjured. Immediately this part is seriously hurt, however, death ensues because the power of breathing is lost, owing to there being no nervous influence evolved to set the requisite muscles in action.

It is the medulla oblongata that is injured when a man is *garroted,* as practised in Cuba. The victim is seated in a chair, with a kind of iron collar round his neck, through which, behind, works a powerful screw, with a sharp point. This point is placed against the back of the neck and one turn of the screw forces it into the medulla oblongata. If the point be rightly placed death is instantaneous.

Some forms of difficulty of breathing arise from disease of this part of the nervous system, and are attributed to disease of the lungs. Difficulty of swallowing may also arise from the same cause, because the process of swallowing, as well as breathing, depends upon nervous influence from the medulla oblongata. The power of speech may also be similarly affected.

Being an independent nervous centre, the functions of the medulla oblongata can be carried on unconsciously, and involuntarily, by simple reflex action, and thus we breathe, and swallow,—the saliva, for instance,—while we are asleep. Still it is connected with the brain, and we can influence both breathing and swallowing, to a certain extent, by an act of the will. We can stop breathing, but only for a time, because the necessity for air soon becomes too urgent to be longer resisted Breathing, therefore, is not a *voluntary* act, but can be partially influenced by the will, for a time. No man could hold his breath long enough to die from it, because the reflex nervous action would compel him to breathe in spite of his will.

Medicines which affect the brain, or spinal marrow, may not affect the medulla oblongata ; and thus a person may become quite insensible, from chloroform, for instance, and yet keep on breathing, because the drug paralyses only the brain. Some drugs, however, do affect the medulla, and cause difficulty of breathing, or swallowing, and sometimes this difficulty arises spontaneously. Many persons have felt the peculiar sensation of suddenly not being able to swallow, or breathe, as if they had *forgotten how*. This arises from temporary suspension of nervous influence from the medulla, which is soon restored, however, by reflex action.

The Pons Varolii.—This part is a bond of connection, or *bridge*, between the two parts of the cerebellum, and between them and the medulla oblongata proper, and therefore connects the spinal cord with the brain. It also appears to be, to a certain extent, an independent nervous centre, like the medulla itself. For experiment has shown that when the entire brain is removed, some *sensation* seems still to be left if the pons be irritated, and some motions also originate from it.

It will thus be seen that many parts of the nervous apparatus have certain peculiar functions, more or less independent, and peculiar to themselves, though all the parts cooperate together, and influence one another.

Plate XV.

THE MEDULLA OBLONGATA.

Fig. 1. Fig. 2. Fig. 3.

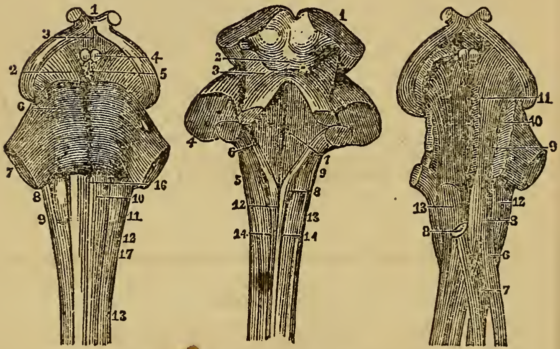


Fig. 1. Front view of the medulla oblongata. (1), portion of the optic nerves; (2), the crus cerebri; (3), tuber cinereum; (4), corpora-albicantia; (5), locus perforatus; (6), pons varolii; (7), part of the cerebellum; (8), the fissure which separates the pons varolii from the medulla; (9), enlargement of the medulla; (10), the anterior pyramid; (11), olivary body; (12), anterior portion of the restiform body; (13), neck of the medulla oblongata; (16) shows the fissure dividing the medulla oblongata, and cord, into its two portions; (17) is the anterior lateral furrow.

Fig. 2. Posterior view of the medulla oblongata. (1), part of the optic tract; (2), tubercula quadrigemina; (3), triangular band; (4), crus cerebelli; (5), medulla oblongata; (6), the fourth ventricle; (7), fissure of the fourth ventricle, which forms part of the calamus scriptorius, or *pen nib*, the form of which may be plainly seen, this fissure representing the *split* of the pen; (8), the mammary swelling, close by the pen nib; (9), part of the restiform body; (12), the middle fissure; (13,) the lateral furrow; (14), posterior furrow.

Fig. 3. Anterior view of the medulla oblongata. (6), the anterior column of the spinal cord, divided into two parts; (7), the middle, or lateral column, (the columns are all seen to divide into three or four parts, which cross and intermix with each other); (8, 8), the pyramids; (9), white fibres of the pyramid; (10), part of the pons varolii; (11), deep section of the fibres of the pons; (12), olivary body; (13), the right olivary body.

CHAPTER VI.

THE BRAIN, AND THE NERVES OF SPECIAL SENSATIONS.

The Brain.

It has already been explained that the spinal cord is, as far as organic, or vegetative life is concerned, the principal nervous centre, to which the brain is added, as the nervous organ of animal life. In some of the inferior beings the spinal cord alone seems to suffice for all nervous needs ; but a brain of some kind must always exist where there is consciousness, or mind, and voluntary motion. And, in fact, there is good reason to suppose that no perfect animal, however small and inferior it may be, is without brain, and consequently mind, the same as the brain and mind of man—only different in degree, as will be shown further on.

The brain is therefore an addition to the spinal marrow, and, in fact, its principal parts originate from it, and partake of its powers, only in an exalted degree.

The two main masses of the brain are called the *cerebrum*, and the *cerebellum*.

The *cerebrum* comprises all the upper and frontal part of the brain, overlapping the *cerebellum*, which lies under it, at the top of the spinal marrow, as shown in the annexed plate.

Plate XVI.

THE BRAIN VIEWED SIDEWAYS.

(1) is the upper part of the spinal cord, or medulla oblongata; (3) is the cerebellum, which has the appearance of being formed of *striæ* or *cords*, owing to a number of furrows, or fissures, which descend into its substance. The large mass above is the cerebrum, which is seen to be formed in folds, or convolutions, the fissures between which extend to a considerable depth.

The exterior of both these bodies is formed of vesicular, or grey nervous matter, but internally they are formed of nervous fibres.

The fibrous, or inner portion, of both cerebrum and cerebellum, is only a continuation, or expansion, of the fibrous substance of the spinal cord, which is continued, as previously explained, from the cord itself up into the medulla oblongata. From the medulla the fibrous matter of the cords ascends to the *crus cerebri*, and then divides, forming two masses, or bundles—one being the base, or foundation, of the cerebrum, and the other of the cerebellum, each of which contains both kinds of fibres, sensory and motor, owing to the crossing and interlacing of the anterior and posterior fibres.

So far, then, as before remarked, the brain is merely an expansion of the spinal marrow. But the exterior, or vesicular matter of the brain, is not derived from, nor connected with, the vesicular or grey matter of the spinal cord; on the contrary, it is quite unconnected with, and independent of it.

The vesicular matter of the cord is, it is true, continued up into the corpus striatum, where it forms a dark colored mass, called the *locus niger*; but it is in no way continuous with the vesicular matter of the brain.

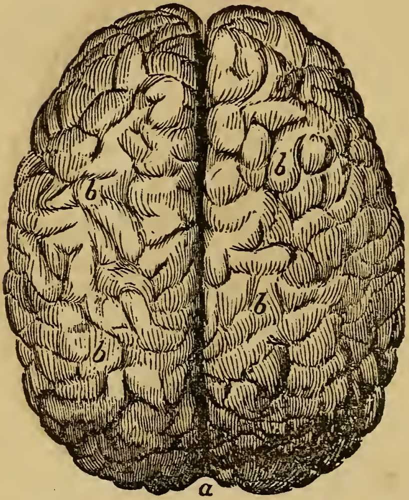
The only direct connection, therefore, between the spinal cord and the brain is by the *fibres*, and these, as before explained, form the interior, both of the cerebrum and the cerebellum, and they also radiate upon the surface of the cerebral convolutions in all directions. So fine are these fibres, and so universally are they distributed, that it is calculated there must be many millions of them altogether.

The convolutions, or folds, of the cerebrum and cerebellum, increase the amount of *surface* presented by the vesicular matter, and thus gives more space, on which the nervous fibres, and the bloodvessels, can be distributed. If this surface was *smooth*, it would only be a few inches in extent; but the depth of the furrows, and the windings and turnings of the convolutions increase it so much, that it is calculated to be equal to some *six hundred and seventy square inches*, for both cerebrum and cerebellum.

Underneath the brain, at its base, are a number of different ganglions, or vesicular masses, some of which are connected with the organs of the special senses—sight, hearing, smell, and taste. But the functions of the others have not yet been made out. These parts are all connected with each other, and, being double, are also connected with their like on the opposite side of the brain.

Plate XVII.

THE TOP OF THE BRAIN.



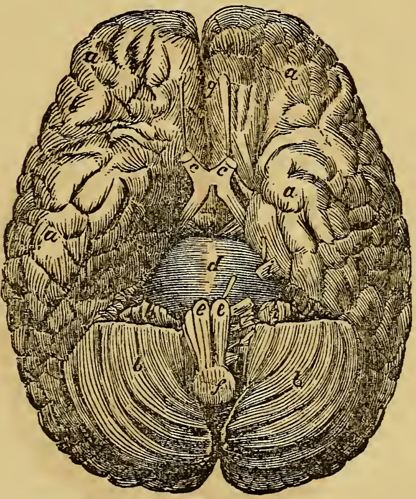
In this view nothing is seen but the cerebrum. (*a*) shows the fissure that divides it into the two halves; (*b*, *b*, *b*, *b*,) show the convolutions, or folds.

In fact, all the parts of the brain are connected, both directly and indirectly, with each other, in the most bewildering manner, so that it is difficult to study, or think of, any part as an independent organ.

The following cut will show the appearance of the base, or under part of the brain.

Plate XVIII.

UNDER-SURFACE, OR BASE OF THE BRAIN.



(a, a, a, a,) are the convolutions, or folds of the cerebrum; (b, b,) are the two halves of the cerebellum; (c, c,) are the two branches of the optic nerve, one for each eye; (d,) the pons varolii; (e, e,) part of the medulla oblongata; (f,) part of the spinal marrow; (g,) the olfactory nerve, or nerve of smell.

The brain is enclosed in three coverings, or membranes, analogous to those which enclose the spinal cord, and probably continuous with them. The outer covering, called the *dura mater*, is strong and tough, and at certain parts grows fast to the inside of the skull. The middle membrane, called the *arachnoid*, or spider web, is so fine that it is scarcely visible. The inner membrane, or *piâ mater* covers the brain completely, in every part, and even descends, in some places, into the interior.

In the inside of the brain are several cavities, or hollow spaces, two of which are pretty large; they are called *ventricles*. Into these cavities there is constantly exuded a clear fluid, which is absorbed, in a healthy state, as fast as it is secreted, but in disease it sometimes accumulates in large quantities, and distends the whole head. In some cases many gallons have thus accumulated. This is called *hydrocephalus*, or water in the head.

The brain itself is almost entirely devoid of sensibility, and may be even cut away without causing any pain. In many cases when the skull has been fractured, and part of the brain has extruded, it has been shaved off, without any evil consequences, and in some of the lower animals it has been entirely removed, without any sign of suffering. If, however, the medulla oblongata be touched, then the most acute pain is felt.

M. Flourens performed some very curious experiments on the brain, to show how it was affected by wounds, and especially how curable many such wounds were. He took dogs, and rabbits, made holes in the top of the skull, and through the membranes into the brain, and then dropped lead bullets into the wounds. The weight of the bullets carried them down, through the substance of the brain, till they reached a firm part, where they became imbedded. This was through the *cerebrum*, and, strange to say, no particular distress seemed to be caused by the bullet, nor were any of the mental faculties at all affected. There remained for some time a canal, or passage, down which the bullet had passed, but this eventually closed, and finally healed up perfectly. When, however, the hole was made further back, so that the bullet, when it reached the bottom, pressed upon the base of the brain, or *sensorium*, death soon ensued.

These experiments explain many of those cases where soldiers have had bullets in their heads for years, with no apparent inconvenience, and which appear so strange. If the bullet be merely in the cerebral hemispheres, it may lodge where it may do no harm, but if it reach the sensorium, or cerebellum, it may cause paralysis, or death.

It has also been found, in some cases of sudden death, that one half of the brain has been totally destroyed by disease, without the patient showing any very unusual symptoms.

This, however, will not appear so inexplicable, when it is borne in mind that the two halves of the brain, though connected, can act each by itself. They are, in fact, in one sense, *two brains*, and can act either separately, or unitedly. All the organs connected with them are in pairs, one of each belonging to each side, and all the corresponding parts being exactly alike.

Generally the two halves of the brain, and the parts connected with them, are exactly equal; but sometimes one side is more powerful, or active than the other. Indeed Dr. Brown-Sequard believes, as the result of his experiments, that the right side of the brain is more important, for organic life, than the left side. He also says that, though the two sides are alike, at birth, yet the right side, eventually, becomes quite different to the other, owing to its greater functional activity.

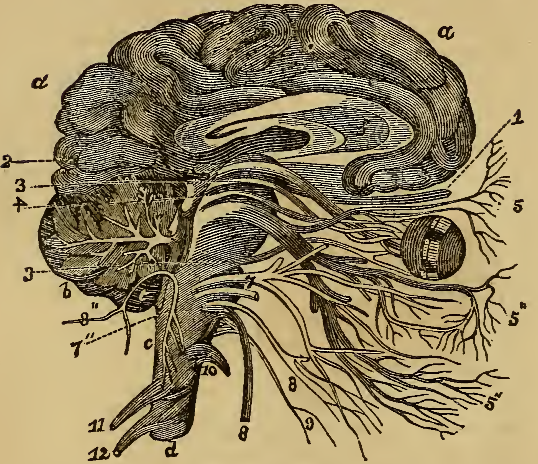
Although the nerves of the special senses, and others, in connection with the brain are usually spoken of as the cerebral, or *brain nerves*, yet it is not by any means sure that they are so in reality. Some anatomists think that they can all be traced to the top of the spinal marrow, and that no nerves originate directly from the brain itself.

These so-called brain nerves, unlike those of the spinal cord, are not always found in symmetrical pairs, one sensory and one motor, though most of them are double, both parts performing the same function, but on opposite sides of the body. They have, however, connected with them, ordinary nerves of sensation and motion, to assist them in the performance of their functions.

Whether the cerebral nerves are really derived directly from the brain, or not, it is certain that they are intimately connected with it, and influenced by it, and they also exert a marked effect on the brain in return. All our ideas, and all our knowledge of the world we live in, is acquired through the actions of these nerves.

Plate XIX.

THE BRAIN CUT THROUGH THE MIDDLE.



(*a*, *a*, *a*,) The cerebrum; (*b*,) the cerebellum, the centre of which is formed something like a *tree*; (*c*,) the medulla oblongata; (*d*,) the spinal marrow; (*f*,) the lateral ventricle, or cavity in the centre of the brain—usually containing a fluid.

(1), The olfactory nerve, or nerve of smell, going to the nose; (2), the optic nerve, or nerve of sight, going to the eye; (3, 4, 5, 6,) the third, fourth, fifth, and sixth nerves; (7), is the auditory nerve, or nerve of hearing, (the *short* one, which is cut off, *below* the figure 7,) the large branching nerve on which the figure 7 is placed, is called the *portio dura* of the seventh nerve; (8), (branching), the glosso-pharyngeal nerve. The nerve without branches, marked 8, which descends straight down, parallel with the spinal cord, is the par vagum; (8″), the spinal accessory nerve; (9), the hypoglossal nerve; (10), the sub-occipital nerve; (11, 12,) two pairs of spinal nerves.

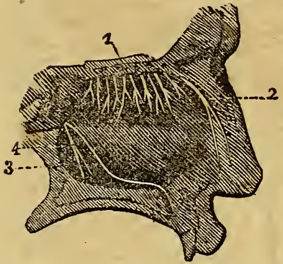
Having thus shown the location of the different cerebral nerves, we will now proceed to show the nature of their special functions, and the connection which exists amongst them.

The Nerves of the Brain, or Cerebral Nerves.

The Olfactory Nerve.—The function of this nerve, which is distributed on the inner surface of the nose, is to enable us to smell; without it we should have no idea of odor at all. The manner of its distribution will be shown by the following cut:

Plate XX.

THE OLFACTORY NERVE.



1 and 2. Show the manner in which this nerve ramifies on the inner membrane of the nose, and of the air passage leading from it.

In some persons this nerve is very sensitive; and they can detect slight odors which other people cannot perceive at all. Sometimes it is absent, or dormant, for there are people utterly without smell, and I believe deaf-and dumb people usually are so. Many diseases will destroy the sense of smell. and some will make it preternaturally acute, or pervert it in a singular manner. A common cold, as is well known, will, for a time, frequently destroy all power of smell, and taste too.

Certain persons, and also animals, are peculiarly affected by certain odors. The excitement which the smell of *valerian* will cause, in a cat, is amusing to observe, while the oil of rhodium will irrisistably attract many animals, and even fish, who are often caught by it.

Different odors affect the brain in different ways, causing a variety of sensations, pleasing or disagreeable, and sometimes producing the most uncontrolable excitement, as in the case of the dog, when his olfactory nerve is affected by the scent of the female, when in heat. This is an illustration of reflex action, the odor affecting the brain, and the brain reflecting the influence back on the sexual organs.

In the case of sneezing, also, we have a good illustration of reflex action. Some irritating substance, like snuff, for instance, attacks the mucous membrane of the nose, and immediately the sensation is conveyed to the nervous centre, from which comes back, along a motor nerve, the influence which sets in action the appropriate muscles which cause a sneeze, to expel the intruder. This reflex action will occur in spite of our will, if the irritation is powerful enough, and is, in fact, usually quite involuntary.

Smelling is probably only a modification of the general sense of touch, or common feeling, which we possess more especially at the ends of the fingers. But owing to some peculiarity of formation in the olfactory nerve, the sense is here *specialised,* or modified in a certain manner. In fact, all the senses, sight, hearing, smell, and taste, are probably only modifications, or special manifestations of the sense of touch.

Animals can sometimes smell things an astonishingly long way off—further, probably, than they can see ; and in some cases they can detect odors of whose existence *our* noses give us no idea. The uneasiness that dogs sometimes exhibit when people are dying, is supposed to be caused in this way,—they really smell the changes which approaching dissolution is causing in the bodily substance.

The perverted sense of smell may cause, in some cases of nervous disease, peculiar hallucinations, as will be shown further on. And in many cases we can act upon Diseases, or *medicate* for them, by means of odors, through the sense of smell, better than we can by giving drugs into the stomach !

This may seem strange to those unacquainted with such subjects, but it is very simple. A scent, or odor, is merely some of the odorous substance in a fine *gaseous* state, which can be drawn into the nostrils, and absorbed from thence, like air. In this state it can reach parts of the system that grosser medicines cannot—especially the nervous centres, in whose organic changes and functions gases play an important part.

This matter will however, be more especially treated upon in a subsequent chapter.

It is, perhaps, scarcely necessary to state, that if the olfactory nerve were cut through, so that there should be no connection between its terminal fibres and the brain, there would be no sense of smell, though there might be sneezing when the nostril was irritated, because that is simply a reflex muscular action.

The Optic Nerve.

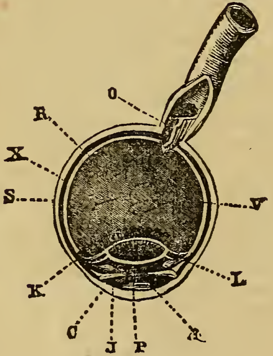
This is one of the most wonderful and important nerves in the body. It connects the eye with the nervous centre, and its function is to convey the impressions made on the eye to the brain, so that we may become *conscious* of them. The eye itself is a perfect optical instrument, which receives, and transmits, the images of objects presented before it, but we cannot *see* by the eye alone, any more than we can by a glass one. The optic nerve must connect the *instrument* with the brain, before the brain can take cognisance of what is presented to the instrument.

A loss of the power of seeing, or blindness, may therefore arise in two different ways. There may be something wrong with the eye,—the *instrument*,—or with the optic nerve. Blind people are often found with perfect eyes, but owing to some change in the optic nerve, no impressions made upon them are conveyed to the brain ; and this causes blindness, as certainly as if the eye itself were destroyed or injured. Such blindness is called *Amaurosis.*

There are as many peculiarities, and diversities, in the sense of sight, as in that of smell. Some people, as it is well-known, can see small objects at a greater distance than others, owing to peculiarities in the construction of the eye. But there are certain peculiarities of vision, by which some people differ from most others, that apparently do not depend on the eye, but upon peculiarities in the optic nerve, or the part of the nervous centre it is connected with. This is especially the case in regard to *color.* Most people perceive, and distinguish all the ordinary colors, but there are persons who are more or less *color blind !* That is, they never see certain colors at all, or cannot distinguish them from other colors, and occasionally even there is no distinction, but all things have the same hue. This seems strange, but it is nevertheless the case, and a man's eye may be perfect, as far as seeing everything else is concerned, and yet to him all things have the same color.

Plate XXI.

THE EYE AND OPTIC NERVE.



(*o*) is the optic nerve, proceeding from the bottom of the ball of the eye to the brain. The different parts of the eye are seen arranged like the glasses of a telescope, and the *image*, which is formed on them, is reflected, through the ball, on to the bulb of the optic nerve, at the bottom, from whence perception of it is excited in the brain.

In some diseases the forms, size, and colors of surrounding objects change in the most singular manner, and images may be seen of objects that are really not present. The same effect may also follow the use of certain drugs, especially the Indian *Hemp*, or *Haschich!* In such states a man knows not how far anything which he sees is real or not, and such states are more common than is supposed, especially in certain conditions of the nervous system.

In a state of high nervous excitement, such as that caused by extreme religious enthusiasm, both sight and hearing are deranged, and the person sees objects that are not present, and hears words that are not spoken. So vivid, in fact, may be the false impressions, that they may overpower real ones made at the same time; and a man may honestly testify to having seen sights, and heard sounds, that never existed.

There have been many instances of this kind, in which persons have seen false images of people so distinctly, from a morbid state of the eye, that they could not tell the false appearances from real ones. One gentleman afflicted in this way used to have his room, at times, crowded with people, and could tell them from real beings only by speaking to them, or trying to touch them. When he met a friend in the street he was never sure, without accosting him, whether it was really his friend or his image. Being a scientific man, he was neither terrified at this, nor superstitious about it, but put himself at once under a course of medical treatment, which soon banished all the ghosts.

An uninformed and superstitious person would have regarded such an occurrence as a SUPERNATURAL *visitation*, intended as a *warning;* and instead of the physician would have gone to the priest.

The early history of all religions abounds in instances of visions, and of mysterious voices, all of which, when not invented, arose from a morbid condition of the nervous system, and of the eye and ear. Indeed, such things occur even now, at love-feasts and prayer-meetings, and are believed to be real, just as they were thousands of years ago. Nothing can banish such superstitions, and cause such occurrences to be regarded in their true light, but the universal dissemination of real *scientific knowledge*,—not the mere scholastic and dogmatic *word* learning, which is now called knowledge.

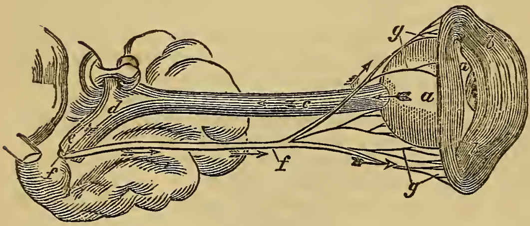
Connected with the eye are many nerves of common sensation, and of motion, to assist in its various operations. Thus it has to be moved in different directions, and its lids have to be opened and shut, to admit or exclude the light, all of which are ordinary muscular motions.

This opening and closing of the lids gives a good illustration of both reflex and voluntary action. Thus we can close the eyelids voluntarily, whenever we choose, but if a sudden gleam of intense light falls upon the eye, or any object be thrust at it, the lids close at once, involuntarily, by reflex action.

This is well shown in the following cut.

Plate XXII.

THE EYE AND ITS NERVES.



(*a*) is the eye ; (*bb*) the muscles of the eyelid ; (*c*) is the optic nerve. The arrows show the direction of the influence from a beam of light, down the optic nerve, by (*d* and *e*), till it reaches the nerve of motion, (*f*), which is seen to branch and ramify on the eyelid, at (*gg*); (*h*) is a portion of the brain, where the optic nerve terminates.

Suppose, now, a sudden beam of light strikes the eye, it sends an impression, or sensation, down to the optic nerve, as shown by the arrows. This impression is then conveyed, by the optic nerve, to the brain, from whence a nervous impulse is transmitted down the nerve of motion *f*, which acts on the muscles of the eyelid and closes it. This is purely a reflex action, the light acting down the optic nerve, to the nervous centre, and from thence back along the nerve of motion to the eyelid.

If the optic nerve were to be cut, the light would not be felt, and if the nerve of motion were to be cut the lid could not be closed, though the light were felt ever so painfully.

The same muscle can be also acted upon, and the eyelid closed, or opened directly, by the *will*, acting on the nerve of motion, without any external stimulus whatever. Such an act may therefore be either voluntary or reflex.

The Third Nerve.—This is exclusively a nerve of motion, and it originates from the anterior column of the spinal cord, where it runs up to the cerebrum. It goes to the muscles of the eye alone.

The Fourth Nerve.—This is the smallest nerve in the body, and in man is only about the size of a small sewing thread It is connected only with one muscle, called the *trochleator,* which moves the eye. Like the *third,* it is a nerve of motion only, and probably it originates from the spinal cord also, but its commencement has not yet been fully traced.

The Fifth Nerve.—This is a large, and important nerve, with extensive ramifications. It arises by double roots, and is therefore both sensory and motor, and is the highest in the body of that class. It has many branches, going to different parts of the face, the first of which, (marked 5, in Plate 19,) is distributed to the eye, eyebrows, forehead, and neighboring parts, to which it gives common sensation, or touch. This branch arises altogether from the posterior, or sensitive column of the spinal cord.

It is very instructive to consider what would happen if this branch of the 5th nerve were destroyed. None of the parts to which it is distributed would then have any sense of touch, or feeling, and might be cut, or pinched without any sensation. Even the eye itself would not feel any hurt, tender as it ordinarily is; but still it would be sensitive to *light,* just the same as before, because that is a special sensation, depending on the *optic* nerve.

The second branch (5′′, Plate 19,) also arises from the posterior column of the spinal cord, and it gives common touch, or feeling, to the upper jaw and lips, and to the palate. It is a sensory branch only, like the first branch.

The third branch, (5′′′, Plate 19,) is both sensor and motor, and it has fibres which arise from both the anterior and posterior columns of the spinal cord. It gives both sensibility and motion to the muscles, skin, and other parts, of the lower jaw, the tongue, and the mouth.

It is usually the sensory branches of the fifth nerve that are affected in cases of Tic Doloureux, and also in most cases of Toothache and Neuralgia.

When the extensive ramifications of this nerve are considered, and its numerous connections with other nerves of the head, we need not be surprised at the suffering which results from an affection of any of its branches. Tic Doloureux, as it is well-known, will often dart like lightning, from one part to another, and the pain of toothache will affect the whole head. The *twitchings* which are often experienced, in different parts of the face, arise mostly from reflex action, through branches of the fifth nerve. In some cases, there is a permanent *tic*, as it is called, and the patient all the time practices some grimace, or twist of the features, occasionally of an extremely ludicrous or disagreeable character. This is quite involuntary, and arises from some permanent cause of irritation in the motor nerve.

By concentrating all the power of the will on the action, it may be, in some cases, temporarily arrested, but returns again when the attention is withdrawn from it. The only cure is to destroy the motor nerve connected with the twitching muscle, and this cannot always be done.

The Sixth Nerve.—This, like the third and fourth, arises only from the anterior column of the spinal cord, and is therefore only a nerve of motion ; and, like the fourth nerve, it causes motion only in a single muscle of the eye.

The Seventh Nerve.—This has two parts, one called the *portio dura*, or hard portion, and the other the soft portion.

The hard portion of the nerve (7, Plate 19,) is a nerve of motion coming from the anterior column, and is distributed to the muscles of the cheeks and forehead. If this nerve be cut through, on one side of the face, the muscles around the mouth, on that side, will cease to act, and it will be drawn over to the other side. This is often seen in paralysis of one side of the face.

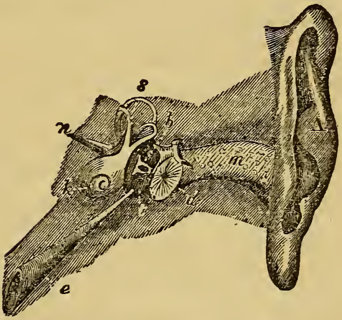
The short nerve just below the figure 7, in plate 19, is the soft portion of the seventh nerve ; it is sensory, and goes to the inside of the ear, constituting the *auditory nerve*, or nerve of *hearing*.

Without this nerve we should have no perception of *sound*, but should be deaf No matter how perfect the ear might be, it could distinguish no sound without this nerve—the same as the eye is incapable of imparting vision without the optic nerve.

The structure of the ear is admirably adapted to *collect* sound, and to modulate it, so that the most delicate toues can be distinguished. It is a perfect *instrument* for the purpose, as the eye is for seeing, but the instrument is useless without the nerve to connect it with the nervous centre.

Plate XXIII.

THE EAR, AND AUDITORY NERVE.



(A) is the external ear, which collects the sound; (*m*) the canal leading to the inner parts; (*t*) the drum, or sounding box; (*d*) the membrane of the drum; (*b*) the small bones of the drum; (*k*) the cochlea, or snail shell; (*s*) the canals; (*e*) the Eustachian tube, which leads from the ear into the throat; (*n*) is the Auditory Nerve.

A morbid condition of the auditory nerve may affect it in various ways., In some cases hearing may become agonisingly acute, so that sounds can be heard which are too low for ordinary good hearing to distinguish at all. It seems impossible, in some of these cases, to shut out sound; and, just as the excited eye can see, in what is usually called darkness, so can the excited ear distinguish sounds, when all seems perfectly still to the normal ear.

In cases of delirium, or great excitement, persons will often hear voices, and other sounds, which have never been uttered, just as others will often see what is not present. Unscientific people usually think such things are supernatural, and we have on record numerous communications of this kind, which are believed in as realities, though only the results of disease. Dying people, whose perceptions of the realities around them are getting dim, are very apt to have the last remnants of vitality concentrated in the special senses, and hence they see, and hear, in a morbid state, uncontrolled by the judgment. The visions which haunt the dying pillow, and the voices that salute the dying ear, pleasing or painful as the case may be, though they are often thought to be supernatural, originate in this way.

A religious enthusiast, or a conscience-haunted criminal, can readily hear voices, or see visions; and so also can any one while suffering under peculiar forms of disease. It is therefore important to bear in mind that seeing, and hearing, are not always to be believed, no matter how strong may be the conviction, or assertion of their reality; and it must be further borne in mind, that, in periods of great excitement, thousands of people may all be afflicted with the same disease, or illusion, at the same time. Hearing is merely a modification of touch, or common feeling, the same as seeing, and smelling. It is due to the vibrations of the air striking on the drum of the ear. Deafness may arise either from malformation, or derangement of the ear, or from abscence, or torpidity of the nerve. But even deaf people have a certain amount of sensation similar to hearing, though it is not localized. They can *feel* the tremor of loud sounds, such as thunder, or artillery, and thus may be said to hear in the whole body.

No. 8. *The Glossopharyngeal Nerve.* (The branching nerve marked 8.)—This is so named because it is distributed both to the tongue and to the pharynx. Its nature and functions are not yet perfectly understood. Some physiologists consider it to be only a motor nerve, while others think it both motor and sensiferous, and others again consider it to be the exclusive source of the sense of *taste.* Those who adopt this view think that the Glossopharyngeal nerve gives special taste to the tongue, and the third branch of the fifth nerve common *sensation* or touch.

It has been thought, however, with good reason, that both the special sense of taste, and also common sensation, may both be derived from the fifth nerve, because taste is merely a modification of *touch.*

In short, this nerve is not yet well understood, and its functions are probably complicated. It certainly appears to influence the muscular action of swallowing, to some extent, and when it is cut, all sense of taste in the tongue is not wholly lost.

One peculiarity of this nerve is, that if cut, and the ends irritated, it is not the end connected with the muscle that causes contraction, as is usually the case, but the end connected with *the brain!* This is probably from reflex action. There is, however, in all probability, a mixing up here with the motor fibres of the pneumogastric nerve.

No. 8. *The Pneumogastric Nerve, or par vagum.* (The single stem nerve marked 8, which descends vertically.)

The fibres of this nerve are distributed principally to the lungs and stomach, and hence its name. The real functions they perform, however, are not certainly known, though there seems no doubt but that they give motor fibres to the windpipe, pharynx, and throat, and perhaps also to the lungs. Some experiments seem to show also that they give a certain amount of sensation to the lungs.

But, besides this, it seems probable that the pneumogastric nerves influence the *functions* of the stomach also, for when they are cut, below these branches which go to the windpipe, the process of digestion is nearly always suspended. We thus see that, in most cases, nervous influence is essential to the proper action of the stomach; and probably in those cases where digestion still goes on, after these nerves are cut, it is because some of the numerous branches still convey the necessary influence. All the different nerves in this region interlace with one another, sometimes much more so than at others; and thus, though the direct road may be destroyed, there may still be bye-paths, along which the nervous power can find its way.

If the nervous influence was not essential to the process of digestion, there seems no reason why its withdrawal should arrest this process, at any time—as we know it does. The evil influence which over-study, violent grief, or long-continued worry and anxiety has upon digestion, is well-known, and the reason for it will be obvious enough from the above explanation. If a man use up all his nervous power in thinking, as so many do, he has none to spare to act upon the stomach; and, therefore, he becomes *dyspeptic*. The same result follows if, under the paralysing influence of grief, or anxiety, he does not *produce* sufficient power for all his requirements. In either case, the same result follows to a certain extent, as if the pneumogastric nerves were cut through.

Dr. Philip tried some curious experiments on these nerves, which were also very instructive. He cut them through in animals, whose stomachs were commencing to act upon a full meal, and, immediately, digestion stopped. He then passed a current of *electricity* down the cut nerve, to the stomach, in the same way that the nervous current used to flow, and immediately digestion recommenced again. By continuing the electric action, the meal was finally digested; the same as it would have been under the stimulus of the nervous influence.

In short, *electric power* performed, in the living body, the same function that the *nerve power* usually performs.

As a corollary to this, it may be stated that an experiment the reverse of this has been performed. Slices of a fresh *brain* have been taken, and used as elements in a battery, and have produced an electric current, exactly the same as from one of the metal batteries in ordinary use.

If these experiments do not prove that the electric and nervous powers are identical, they at least prove them to be very similar; and that one can, at least in some circumstances, do the work of the other.

No. 8″. *The Spinal Accessory Nerve.*—This appears to be only a motor nerve, influencing the muscles of the neck and shoulder. By some physiologists, this has been considered the third branch of the eighth pair of nerves—the other two branches being the glossopharyngeal and pneumogastric.

No. 9. *The Hypoglossal, or ninth pair of Nerves.*—This is merely a nerve of motion, influencing the muscles which move the tongue. If this nerve be inactive, or severed, the tongue remains motionless, in spite of all efforts of the will. In one case, a severe kick, under the chin, so bruised this nerve that it could not convey the nervous current, and the tongue was motionless for several days. The patient and his friends thought the *windpipe* was hurt, because he could not speak nor swallow; but, as soon as the nerve recovered its conductivity, the tongue moved again, and speech and the power of swallowing returned

No. 10. *The Sub-Occipital Nerve.*—This is a true spinal nerve, having a motor and sensory root, coming from the anterior and posterior columns of the spinal cord. It comes out just below the occiput or back of the head, and is distributed to the muscles of the neck.

All the nerves below this are true spinal nerves.

Some physiologists reckon twelve pairs of these nerves connected with the brain (cranial or encephalic nerves); others only nine—as we have done. It is of no consequence; as the principal nerves are the same, whatever division may be adopted, and it makes no difference whether we reckon all the branches of a nerve as one nerve, or give each a separate name, though it is usual to speak of them in *pairs*—the first pair, second pair, and so on, in the order we have enumerated them.

It may be regarded as nearly certain, that none of these nerves are connected directly with the brain, neither with the cerebrum nor cerebellum. They all proceed from the *medulla oblongata*, or upper part of the spinal cord, but have intimate relations with the brain.

One great distinction between the cranial nerves and the spinal, is in their mode of origin. The spinal nerves, as already explained, all arise from two roots—one anterior and one posterior—but the true cranial nerves have one root only. Nor could this well be otherwise; for, in the medulla oblongata, the anterior and posterior columns are not kept distinct, as in the spinal cord, but inextricably crossed and intermixed. The fifth nerve is the only one among the cranial nerves that arises from two roots, with a ganglion on the posterior root, and is both motor and sensory. It is, therefore, by some physiologists, classed among the spinal nerves.

The Sensorium.

The mass of nervous substance within the skull is composed, principally, of the cerebrum and cerebellum, constituting the brain, underneath which, at the base of the brain, are a number of irregular nervous masses of various sizes and forms, called the *sensory ganglia*, already referred to in connection with the nerves of special sensation, which are connected with them. These ganglia are partly shown in *plate* 18, which represents the under-surface of the brain.

The functions of these smaller ganglions are quite distinct, and unlike those of the spinal marrow; and, indeed, unlike, for the most part, those of any other parts of the nervous system. Not only do they act like the ordinary nervous centres, in receiving impressions and causing motions, but there is a certain amount of *consciousness* attending these processes. Not only are the organs of our special senses of sight, hearing, smell, and taste, impressed by appropriate external agencies, causing them to react upon the appropriate muscles, but we are *conscious* that they are so affected, and that the appropriate motions take place.

These ganglia, therefore, form a separate and distinct part of the nervous apparatus, by the action of which we receive sensation from, and have consciousness of, the physical world. They constitute, in fact, the seat of *conscious sensation*, or THE SENSORIUM!

So far as we can judge, the powers of the sensorium are limited to simple consciousness and sensation; the higher powers of reasoning, memory, and other more exalted mental processes, are connected solely with the brain proper, or the cerebral hemispheres.

The consciousness here spoken of, in connection with the sensorium, it must be remembered, is simple or passive, and not active, intelligent consciousness. It is rather a simple perception of the fact, unaccompanied by any reasoning process—something like what is experienced under the influence of some drugs.

A man may *live*, if the cerebrum or *reasoning* part of the brain be removed, and will exhibit a kind of half-consciousness, in connection with special sensation—

something like that shown by a person half-awake. This results from the action of the sensorium.

In some of the lower animals there is no higher consciousness than this, which results from the action of the sensorium; and in softening of the brain, and some other diseases, it is all that is left.

In these lower animals, the sensory ganglia constitute the whole brain—there being no cerebrum;—and, consequently, *mind*, with them, is limited to sensation and simple consciousness; the same as it must be in those human beings born without brains.

The cerebral hemispheres (or true brain) are, therefore, superadded to the sensorium, and give the *reasoning faculty*, which can take cognizance of, and control, more or less, all other nervous operations.

Some beings need only a simple spinal cord, and nerves, to effect all the nervous influence they require. In them, probably, all motions are *reflex;* and there is neither true sensation nor consciousness. Other beings have the sensorium superadded to the spinal cord, and they, in addition to reflex action, have *conscious sensations.* Still, other beings have the cerebrum superadded to the sensorium, and such beings exhibit, not only reflex action and conscions sensation, but also *reason!*—like *man!*

All these new parts, superadded to the spinal cord or original nervous centre, give, therefore, new nervous powers—the most exalted of which, as far as yet known, are those given by the human cerebrum, or true brain.

It may, however, well be questioned, whether this development of the nervous apparatus is not destined to go still further, and whether some future being may not have a nervous organ as far above the cerebrum, as that is above the sensorium.

There is nothing unreasonable in this idea, but the contrary; and mental faculties may yet be evolved, as far above our present *reason*, grand as it appears, as that is above simple conscious sensation.

It will be seen, further on, that there are parts of the human brain apparently rudimentary, which may yet be developed, and become the sources of unknown mental powers. In some beings, we find some parts rudimentary, and, in other beings, other parts; many of the lower beings possessing only the *germs* of nervous organs, which are found fully developed in those above them.

The following are the principal nervous masses situated at the base of the brain, including the known sensory ganglia, and some others whose functions are not yet ascertained.

By referring to Plates 15, 18, and 19, the situation of these parts will be readily understood. They are all close together, at the top of the medulla oblongata and under the hemispheres of the brain. In one or other of the above plates, all the parts referred to may be found.

The Olfactory Ganglia.—These ganglia are situated in the front part of the base of the brain, and from them originate the olfactory nerve, or nerve of *smell.*

The Optic Ganglia.—These are further back, behind the olfactory ganglia; and into them can be traced most of the roots of the optic nerve or nerve of *sight.* They are sometimes called the *corpora quadrigemina.*

The Auditory Ganglia, from which originate the auditory nerve or nerve of *hearing,* are not so prominent as some of the other ganglia, but are buried in the medulla oblongata; nevertheless, they can be found by dissection.

The Gastatory Ganglia gives origin to the nerve of *taste,* which goes to the tongue. The nerve of taste is described as the *glosso-pharyngeal,* which may be traced to this ganglia, as may also a part of the sensory root of the fifth pair of nerves. Like the auditory ganglia, the gastatory ganglia are buried in the medulla oblongata, and have to be sought out by careful dissection.

The Thalami Optici and Corpora Striata.—These are two large ganglionic bodies, on each side of the base of the brain, which observation and experiment point out as very important parts of the sensory apparatus.

The Thalami Optici.—The *sensory fibres* from the spinal cord, after passing through the medulla oblongata, are distributed through the substance of the thalami optici, with which are also connected the olfactory and optic nerves, and probably, also, those of hearing and smell.

The thalami optici seem, therefore, to form a kind of centre or *focus*—both for the nerves of special sensation, and also for those of common sensation—coming from the medulla.

The Corpora Striata.—These seem to form just such a centre, or focus, for the *motor* fibres from the medulla oblongata, as the thalami optici do for the *sensory* fibres. They all pass into it, and from it special motor influence seems to issue.

Both these bodies are intimately connected with each other, and they bear a similar relation, it will be seen, to the anterior and posterior columns of the spinal cord.

These, then, are the principal ganglionic masses, situated at the base of the brain, which essentially constitute the *sensorium*. Each of them is, to a certain extent, an independent nervous centre—having its own special functions, and giving out its own special nervous influence—but all having a common centre or focus in the thalami optici and corpora striata.

The *sensorium* may, in fact, be considered as a distinct portion of the nervous apparatus, equally with the *cerebrum* and *cerebellum*; the three together forming the complete brain or *encephalon*.

The uses of some of the sensorial ganglia, and also of some other ganglionic bodies about the base of the brain, are utterly unknown. Some of them are found only in certain animals. Thus, the *olivary bodies* are found only in man and monkeys, and the *mamillary bodies* only in man. Perhaps some of these have yet to be developed, and become the sources of new powers.

As before stated, in some animals there is no cerebrum nor cerebellum, but only the sensorium—which then forms the whole brain. The different ganglionic masses are also very unequally developed, in different beings—some having the optic or the olfactory ganglia unusually large—while in others again these are small, and other portions are more prominent. Each separate nervous centre is thus expanded in proportion as its special nervous influence is needed.

In Plate 18, the whole of the sensorium is shown at the under-surface of the brain, and the different parts in Plates 15 and 19. The ganglia of the nerves of special sensation, are understood to be situated where the nerves begin.

Some of the special functions of the sensorial ganglia will be more fully explained further on, but there are some other adjuncts of the brain to be explained first.

The Membranes, Ventricles, and Glands of the Brain.

The parts now to be described are merely adjuncts to the different nerve masses, serving to connect, or separate them from each other, and to support, or maintain them in position. They do not, as a rule, take any part in the nervous functions, nor are they in structure like the nerve masses.

It is requisite, however, to describe them, because they are often referred to, when treating upon the organization and functions of the brain,

The Membranes of the Brain.—It has already been stated that the brain, like the spinal marrow, is enclosed in three membranes, an outer one, the *Dura Mater*, firm and tough. A middle one, the *Arachnoid*, very fine and thin, like a spider's web. And an inner one, the *Pia Mater*, which varies in density and structure in different parts. This inner membrane is the medium in which the arteries ramify that convey the blood which nutrifies the brain,

The Dura Mater is first seen when we open the skull, as it covers the brain mass like a sack. Not only does it cover the outside of the brain, but sheets of it descend between different parts of it, to keep them asunder, and support them ; the two *halves* of the brain are thus separated by a firm strong sheet of the dura mater, which descends to where they are united, at the base of the brain. It also forms into tubes to cover and protect the nerves as they issue from the skull.

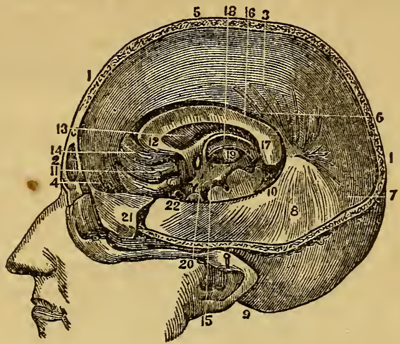
The following plate will show how the dura mater separates the two halves of the brain,

Most of these parts can be well studied, and their relations well understood, by carefully opening and inspecting the brain of a *sheep*, in the same way that the human skull is here shown to be opened.

The Arachnoid is what is called a *serous* membrane, and secretes a fluid called the *cerebro-spinal fluid*, which occupies the spaces between the convolutions and nerve masses generally. Such a fluid is necessary, as a bed on which the parts can lie, and it also serves to prevent them pressing unevenly and injuriously upon each other. It is, in fact, a water bed.

Plate XXIV.

THE HEAD CUT THROUGH THE MIDDLE.



In this section the brain is removed from the upper side. (1 1), the cut edge of the skull bone ; (2), the frontal sinus, or hollow space between the two plates of bone which form the skull ; (3), is the falx cerebri, or plate of the dura mater, which descends from the top of the skull, just in the middle, to separate the two halves of the cerebrum like a wall. If the falx were taken away the half of the cerebrum on the other side would fall out. It is called *falx*, because in shape it resembles a *sickle*, the Latin name for which is falx ; (4), shows where the falx descends to in front ; (5), shows where it is attached at the top ; (6), shows its lower edge ; (7), shows where it ends below, by joining what is called the tentorium ; (8), the tentorium, this is also a plate of the dura mater, but placed horizontally, its use being to support the back part of the cerebrum, and to separate it from the cerebellum, which lies below. If it were not for the tentorium the cerebrum would press upon the cerebellum ; (9), shows where the tentorium is attached to the temporal bone ; (10), is the edge of the tentorium ; (11), some of the convolutions of the front lobe of the cerebrum ; (12), the front extremity of the corpus callosum, or band of hard substance which unites the two halves of the brain below ; (13), the septum lucidum, a thin clear wall of separation, which will be spoken of further on ; (14), the anterior commissure ; (15), the front crus of the fornix ; (16), the middle of the fornix ; (17), the back termination of the fornix, where it joins the corpus callosum ; (18), part of the thalamus optici ; (19), part of the corpus striatum ; (the situation of these two important ganglia, referred to in the previous article, as the centres of the sensorium, can here be plainly seen,) (20), the walls of the third ventricle, one of the hollows, or cavities, which exist in the centre of the brain ; (21), a flap of the dura mater turned over ; (22), the internal carotid artery.

The quantity of the fluid is less in youth than in old age. In the adult there is usually about two ounces of it, but in some diseases it increases to a great extent, as in Hydrocephalus, or water on the brain.

The Pia Mater is mainly composed, in most parts, of the minute blood vessels from which the brain derives its nutriment, but in a few places it becomes hard and fibrous, like the dura mater. It envelopes the whole brain, like the other two membranes.

The Corpus Callosum.—The two halves of the cerebrum, which are kept apart by the falx cerebri in their upper parts, are joined below by a firm band of fibres, passing from one to the other. This is the corpus callosum,—the great commissure of the cerebrum,—or the *beam* of the brain. It is about four inches long, (12, Plate 24.)

The Ventricles.—If the corpus callosum be cut into, on each side of the middle line, there will be found two cavities, of an irregular form, one on each side. These are called the *lateral ventricles.*

The middle cavity of each ventricle is triangular in shape in the middle, with three corners, (*cornua*) or horns, one front, one in the middle, and one behind.

The anterior, or front cornu of the ventricle, is triangular in shape, and projects into the front lobe of the cerebrum.

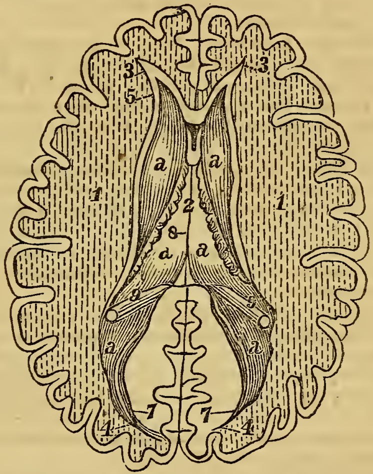
The posterior, or behind cornu of the ventricle, extends into the posterior or back lobe of the brain. There is a curiously formed mass of nervous matter, (ganglionic) which projects into this cornu of the ventricle called the *hippocampus minor.*

The middle cornu of the ventricle extends into the middle lobe of the brain. It is very irregular in its direction, and also has a very peculiar projecting mass of ganglionic matter, called the *hippocampus major.*

These two masses of nerve matter, the hippocampus minor, and hippocampus major, are only projections from the convolutions of the cerebrum. Their special uses, if they have any, are unknown. They are, however, important anatomically, and, as it will be shown further on, are much referred to in the discussions respecting the difference between men and monkeys.

Plate XXV.

THE BRAIN CUT ACROSS HORIZONTALLY FROM EAR TO EAR, TO SHOW THE VENTRICLES, AND THE SITUATION OF THE HIPPOCAMPUS MAJOR AND HIPPOCAMPUS MINOR.



(1 1) the cerebrum cut through horizontally; (*a a a a*) is the hollow of the two lateral ventricles, divided by the fornix 2, down the middle; (3 3) the anterior cornua of the ventricles; (4 4) the posterior cornua; (9 9) shows the commencement of the middle cornua.

The hippocampus major commences in the middle cornua, opposite the figures 9 9; the hippocampus minor is located by figures 7 7, in the posterior cornua, one on each side.

From this description it will be seen that there are two ventricles, or hollow spaces, one on each side of the corpus callosum, and they are both formed alike. Each one is triangular in the middle part, with three cornua or corners, in each hind cornu being a hippocampus minor, and in each middle cornu a hippocampus major.

The Fornix is a sheet of firm white fibrous matter, below the corpus callosum, and continuous with it. It extends into each of the lateral ventricles, forming part of their surrounding walls.

The Septum Lucidum is the thin partition which separates the two lateral ventricles from each other.

The Third Ventricle.—This a hollow space between the two thalami optici.

The Fourth Ventricle.—This is connected with the cerebellum, and is situated on the back of the medulla oblongata and the pons varolii. Portions of the cerebellum project into this cavity, as the portions of the cerebrum forming the hippocampi do into the cornua of the lateral ventricles. These projections of the cerebrum are called by various names, the principal being the *nodulus*, the *uvula*, and the *amygdala*, or *tonsils*.

The uses of these bodies, if they have any special functions, like those of the hippocampi, are unknown.

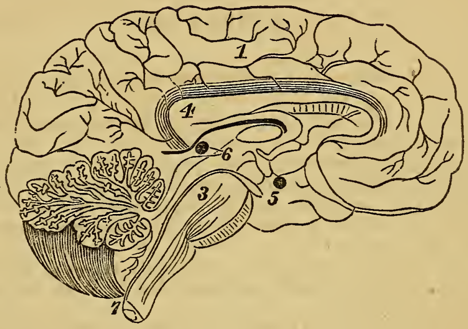
The Fifth Ventricle is a small hollow space in the septum lucidum, and it therefore lies between the two lateral ventricles.

The Pineal Gland.—This is a small grey body, of a reddish tinge, placed nearly in the centre of the base of the brain, between the corpora quadrigemina, where the optic nerves begin. In plate 18, it is situated above the pons varolii, (*d*), and below the fork of the optic nerves, (*c*, *c*).

This small gland was supposed, by some of the old physiologists, to be *the seat of the soul.* It always contains a number of small stony bodies, composed of phosphate of lime, magnesia, and ammonia, with organic matter. It would seem that these small stones are some way necessary, as they are always there, but no use is known for them. It may well be a puzzle, also, to those who have not studied the process of nutrition, how this stony matter could get into the centre of the brain, but there it is.

Plate XXVI.

SECTION OF THE RRAIN, TO SHOW THE SITUATION OF THE PINEAL GLAND AND OTHER PARTS.



(1), Convolutions of the cerebrum; (2), the cerebellum; (3), the medulla oblongata; (4), the corpus callosum; (5), (the black spot,) the pituitary gland; (6), (the black spot), the pineal gland; (7), the spinal marrow.

The black spot, (6), is placed merely to show the *situation* of the gland, and not its relative size; it being in fact very small.

The pituitary gland, (5) is also not relatively so large as the spot, which merely shows its location, the uses of the pituitary gland are also unknown.

Having now completed our view of what may be called the regular parts of the nervous system, it is necessary still to explain another part, entirely dissimilar in its structure and in the mode of distribution of its parts. This is what is called the great sympathetic nerve, or the nerve of organic life, because its branches are distributed to the vital organs, and bind them, and the other parts of the system, in one bond of sympathetic action.

CHAPTER VII.

THE GREAT SYMPATHETIC NERVE.

This is also called the ganglionic, vegetative, and organic nerve.

Its central, or main part, consists of a series of ganglionic knots, connected together by a trunk of nervous matter, and extending down the outside of the spine, from the bottom of the skull to the lowest part of the back bone.

Each of these ganglionic knots appear to be a kind of small independent brain, entirely distinct from any part either of the brain or spinal marrow. It is, however, connected with them in this way. It gives off branches which connect with each of the spinal nerves, and also with some of the nerves of the brain. At the place where these branches of the sympathetic communicate with the other nerves, there is a ganglion formed ; and from that it gives off nerves which run side by side with the arteries, to most of the vital organs whose functions are involuntary. From its upper ganglion it gives off nervous twigs, which connect with the sixth pair of cranial nerves, and also with part of the fifth pair, which again connects it with the ophthalmic ganglion

There are *three* of these sympathetic ganglions in the *neck*, *twelve* in the *back*, *five* in the *loins*, with *three* and sometimes *four*, in the sacrum. At the bottom there is commonly a small end ganglion, called the *coccygeal*, but sometimes this is absent, and there is merely a band of communication between the sympathetic of the other side, for, it must be borne in mind, there are two great sympathetic nerves, one on each side of the spine, exactly alike. The sympathetic ganglions are different in their structure from either the brain or the nerves, being somewhat intermediate between the two. They are reddish gray in color, and rather pulpy in consistence, but apparently more fibrous than gelatinous.

There has been much discussion as to the special functions of these nervous centres, but observation seems to show that they act like the brain, and spinal marrow, originating nervous power, which is apparently specially used by the vegetative organs. Cuvier has remarked that when the brain is too small, the sympathetic ganglions are larger than common, as if to compensate for the deficient brain. They also appear to render the organs which receive nervous influence from them independent of the brain, or *will*—at least in many cases. So independent, in fact, is the sympathetic nerve that, though connected both with the brain and with the spinal marrow, it may yet be but slightly influenced by them. This is shown by the fact that the vital organs, with which the sympathetic is connected, can continue performing their functions after being separated from both brain and spinal cord. The heart and intestines may be even removed from the body, and yet, if connected with the sympathetic nerve, will still continue acting. This, of course, is owing to the nervous influence which they get from the sympathetic, and it goes far to show that this nerve is really an independent source of nervous power.

The sympathetic nerve is especially connected with the digestive organs,—those of assimilation,—of secretion,—and with the heart and blood-vessels. It also connects all these organs with each other, and with the brain and other parts of the system; thus establishing a *sympathetic union* among the whole.

The peculiar connections of the sympathetic nerve explain, very obviously, why one organ sympathizes so readily with another—though they may be far apart, and, apparently, in no way related. It shows, for instance, how derangements of the stomach or other organs may affect the brain, or the reverse; thus, the optic ganglia are connected with the upper sympathetic ganglia, and the stomach with the middle ones, so that the eye and the stomach are nervously connected, and can influence each other, as we often find them doing. A disordered stomach frequently affects the vision, and certain impressions made on the eye will affect the stomach. The generative organs especially, in both sexes, but particularly in the female, have a remarkable sympathetic relation with other parts of the system, and sometimes exert an almost paramount influence over them; as will be shown further on. The action of the mind—through the brain—the functions of the stomach, intestines, heart, and other organs, may all become deranged through a morbid or over-active condition of the womb, or testicles.

There is nothing strictly analagous to the sympathetic nerve in the lower orders of beings, or invertebrates, although the vital organs are prominent enough in them. This would seem to show, therefore, that the function of the great sympathetic is, not merely to give nervous power to those organs, and thus make them and the animal organs independent of each other, but really to bring them both into sympathetic relation, and to connect them with the rest of the organization, as above illustrated. The great sympathetic nerve is more immediately connected with the visceral organs, or those of the chest and abdomen; and it has a more obvious and decided influence over them than over any others. As before stated, these organs receive so much nervous power from the sympathetic, that they are, to a great extent, independent of the brain and spinal cord; and, therefore, act involuntarily. Consciousness, or will, has nothing to do with the normal action of the heart, stomach, or intestines, because they are not dependent upon the brain for nervous influence, but chiefly upon the sympathetic.

The nerves given off from the sympathetic to the different visceral organs, form several large masses of interlaced fibres called *plexuses*, resembling masses of white cord crossed and intertwined in every direction. One of these plexuses, called the *cardiac plexus*, supplies nerves to the heart and great blood-vessels. Another, much larger, called the *solar plexus*, supplies the liver, spleen, kidneys, stomach, intestines, and testicles, or womb and ovaries. This solar plexus is formed by the interlacing of the fibres of two others, called the *semi-lunar plexuses*, which are derived from a large branch of the sympathetic, called the *splanchnic* or *visceral* nerve. This splanchnic nerve descends from the upper sympathetic ganglions, in the top of the chest, through the diaphragm. See Plates XXVIII, XXX, XXXII.

The branches of the sympathetic nerve, almost invariably, accompany the blood-vessels to all the visceral organs, so that nutriment and nervous influence go together.

The investigations of some eminent physiologists have made it probable, however, if not certain, that the visceral organs do not entirely depend on the great sympathetic for their nervous power, but that they derive some power from the *eighth pair* also.

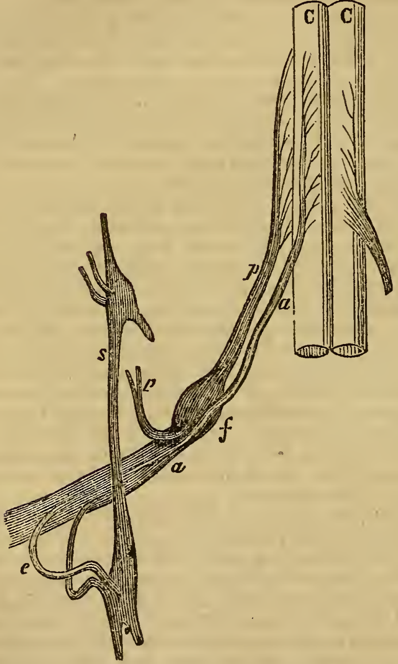
Sir Astley Cooper cut the great sympathetic nerve in a dog, on both sides, and found that it affected the action of the heart very little; but, when he tied the eighth pair, and the phrenic nerve as well, the animal died, in about a quarter of an hour, from inability to breathe.

Such an experiment, though it proves that nervous influence is necessary to the action of the breathing apparatus, would seem to show, also, that this influence is not derived exclusively, nor principally, from the great sympathetic nerve. It may be, however, that the part of the nerve below the cut could give power enough, independent of the part above: and, indeed, some physiologists contend, that every section of the sympathetic nerve, and every one of its ganglions, is an independent centre of nervous power.

The actual origin of the sympathetic nerve is not known; some supposing it to be an offshoot from the spinal cord or brain, while others suppose it has an independent origin, and that its various ganglions are independent nervous centres. It is also asserted, by some physiologists, that the sympathetic nerve is formed before any other part of the nervous system, at the same time with the visceral organs. It is also stated to have been found in imperfect beings, that had neither brain nor spinal marrow. In such a case, it must, therefore, alone, have supplied nervous influence enough to excite the vital organs to action.

Plate XXVII.

CONNECTION BETWEEN THE SPINAL NERVES AND THE GREAT SYMPATHETIC NERVE.



(C C), the two columns of the spinal cord ; (*a*) the motor nerve, connected with the anterior or front column ; (*p*) the sensory nerve, connected with the posterior or behind column ; (*f*) the knot, or ganglion, where the two enter together, but emerge again at *a* and *p*; (*s*) is the sympathetic nerve ; (*e*) shows the two filaments, or threads of the sympathetic—one white and one grey—going to form a double junction with the spinal nerves.

It must be remembered, however, in regard to the sympathetic nerve, that, though its branches are distributed on so large a scale to the viscera, its associations are not confined to them alone. On the contrary, it is connected with every internal organ of the head, chest and abdomen. Its twigs interlace with those of the nerves of the brain, as well as with the spinal nerves, and it thus establishes a common bond of union and sympathy, through the whole nervous system. And this explains how the brain, heart, lungs, stomach, and other organs all act upon and influence each other.

Plate XXVII shows the manner in which the spinal nerves and the great sympathetic are connected.

Every pair of the spinal nerves is connected in this way, with the sympathetic, as shown in Plate XXIX.

All the branches of the sympathetic nerve, it will be seen, are compounds, since they contain, not only the sympathetic itself, but also cords from both the motor and sensory columns of the spinal cord, and they therefore influence both sensation and motion. This, however, is only through the spinal nerves, for the sympathetic appears to be neither sensory nor motor itself.

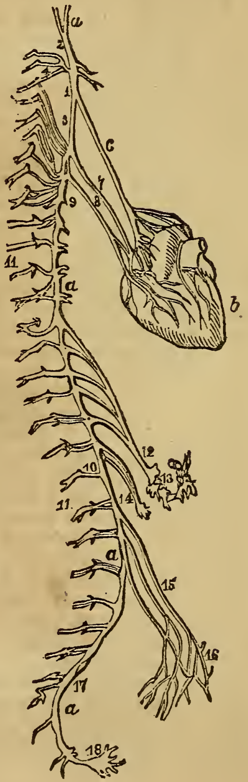
It is noticeable, also, that the sympathetic nerve is not so quick in conveying impressions as the other nerves. It seems as if an influence passing through its ganglions is retained or delayed a little. This, probably, allows of its being distributed in new channels, or perhaps, even, of more or less of it being stored up for future use. In this way it may act as a regulator to the nervous system, by which the nervous power is evenly distributed to the internal organs, instead of some parts receiving too little and others too much. Now, when the stomach is digesting it needs a large amount of nervous power; but when digestion is completed, not so much. Here comes in the regulating influence of the sympathetic ganglia, which send this overplus of power, when the stomach no longer needs it, to some other part, where it is required.

These sympathetic reactions will be more fully referred to further on, and it is therefore desirable that the subject should be well understood.

Plate XXXVIII, also shows the sympathetic in the whole of its course.

Plate XXVIII.

THE GREAT SYMPATHETIC IN ITS WHOLE LENGTH.



(*a*, *a*, *a*). The sympathetic nerve. 1 Upper ganglion of the neck. 2. Ascending branch. 3. Descending branch. 4. External branch, communicating with the spinal nerves of the neck. 5. The branch on the opposite side, communicating with the facial, and with the eighth and ninth pairs of nerves, as well as with the pharyngeal plexus. 6. Superior cardiac nerve. 7. The middle cardiac, and 8, the lower cardiac nerve; all going to the heart, (*b*). 9. The first dorsal, or back ganglion. 10. The last dorsal ganglion. 11. Spinal nerve. 12. The great splanchnic nerve. 13. The semi-lunar ganglion, the two forming the solar plexus. 14. The lesser splanchnic, forming the renal plexus. 15. Branches from the lumbar ganglia, forming, 16, The hypogastric plexus. 17. Sacral ganglia. 18. The last, or coccygeal ganglion.

Plate XXIX.

PORTION OF THE SYMPATHETIC NERVE WITHIN THE CHEST.

a, *a*, *a*, The backbone; *f*, *f*, the ribs; *k*, the large artery; *m*, *m*, the great lymphatic vessel; *q*, *q*, ganglions of the sympathetic nerve; *r*, the branch going to the bowels; *s*, *s*, branches of the sympathetic nerve connecting with the spinal nerves; *t*, *t*, upper and lower ends of the sympathetic nerve cut off.

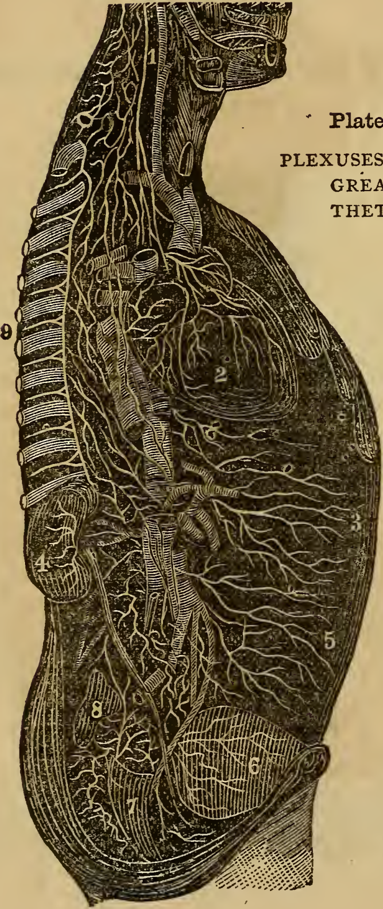


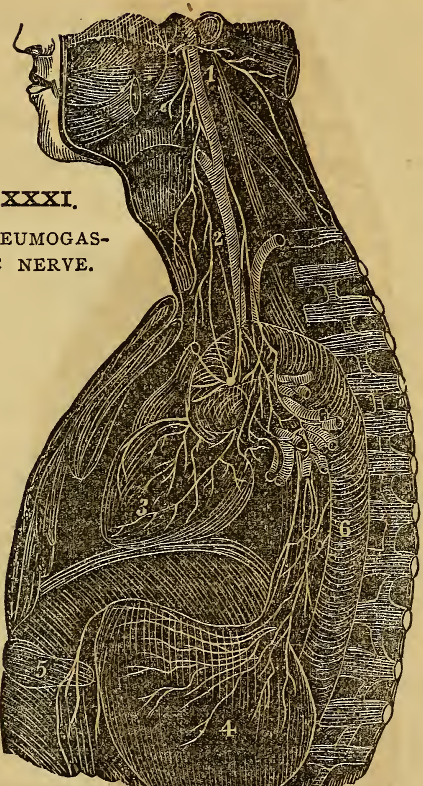
Plate XXX.

PLEXUSES OF THE GREAT SYMPATHETIC NERVE.

1. Commencement of the great sympathetic nerve in the ganglions of the neck; 2, shows the plexus of its branches about the heart; 3, the plexus about the stomach; 4, the kidney; 5, the plexus about the bowels; 6, the bladder; 7, the rectum; 8, the spermatic plexus, connected with the internal generative organs; 9, the backbone.

Plate XXXI.

THE PNEUMOGASTRIC NERVE.



1. The commencement of the nerve; 2, branches going to the heart; 3, branches distributed to the lungs; 4, branches distributed to the stomach; 5, the gall-bladder; 6, the large vein going to the heart.

At every joint of the backbone, Plate 29, may be seen the two branches leaving the sympathetic to go and join the spinal nerves.

These diagrams show how all the internal organs receive their network of nerves from the main trunk of the sympathetic nerve, and how they are, consequently, in sympathetic union with each other. The upper end of the trunk of the sympathetic, it must be remembered, is also connected with the cerebral nerves, issuing from the sensorium; and thus all the visceral organs are connected with the special senses, and with the brain, as well as with each other.

The importance of this fact, in many derangements of the system, will be at once apparent, especially in many otherwise inexplicable *nervous diseases!* Thus, a diseased womb may affect the stomach, heart, or brain; or, conversely, the womb may be affected through them.

It should further be remarked that all the internal organs receive nerves from the spinal cord, as well as from the sympathetic, and some of them from the cerebral nerves—as shown in Plates XXIX, XXX, XXXI.

These diagrams, of course, show only the large branches. It would be impossible to represent the thousands of minute twigs, ramifying, interlacing, and crossing each other in every conceivable direction.

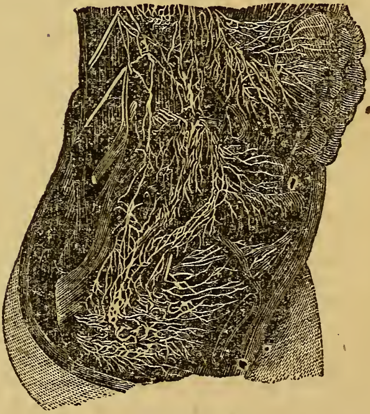
The mass of nerves in Plate XXXI, it must be borne in mind, is only the branching of the pneumogastric; but, besides these, there are those already shown from the sympathetic, and also others from the spinal axis, all to the same organs, and all intermixed and connected together.

Every one of these fibres, even the minutest—such as require a powerful microscope to make them visible—all convey the nervous influence, and are concerned either in sensation, nutrition, or motion, and all are connected with each other, and with every other part of the nervous system.

All the other plexuses are equally as extensive and complicated as those shown.

Plate XXXII.

PLEXUSES OF THE GREAT SYMPATHETIC NERVE IN THE ABDOMEN.



The upper plexus is connected with the intestines, as will be seen; the middle and lower ones with the generative organs, bladder, and rectum.

CHAPTER VIII.

GENERAL VIEW OF THE NERVOUS ORGANS AND FUNCTIONS IN MEN AND OTHER ANIMALS.

The explanations already given will have shown that the nervous system, in man and the higher vertebrated animals generally, is composed of a number of nervous *centres*, connected with each other, and with the rest of the organization, by nervous *fibres*. These centres are the sources of nervous power, which the fibres merely convey where it is needed, and each centre appears to have some power or function peculiar to itself. It is, however, difficult to find out what these peculiar powers of the different nervous centres are, owing to their being so intimately connected, and mutually influencing each other. Indeed, if our attention be exclusively directed to the nervous system in man, and the higher animals, only, it is not possible to find out much about the special functions of its different parts, on account of this mutual action and reaction. Fortunately, however, in the lower animals, the number of these nervous centres is less, and they are more disconnected, in fact, often standing alone, so that their special functions can be more readily ascertained.

It is, in fact, from a study of the nervous system in different classes of beings, from the lowest upwards, that much of our recent knowledge of it as it exists in man, has been obtained, as the following brief statement will show:

The Nervous System, from the lowest types to the highest types.

Observation, analogy, and experiment, all lead to the conclusion that no animal, no matter how minute, or how simple in its organization, is without some kind of nervous material, which enables it to receive impressions from external objects, and to respond to such impressions by motions more or less voluntary. In the very lowest beings, it is true, the nervous apparatus cannot be distinguished separate from the other parts of the organization; but neither can the muscular, the digestive, nor any other organs. In these beings, in fact, the whole system is uniform; so that every part is nerve, muscle, stomach, and everything else at the same time. It is only in beings higher in the scale of organization that one part becomes all nerve, another all muscle, another only stomach, and so on. This is called *differentiation*, or the separation of the various functions, and their location in separate organs. This principle of the differentiation of parts is an important one, and it is very instructive to notice how it first begins to work. In the *Amœba*, one of the lowest kind of beings, consisting of little more than a minute uniform bag of jelly-like matter, every part is exactly alike, and can perform every function of which the being is capable. From any part of it a prolongation will stretch itself out like a leg, or as an arm, to lay hold of things, and in any part of it a hollow will form, by the side sinking in, and this hollow acts as a stomach. And thus every part may be limb one moment, and stomach another, and keep on thus changing perpetually, inside or outside all the same—there is no *differentiation of parts!*

The very lowest type of a separate nervous apparatus consists of *a single nervous centre*, or ganglion, with *afferent* and *efferent*, or *sensor* and *motor* nerves, forming a simple nervous circle. Something of this kind is found in most of the very simply organized animals; and the whole nervous action, in such beings, is apparently merely *reflex*, or *excito-motor*. Something acts externally on the nerve of sensation, which conveys the impression to the ganglionic centre, and from thence proceeds an influence, along the nerve of motion, which leads to some necessary action.

A small jelly fish, for instance, floating in the water, stretches out its tiny feelers in all directions, and eventually one of them comes in contact with some particle of substance, suitable for its nutriment. This particle of nutritious matter makes an impression on the sensor nerve of the feeler, which is instantly transmitted to the ganglionic centre, and from thence comes back, down the motor nerve, an influence which causes the muscles of the feeler to contract, to grasp the particle, and convey it to the animal's mouth. Now, all this, as before remarked, appears to be simple reflex action; and there is, as far as we can ascertain, no such thing as *consciousness*, or even *special sensation*. The animal appears to live only a vegetative or organic life, and to have nothing analagous to *true animal life*, such as special sensation, consciousness, or knowledge. In fact, it would seem impossible that there should be any such functions, because such a being, as far as can be ascertained, has no such thing as a *brain*, or organs of *special sense*, but merely a single spinal ganglion, with its sensor and motor nerves.

Still we are not justified in saying that such a being cannot have, or has not, any trace of consciousness. We are merely justified in saying that we cannot find any such trace, nor the rudiments of any organ analagous to the brain. But many physiologists are of opinion that, to some extent, consciousness does exist, and probably, also, some form of intellect and special sensation, in all classes of animals, down to the very lowest and simplest of all.

Mr. H. J. Cartter mentions, in the *Annals of Natural History*, an instance where one of the very lowest kinds of beings, such as scarcely appear alive at all, showed decided indications of *mind!* This was one of the *Infusoriæ*, such as are produced in water, when it contains any decaying animal or vegetable matter. The whole being is only like a minute ball of jelly, with no very distinct form, and so small that it can be studied only with a microscope; and yet this minute animalcule evidently had *mind*, as the facts will show. Mr. Cartter watched it taking grains of starch, as they flowed from a ruptured vegetable cell, for food. It would watch till one came, and then seize it; but, finally, apparently tired of watching and waiting, as no more flowed out, it went up to the cell and drew them out. Now, here was, unquestionably, intelligence, or mind, just as decided, in proportion to its minute nervous system, as is the mind of man in proportion to his. This mere animalcule *knew*, from *observation*, that the grains it wished for flowed out of that ruptured cell, and that it had only to watch for and get them. But, finally, when they ceased to come, it *reasoned* further that more could be got by going to the *source* of supply itself, and then it went accordingly. Now, here are, apparently, observation, reflection, and deduction, or a regular process of *reasoning*, the same in *kind* as that displayed by a Newton or a Faraday, only different in degree.

Mr. Cartter also mentions another instance of an Amœba, the mere minute jelly-bag before referred to, with literally no regular form, nor any distinct organs, which exhibited evident signs of intelligence in procuring its food. This being is merely a minute *bag*, or *bladder*, which keeps continually changing its form, and is nourished by still more minute beings, which are conveyed to its interior by the water, which flows constantly in and out. It is, in fact, all stomach, apparently, and may be turned inside out without causing it any inconvenience. Yet even this being was observed to watch for the ovæ or eggs, as they were thrown off from the ovary of another being, nearly as simple as itself; and, to make sure of them, it even placed itself round the opening through which they came, so as to intercept them.

In all such primitive organizations, as before explained, what is called the principle of *differentiation* is not yet brought into play;—that is to say, separate parts of the organization are not set apart for different uses, and endowed with distinct faculties, as we see them to be in beings higher in the scale of development. Thus, in man, one part feels, another thinks, another moves, another digests, and so forth, but in the *Amœba*, and other such beings, every part is alike, and performs every function of which the being is capable. Thus, it digests with its whole body, every part alike, inside or out; and every part is also, probably, equally endowed with nervous power, such as it needs—the organs are not *differentiated*.

Another fact may also be mentioned, to show that *mind* is exhibited by the lower animals. Dr. Wm. Ogle, in the "Popular Science Review," tells us that different bees proceed in different ways to get the nectar out of bean-blossoms. Thus, the majority of the bees simply push themselves down the open blossom as far as possible, and try to reach it that way as well as they can; but, now and then, a bee will come who finds that the nectar cannot be readily and perfectly got at in that way, and he at once adopts a better method. This exceptional bee, of greater intellect, bites a hole in the side of the calyx tube, close down by the nectar, and sucks it all out at his ease. Now this bee always *does so;* but none of the others, who enter the best way they can, at the open mouth, ever adopt such a plan; they evidently have not intelligence enough to see its advantages. Each one acts according to his intellect, and there are different degrees of intellect among them, as there are among human beings.

Many of the lower animals and insects will also change their habits materially, under new circumstances, showing that they act from intellect, and not from a mere blind, unvarying *instinct,* as formerly supposed.

Among others, Dr. Lander Lindsay, in a recent issue, contends that the mind of one of the lower animals and the mind of a man differ only in degree, and not in kind. Each possesses, he remarks, the same faculties, affections, moral sense, and capacity for education, only in different degrees; they are also subject to exactly the same mental disorders.

Dr. Emberton also read a paper before the British Association, in which he showed that the brain of the chimpanzee differed in no essential respect from that of a man; —the parts all corresponding exactly—except in size. The same view is also taken by other eminent anatomists.

It has already been shown that, in its primitive form, animal substance comprises in itself all the special properties which, in higher organizations, are distributed to separate parts. As we ascend in the scale, however, we find come into play the law of *differentiation,* or the performance of particular functions only by particular parts of the organization. Thus, some parts begin to *feel* only, and others to *contract* only, while others again *secrete,* or *assimilate* only; and, finally, in some parts, we have the function of consciousness.

And here comes in two very interesting questions.

First, since we have certainly sensation and motion, with the function of nutrition, in *every part* of the simple animalcule, may there not be also the other, grander, faculty of *consciousness*, though but in a minute degree? If this be so, *mind* exists, in a rudimentary state, in the minutest and simplest beings that the microscope can reveal to us, as the facts already narrated, in fact, prove.

Secondly, since the functions of sensation, motion, and nutrition, and, possibly, also consciousness, exist in *every part* of the simple animalcule, may they not also exist in every part of the more perfect being to some extent? Or, in other words, though we have—in man, for instance, some parts performing only the function of sensation, some of motion, and some of assimilation, and so forth, yet may not *all parts* still retain, *to some extent*, the primitive power of performing all these functions, as they do in the rudimentary being? And, further, may not even *consciousness*, or mind, though known ordinarily only as a special function of the brain, be yet possible, under some exceptional circumstances, in connection with other parts of the body?

It may be possible that, in some exceptional states of exaltation, or disease, any part of the body may feel, or act, or assimilate, or secrete, or even *think!* And, in fact, many curious cases of nervous disease, and of functional derangement, would seem to lend countenance to this view. Much of the mysterious and unknown in animal magnetism, and kindred phenomena, may possibly come to be explained in this way.

This, however, it must be borne in mind, is simply *speculation*, and each one must judge of its probable, or possible, truth or falsehood for himself.

Some animals have a number of simple nervous centres, with afferent and efferent nerves, but all alike. This is the case especially with those whose bodies are composed of many parts, all alike, there being a special nervous centre, with its nerves, for each part, but each resembling the other, so that there is no diversity of function, but merely a repetition of the original simple nervous circle. Still, even in this case, the different centres are all connected together, so that each one is affected through the others,—as in the star fish.

In other beings, still higher in the scale of organization, whose parts are not a mere repetition of one simple plan, but vary in form and uses, the several nervous centres also vary. Some of them influence locomotion, some digestion, and some other special functions. But still there is more or less union amongst them, though each has its own particular sphere of action.

Physiologists formerly thought that none of the lower animals, below the vertebrates, possessed any trace of the cerebral ganglions, or brain proper, and that, consequently, they had no true *consciousness* and never *reasoned*. Some even of the very lowest of the vertebrates, were thought, by them, to be equally deficient.

The exactly opposite view is, however, now held; and the most eminent physiologists contend that all animals, even to the lowest, have consciousness, or mind, proportioned to their development.

Among all of them, except the very lowest invertebrates, we find the *sensorial* ganglia more or less complete, so that they possess the special senses; some excelling in one, and others in another. Thus, some beings are noted for their acute sight; others for their smell; and others for their hearing, and so on. It is contended, however, by those who deny consciousness to all except the higher beings, that the action of the special senses in the lower beings is simply reflex, or excito-motor, and that it is not accompanied by consciousness. These persons contend that, in the lower invertebrate animals, seeing, hearing, smelling, and so forth, are not accompanied by any consciousness of these acts, as with us, but that they are simply reflex; like breathing or digestion.

I cannot, however, think so myself; for, it seems certain to me that any such special act must be more or less a conscious operation. It is true, no trace of brain proper can be found in many beings, but still it may exist, or some other part may officiate for it.

Immediately we find distinct traces of a brain, no matter how small, all the other ganglionic centres seem to be connected with it, and to be more or less under its influence.

There has always been a great fear of allowing anything like *reason* to the lower animals, even to those nearest to man—and hence has arisen the term, *instinct!* This term was meant to convey the idea, that, in all beings but man, every action arose either from a mysterious internal impulse,—originated, no one knew how,—or, from the direct influence of external agents upon the organs of special sense; and that emotion, consciousness, or reason had nothing to do with it. Or, in other words, it was thought that these actions were all *automatic*, or merely reflex, and that there was no more *mind* in them than in the growth of a tree.

It was contended that animals who acted from instinct, always did the same, every individual alike, and that they were incapable of doing otherwise,—in fact, that they did not know what they were doing, but did it for the same reason that the plant produces leaves and flowers, because it was their nature to do so, and they could not help it.

It is, however, now considered, by most modern investigators, that what is called instinct, is in no respect different from human reason, except in degree. As before remarked, *it is all a matter of brain!* Just as human beings vary from each other in mental endowments, according to the different degrees in which their brains are developed, so do the lower animals differ from man. And there is no more reason for supposing that the *mind* of a dog, for instance, is different from that of his master, *in its nature*, than there is for supposing that his master's mind is different, in its nature, from that of some other man. The man has some faculties superior to the corresponding ones in the dog, and he has some that the dog has not at all; but this is simply because his brain is more perfectly developed in particular parts. In some faculties, the dog is the superior; and the parts of the brain with which those faculties are connected, are, with him, better developed than they are in man.

This term, *instinct*, to denote something essentially different from, and below reason, originated from man's vanity, and is perpetuated by the same feeling. It is common to say that animals have not this faculty or that faculty, when no thorough investigation has been made to ascertain whether they have it or not. My own impression is, that animals are often much underrated, and that they do possess, in a modified degree, many faculties that have been denied them. Besides, we must remember, that we have often no means of judging what mental endowments they really do possess, and our dogmatic denial of this or that faculty is often made without any grounds whatever.

This, however, is more fully referred to in another place.

The existence of the higher faculties—reason, will, or intelligence—always depends upon the development of the great cerebral ganglia—the cerebrum. But the cerebrum receives all its impressions, which excite it to action, from the special senses of the sensorium, through which alone the brain receives its knowledge of the external world. Without the cerebrum, there would be no conscious knowledge of anything seen, heard, smelt, felt, or tasted ; and, without these senses, the cerebrum would be powerless to originate a single idea.

Among many of the lower animals, the nervous system forms but a small portion of the organization, and is, apparently, merely an adjunct to more important parts ; but, in the higher vertebrates, it dominates over all, and the form and arrangement of every other part is specially adapted to ensure its protection and facilitate its action. Thus, in man, the bones of the spine are so shaped, that they enclose the spinal axis and brain in a secure receptacle, where they are preserved from injury.

In regard to *mind,* and so-called *instinct,* it must be borne in mind, as elsewhere shown, that some of the very lowest beings, such as require a *microscope* to examine them, exhibit unmistakable signs of intellect, similar to what we see in man. Much of what is called *instinct* is merely inherited *habit!* Children do, instinctively, what the parents did habitually, because they inherit from them a similar form of brain, with similar tendencies to action. And, in this way, each generation is born with more capacity than the one preceding.

CHAPTER IX.

GENERAL SUMMARY OF THE NERVOUS APPARATUS IN MAN AND OTHER ANIMALS.

The primary or fundamental portion of the nervous system, in man, is the *cerebro-spinal axis*—that is, *the spinal marrow, the medulla oblongata, and the sensorium!* From these originate all those movements necessary to life, or the organic functions, and all reflex or automatic motions. With these parts alone the body may live and thrive, as a vegetative organism, but without consciousness.

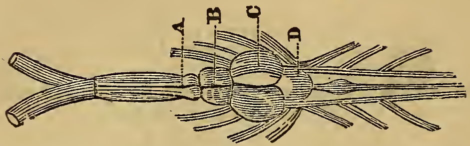
In the invertebrated animals, this cerebro-spinal axis, with its nerves, constitutes the whole nervous apparatus; and even in one of the lowest of the vertebrates it is the same. In the fish called the *amphioxus*, there is not a trace of brain—neither cerebrum nor cerebellum—and even the sensorium and the nerves of the special senses are only rudimentary. In fact, the spinal cord itself, in this curious animal, is imperfect also; being composed of a number of separate parts, or ganglions, placed close together, but still distinct.

In man and all the higher vertebrate animals, not only do we find a perfect, continuous, spinal cord, and a sensorium, with organs of special sense, but also a cerebrum and a cere ellum. The cerebrum is also so much developed, that it covers over the sensorium and the ganglia of the special senses, so that they lie underneath, at the base of the brain, as in man.

In some of the lower animals, however, we find this reversed; the sensorium being very fully developed, and the brain almost rudimentary. This is shown in the following plate:

Plate XXXIII.

BRAIN OF A CODFISH.



(A) the olfactory ganglia (nerve of taste); (B) the cerebral lobe, or cerebrum; (C) the optic ganglia (nerve of sight); (D) the cerebellum.

It will be seen from this, that the optic ganglia in the codfish are greater than all the brain put together. They lie between the cerebrum and cerebellum, and separate them; whereas, in man, the cerebrum extends back till it reaches and stretches over the cerebellum. The codfish, therefore, has more *eye* power, and man more *brain* power, or mind, in accordance with the nervous developments of each.

These optic ganglia seem to be strictly analogous to, if not identical with, the *corpora striata* in the human being, and are, apparently, the centre from which proceed the motor columns of the spinal cord.

At this point it should be remarked, that the cerebrum itself, or the true brain, has, so far as observation goes, no direct connection with any of the nerve fibres, nor with the spinal cord. No sensor nerves terminate in it, nor do any motor nerves issue from it. On tracing these nerves, all the sensor fibres seem to end in the *thalami optici*, whether they form part of the spinal cord, or part of the cephalic nerves; and the motor fibres, whether going direct to the spinal cord, or forming part of the cephalic nerves, all seem to originate in the *corpora striata*.

The nerves of special sense have their own ganglia, as already shown, in which they apparently terminate; and thus no nerves can be shown to terminate in the brain proper, though formerly it was thought they could all be traced there.

The cerebrum, in fact, is placed over all, and exerts an influence over all, without being directly connected with any part. Its only mode of communication with the material world, as far as we can see, is through the sensori-motor apparatus, or the special senses; but the precise manner of its connection with them is not known.

The brain itself is not the immediate source of any actions, not even *voluntary* ones; it only sends forth an influence, which excites the spinal nerves; and *they* excite the muscles. The brain is not the *engine*, but the *engineer*; overlooking and regulating all the parts of the machinery which are under its influence.

Wherever we find the cerebrum placed over the sensorium, we also find another brain mass (the cerebellum) placed over the medulla oblongata; and usually they bear a certain proportion to each other, but not always; for in some fishes, the cerebellum is very small—in fact, almost rudimentary.

The cerebellum is directly connected with both columns of the spinal cord, but only slightly with the other parts, or with the *brain!* It is, therefore, probably, more connected with spinal nervous action, than with true brain action, as will be shown further on.

As before remarked, the cerebrum, or brain proper, is placed over all, and literally above all the other parts of the nervous system, and can, more or less, control and regulate them.* Each section of the spinal cord, and each of the sensorial ganglia, is a distinct nervous centre and an independent source of nervous power—though this is not apparent, unless they are disconnected—but they are all used by the brain in the performance of its functions.

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* Excepting those parts that are concerned in the organic processes necessary to the support of life or nutrition, and these are independent of consciousness or will.

CHAPTER X.

THE WILL.—TRANSMISSION OF IMPRESSIONS.—MUTUAL RELATIONS OF THE DIFFERENT NERVOUS CENTRES.

The Will.

The peculiar state of *mind*, or action of the cerebrum, which immediately precedes any voluntary action, and which appears to cause it, is called the *will!* And thus, all that we do, or refrain from doing, is said to be determined by the will, which controls every bodily action, except those concerned in the maintenance of organic life. Nutrition goes on without consciousness, and independent of the will; and so does every function connected with it, except breathing and swallowing, which, to a certain extent, can be controlled by the will.

Over all other bodily actions, except those necessary to organic life, the will can exert a preponderating influence, from the lowest extremity up to the head, and it is instructive to trace out how this follows, from the peculiar arrangement of the nervous apparatus.

Any *impression* caused by excitement to a sensor nerve, if not arrested at some inferior ganglion, goes up till it reaches the brain, causing no reflex action on the way. On reaching the sensorium, it gives rise to a *conscious sensation*, and this being transmitted to the cerebrum originates an *idea*. This idea may either be associated with some *emotion* of pain or pleasure, or may be simply *intellectual*, and terminate in *thought;* or it may eventuate in *action*—in which case we call it *will!* The *will*, therefore, as before stated, is simply that state of the great nervous centre (or of the mind) which exists just before any voluntary action, and which originates that action. The will, in fact, bears the same relation to voluntary action, as the condition of the spinal cord does to involuntary or reflex action. If a frog's head be cut off, and, afterwards, one of the limbs be pinched, the sensation reaches the spinal marrow through the sensor nerve; and, by reflex action, the motor nerve stimulates the muscles to act and draw the limb away. Now, there is no consciousness in the animal, and, therefore, no *will*, as an intellectual operation; but the reflex action of the spinal marrow serves the same purpose. If the animal still possessed its *brain*, it would *feel* and *know* of the injury; and, by a mental operation, *or act of the will*, exerted through the spinal cord, would act on the muscle and remove the limb. The act is the same, and is effected immediately by influence from the spinal cord in both cases; but, in the one case, the cord is incited to act by the brain; and, in the other case, it acts of itself. It is *brain will*, when the head is on, and *spinal will*, when the head is off.

The current *metaphysical* explanations of mental phenomena, and the terms used in them, have so confused the whole matter, that it is difficult to speak on the subject so as to be understood. Metaphysicians undertake to speak of the mind as something separate from the body, and only using the nervous organs as *instruments!* This is basing the science of mental phenomena on mere *speculation*, instead of *fact*, and it can never lead to the discovery of the truth.

This is well exemplified in regard to the *will*. Volumes upon volumes have been written to prove that the will is, or is not, *free!* And still the contest goes on, year after year, concluding nothing, but leaving the subject just where it was a thousand years ago. And so it must ever be, as long as the will is thus spoken of as a kind of mysterious, independent being—a sort of sprite, or fairy, living in the brain, and deciding upon what shall be done, and what shall not be done, with all parts of the body, and even deciding *when itself shall come into existence!*

When an impression is made upon a man's cerebrum, through a sensor nerve, or by mental reflection, of a character to cause some *action*, we call it *will*; but to apply the terms *free*, or not free, to such a process is meaningless. Free, or not free, apply to *actions*, but not to will. A man can certainly *do* as he likes, if nothing prevents him, but to say he likes as he likes, or wills what he wills, is absurd, and yet it is just what metaphysicians *do say*.

Will, or decision as to action, is merely the dominant impulse, and is a result of a certain condition of the brain, brought about, primarily, by external influences operating through the sensor nerves, and according to the nature of those influences, so will be the decision, or will. For the will to be changed, the condition of the brain must be changed, and we can effect it in no other way. To speak of the will as forming itself, and capriciously making itself this, that, and the other, independent of all causation, is both ridiculous and misleading.

Transmission of Impressions.

If the spinal cord be cut through, so that an impression passing up it cannot reach the brain, that impression will then cause a spasmodic reflex action, through the cord, which in such a case, acts as an independent nervous centre. Instead of being stimulated from the brain, it is stimulated directly, by the impression, but acts upon the muscles the same in both cases. This is true *excito-motor*, or reflex action, unaccompanied by special sensation, or consciousness.

If the impression travels upwards till it reaches the *sensorium*, but still stops short of the cerebrum, the phenomena exhibited are different. In this case there may be reflex action from the sensory ganglia, instead of from the spinal cord, and they may, as the organs of the special senses, guide and direct muscular action, at least to a certain extent.

This is often seen when a person is much abstracted, and so occupied by his thoughts that external objects are quite unnoticed by him. A man in this state will often walk about as if he were asleep, and yet not come in contact with external objects, because his actions, though not directed and overlooked by the mind, are yet under the control of the sensorium. His *mind* takes no cognizance of objects, but his *senses* do, and that is sufficient to give him a certain amount of guidance.

Such actions are called *sensori-motor* or *consensual*, and they are such as are exhibited by beings without the cerebral hemispheres, or in whom they are not developed. Most of the early actions of an infant, such as nursing, are of this character.

But, besides being directly excited by external impressions, the cerebrum may also be excited by an *idea*, or *emotion*, such as often arise, we know not how. Thus, while *dreaming*, or when in deep *reverie*, but especially in *somnambulism*, some idea or emotion will take the place of the *wide-awake* mind, and cause motions of which the individual is quite *unconscious!* People will often do, in such cases, things of which they have no recollection afterwards, because they had no consciousness of them at the time.

In such cases, there is no proper conscious action of the cerebrum, but merely irregular flashes, as it were, of disconnected ideas and emotions, sufficient to cause muscular actions, or even, in some cases, fitful intellectual processes; but no true perception of things, nor any connected trains of thought.

Such actions are called *idea-motor*, when resulting from ideas, and *emotional*, when resulting from emotions; and they are as truly *automatic* or *reflex*, as those which occur when the spinal cord is irritated. In fact, ideas and emotions, or passions, are the most powerful of all nervous irritants; and, when they act in a morbid manner, or to an undue degree, the individual is *insane*. In such cases there is no *will*, as we usually understand it, but the mind drifts about, as it were, like a ship without a rudder. Something is wrong with the *cerebrum*; it is torpid or diseased, or the rest of the nervous system acts so powerfully as to be beyond its control. There is still a *will*, but it is an *emotional*, and not an *intellectual* one.

The Different Nervous Centres—their Powers and Associations.

There seems to be no doubt, as already remarked, that each of the several ganglionic nervous centres exerts a peculiar modification of the nervous power, and can act, to some extent, independently of the others; though all can co-operate, and all are controlled by the cerebrum.

The various nerve fibres, therefore, going to, or coming from, the different ganglionic centres, convey somewhat different impressions, and influence somewhat different actions, according to the ganglion with which they are connected. Most of our impressions, however, are more or less compound, and most of our actions are more or less complex; owing to the fibres from different centres intermixing, which they do in the most intricate manner. In fact, it is seldom that the fibres from any centre proceed directly, and without connection with others to any part. We find everywhere *plexuses*, or intricate networks, composed of nerves from various centres, all crossed and interlaced in every way.

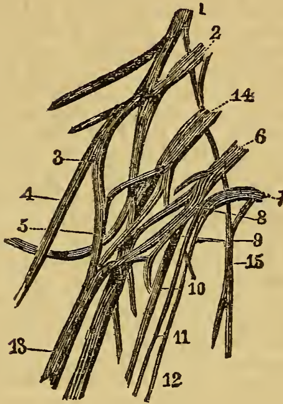
This arrangement, it will be evident, makes the different parts of the body more thoroughly in unison with each other than they would otherwise be. No part can receive an impression without its exciting some influence upon neighboring parts; and scarcely any action can be effected by motor-nerves from one centre only, but by the combined influence of those from several centres.

This combination of various motor influences makes our muscular actions more varied also, and enables us to modify and combine them in an infinity of ways. It is this arrangement which enables the musician, and the mechanic, to do half a dozen different things at the same time, with the same muscles. If those muscles were acted upon by only one set of motor nerves, from one centre, they would perform but one kind of action, with no modification.

In like manner, if the sensor nerves from any part,—from the finger, for instance,—went straight to only one nervous centre, they would convey but one simple impression. But, interlacing and crossing with similar fibres from various centres, as they do, the impression is compound, and gives us a more perfect conception of the nature of the object causing the impression. Thus, by touching an object, we learn, at the same time, whether it is rough or smooth, even or uneven, hot or cold, hard or soft, and various other properties besides, which *a sin-*

Plate XXXIV.

PLEXUS OF NERVES.



In this plate, the fibres from various centres are seen interlaced and crossed together in all directions ; the figures denoting the separate trunks.

See also the plexuses shown in the previous plates of the great sympathetic nerve.

gle set of sensor fibres, unconnected with others, could never teach us.

Besides this, such an arrangement is a security, to a certain extent, against *paralysis* of any part, because it is not dependent upon one source of motive power alone. Thus, for instance, the *arm* is supplied with its nerves from a large plexus called the *brachial plexus,* which is made up of fibres from five different parts of the spinal cord. From the plexus, five different main trunks go to the arm, and ramify in all directions to the ends of the fingers ; but each of these main trunks is made up of fibres from all the five different parts of the spine. The result is, that every part of the arm is connected with each of the five parts of the spine, instead of with only one.

Now, it might so happen, that one of these parts of the spine might receive some injury, or become diseased, and, if the nerves of the arm came only from that one part, the limb would be paralyzed. But, receiving its nerves, as it does, from all the five different parts, complete paralysis would not ensue, unless they were all thus injured. The arm would, however, be *weakened*, just in proportion to the extent of the injury. Thus, if *one* section of the spine were injured, a certain amount of debility would result, and, if two were injured, the debility would be still greater, and so on; but complete paralysis would not ensue till all the five parts were injured.

The inosculation and mixing of different nerve fibres is well shown in the fifth nerve and some others. Some of them are solely motor or sensor in one part of their course, and both motor and sensor in other parts, owing to their receiving twigs from other nerves.

And thus, a mutual connection and interdependence is established between all the parts of the nervous system, notwithstanding that the several parts may have special endowments of their own.

The organs of vegetative life, usually called the *viscera*, afford another instance of the combined action of different nervous centres. These organs, as already explained, receive most of their nervous influence from the great *sympathetic nerve*, but that is directly connected with the cranial nerves, and also with the spinal, some of which also go directly to the viscera along with the sympathetic fibres. In fact, there is a union both ways; for sympathetic fibres intermix with the spinal nerves, and spinal fibres with the sympathetic nerves.

The branches of the great sympathetic nerve, which come from the semi-lunar ganglion, are mostly distributed to the abdominal organs; and those from the cardiac ganglion, to the heart and to the blood-vessels connected with it. In fact, fibres of the sympathetic nerve run alongside of the arterial trunks in their whole length, and are evidently closely connected with them. There is no doubt but that, in some way or other, these nerves affect the action of the heart and arteries, and influence materially the circulation of the blood; but in what way we do not know. They ramify on the surface of the arteries in the minutest manner, and accompany them everywhere.

There can be no question but that nutrition and secretion are, to a certain extent, if not entirely, dependent upon the nervous influence they thus receive from the great sympathetic; and it is equally certain that they can be, and are, affected by other parts of the nervous apparatus, which are connected with the sympathetic.

In the invertebrate animals, the sympathetic does not exist as a distinct and separate system, as it does in the vertebrate, though scattered ganglia are often found, which appear to correspond with it. Even in some of the vertebrates, the sympathetic and spinal nerves are not so distinct as they are in man. In some fishes, the heart and the intestines, in their whole length, are supplied with nerves entirely from the par vagum; there being no trace of a sympathetic nerve. In serpents, also, the lower part of the intestines is supplied with nerves directly from the spinal cord, and the upper part from the par vagum. A few cords of the sympathetic may be traced, but with very few ganglia. Even in human beings, many of the glands, especially those influenced by the mind, are supplied with part of their nerves from the brain or spine. Thus, the tear glands (lachrymal) and the glands under the tongue (sub-lingual), receive branches from the fifth pair, and the milk glands (mammary), receive branches from the intercostal nerves, which proceed directly from the spinal cord.

Having now completed this general view of the nervous system, we will next proceed to describe in detail the special functions of each separate part.

PART III.

THE SPECIAL FUNCTIONS, AND FUNCTIONAL DERANGEMENTS, OF THE DIFFERENT PARTS OF THE NERVOUS SYSTEM, AND THE WAY IN WHICH THEY CO-OPERATE WITH EACH OTHER.

CHAPTER XI.

FUNCTIONS OF THE SPINAL CORD.

The spinal cord extends from the *foramen magnum*, or hole where it enters the skull, down to the first or second lumbar vertebræ. In fact, it is continued, in the form of a small thread, called the *Filum Terminale*, to the very end of the cavity in the spine. It is divided, in its whole length, into two halves, exactly alike and equal, which are connected together only in the middle, by a small band, called the *Commissural band*, through the centre of which runs a hollow passage, called the *Spinal canal*.

The two halves of the spinal cord lie, one on the right side, and the other on the left, and the division spaces between them are called the *Median fissures*, the one in front being the *Anterior Median fissure*, and the one behind, the *Posterior Median fissure* as shown in the next plate.

The two halves of the spinal marrow, as seen in the plate, are united only in the centre, by the commissural band, through the middle of which runs the spinal canal. The outside portion of each column is composed of white nervous matter, while the interior is formed of grey nervous matter, which also forms the commissure, or connecting band. It is with the grey matter that the spinal nerves, *b*, *b*, *b*, and *c*, *c*, are connected. (Plate XXXV.)

This grey matter is partly composed of vesicular, or ganglionic matter—as seen at *d*, *d*, and at the parts where the nerves are connected—and partly of two peculiar substances, called the *substantia gelatinosa*, as seen at *g*, and the *substantia spongiosa*, as seen at *d*, *d*, in the anterior columns. The substantia spongiosa, is, however, largely composed of vesicular matter, and the number of the vesicles is always proportionate to the size of the nerves connected with the anterior portion of the grey matter.

A large portion of the grey matter is also *fibrous*, and it is this fibrous substance which forms the connecting band between the two halves. The fibres are exceedingly small,

Plate XXXV.—CROSS SECTION OF THE HUMAN SPINAL CORD, IN THE LUMBAR REGION.

(A, A,) the front columns, (anterior), of the spinal marrow, right and left; (*a*), the anterior median fissure dividing the anterior columns; (*p*, *p*), the posterior, or behind columns; (*p*), is the posterior median fissure, which divides the posterior columns; (L, L), the lateral or side columns, which are not marked off by any distinct fissure, but only by an indentation, as seen at *c*, *c*; (*b*, *b*, *b*, *b*), roots of anterior spinal nerves, (motor); (*c*, *c*), roots of posterior spinal nerves, (sensor); (*d*, *d*), tracts of vesicular, or grey nervous substance; (*g*), substantia gelatinosa; ( ), points to the hole in the centre, which is the spinal canal, running the whole extent of the spinal cord.

not more than the ten-thousandth of an inch in diameter, and some even not more than the fifteen-thousandth, but they are perfect tubes. They run in various directions, and cross and interlace with each other in a variety of ways, both in the body of the grey matter, and in the connecting band, as will be seen in the plate.

The spinal cord varies in size in different parts of its length, being usually largest at those parts where the most nerves are given off. This is seen also in animals, and especially in birds—those which have great powers of flight having the spinal cord largest where the nerves are given off to the wings, while those which depend most upon running, have that part largest from which the nerves are given off to the legs.

In birds, and mammalia, the amount of grey matter in the cord is less, in proportion to the nerves running from it, than in the lower animals. This is owing to the circumstance that, in the lower animals, most of the actions are simply reflex, and are excited directly from the cord, while in the higher animals many actions are voluntary, and proceed primarily from the brain. In proportion, therefore, as the brain is developed, the mere reflex action of the spinal cord diminishes, and the amount of its grey, or vesicular matter becomes less.

It is now generally conceded by physiologists that the spinal cord fulfils her functions. It is, in the first place, an independent nervous centre, capable of receiving external impressions, and originating reflex motions; and, in the second place, it is the channel by which external impressions reach the sensorium, and the instrument by which the brain transmits its motor influences. Each of these functions must be separately considered.

In one sense the spinal cord may be considered simply as a large nerve trunk, or as a conductor of nervous power, in which capacity it acts like any other nerve trunk. Thus, if it be cut through, as before explained, all the parts below the point of division, are deprived of sensation and the power of voluntary motion. Such a state has frequently been produced in the lower animals purposely, for experiment; and often results in man from disease or accident, and is then called *paralysis*. In the lower animals the completely-divided cord may reunite, and all traces of the injury, and its effects, disappear, as in the case of the pigeon, before related. Even in man, such a restoration is quite possible, and does often take place, but it usually requires much time. An attack of paralysis does, now and then, pass off very quickly; but in such cases there is probably no actual injury to the spinal cord, and the paralysis results only from a *shock* to the nervous system, which may be speedily recovered from.

An injury to the cord may affect only the anterior column, in which case the paralysis will be of *motion*; or it may affect only the posterior column, when the paralysis will be of feeling; but if it affect both, then the paralysis is perfect, both feeling and motion being destroyed.

It should be remarked, however, on this point, that though this is true substantially, yet there may be some apparent exceptions. The posterior and anterior columns are connected, and fibres, both of the cord itself, and of its nerves, run from side to side, and unite with each other in various ways, so that an influence may easily pass from one part to another. This explains why the sensor nerves appear, under some circumstances, to cause slight motion, and motor nerves to cause slight sensation; and it also explains why motion, and sensation, may still be kept up, on either side, though the spinal cord on that side be seriously injured. In such cases, the necessary nervous influence comes from the other side of the cord.

And it should further be remarked, in reference to the conducting power of the cord, that it may still remain, more or less perfect, when the structure of the cord is very much changed by disease. A case is recorded where the spinal cord was softened, by disease, till its substance was almost fluid, for some distance, and yet the patient *felt pain* in his lower limbs, though he could not voluntarily move them. It is evident, therefore, that the cord could still conduct impressions *upward*, to the brain, though it could not conduct the motor influence from the brain downwards. The lower limbs, however, moved *involuntarily*, by reflex action, the influence being probably transmitted from the sensorium. There was, therefore, a certain amount of *downward* transmission, and it was obviously affected by certain *emotions*, the influence of which could be distinctly traced.

In some cases, even the whole length of the cord has been similarly diseased, and yet its functions continued to be, to a certain extent, performed as usual. It is quite probable, therefore, that the substance of the cord, even when partially fluid and disintegrated, still retains more or less of its usual power; and it is similarly the case in softening of the brain, as we shall see further on.

But, in all such cases, the functions of the diseased parts are not *perfectly* performed, and they are liable to sudden stoppage at any moment.

It has been a point of dispute, whether the spinal cord is ever, like the brain, the seat of *conscious sensibility!*—that is, when its connection with the brain is interrupted, if it really *feels* any impression conveyed along the sensor nerves? In man, we know that it does not; for no sensibility is experienced in any part, unless it be connected with the brain; but some observations lead to the opinion that, in the lower animals, it may be different. Reflex actions, of the most energetic character, may result from the spinal cord, after the whole brain is removed, but there is no evidence that they are connected with the slightest sensation. If a chicken be suddenly beheaded, both head and body will exhibit the most energetic motions; the mouth will open, the legs kick, and the wings flap, for some time, and the animal may even run for a considerable distance. These motions are, however, all reflex; and, in all probability, are totally unaccompanied by conscious sensibility. They, in fact, resemble the motions which occur during fainting or deep sleep, and in cases of St. Vitus' dance.

After all reflex motions have ceased, in a beheaded animal, if fresh blood be made to circulate through the cord, they will *recommence*, and the muscles may be excited to act, by pinching or pricking, the same as at first. In fact, the cord retains this power, of exciting reflex action in the limbs, for a long time, providing the circulation of the blood be kept up in it, and it may be readily restored by re-establishing the circulation. Probably, also, the functions of the brain, or mind, could, in the same way, be restored in the head, when separate from the body.

All such spinal motions, however, in man and the higher vertebrata, at least, are simply reflex, and take place without any design or purpose; but, in some of the lower animals, they appear to have a different character. Thus, if a frog be beheaded, it will still support itself on its limbs, and will even get up again if turned over. If its feet be irritated, it will even jump; and, if the anus be irritated by a small stick, it will try to push it away. Now, all these motions are performed *for certain purposes*, and perfectly, just the same as if the animal still had its head on! The question then comes—*how* or *why* are they so performed, without any concurrence of the brain? As before stated, some physiologists allow, in these lower animals, a certain amount of consciousness or mental power to the spinal cord, and thus explain these singular actions. Others, on the contrary, conceive all such actions to be merely automatic, or mechanical,—that is, simply reflex.

In man, it is evident, the spinal cord is simply concerned in reflex and involuntary actions; but is in no way connected with consciousness nor sensibility,—so far as we know.

CHAPTER XII.

FUNCTIONS OF THE MEDULLA OBLONGATA.

The medulla oblongata is simply that portion of the spinal cord which is contained within the cranium, or skull. It is composed, essentially, of similar parts to those which form the rest of the cord, and it is also similarly concerned in reflex actions—having its own afferent and efferent nerves. There is, however, this important peculiarity about the medulla oblongata, at least in man and the higher vertebrates, that it is essential to *life!* The cerebrum, and cerebellum, may be removed, and even most of the spinal cord, but still life may continue if the medulla be uninjured.

On this account, it has been supposed, by some, to be the essential seat of vitality, or life. But the simple explanation of the fact is this—that the peculiar ganglion which gives the nervous influence necessary to *breathing*, is located in the medulla oblongata. If this ganglion, or the nerves which connect it with the breathing apparatus, be destroyed, breathing immediately stops, and death ensues. The reflex action of the medulla is the same as that of the rest of the cord, only it is concerned in the essential vital function of respiration, and also in swallowing. Many animals, such as reptiles, frogs, and the amphibia, breathe more or less from the whole surface of the body; and, in them, the whole medulla oblongata may be removed, and yet breathing, swallowing, digestion, the circulation of the blood, and secretion, will go on as usual for weeks and months. Finally, however, these animals die, apparently from want of more perfect respiration; they can exist only for a certain period without the action of the lungs.

The general structure of the medulla, and the arrangement of its different parts, have been fully given before, in a previous article, to which it will be well to refer in connection with this. The only thing necessary to call attention to here, is the distribution of its two essential constituents.

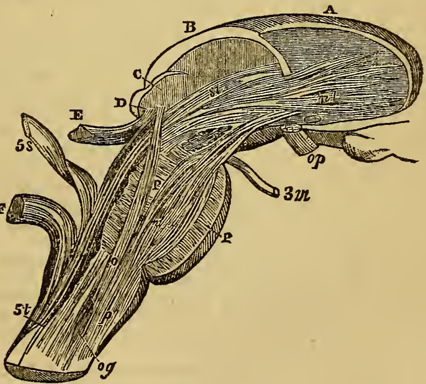
The white or fibrous substance of the medulla is principally contained in eight bundles or strands,—four in each half,—the medulla, like the cord, being divided into two equal and similar parts. These strands are, first, the two anterior pyramids; second, the two olivary bodies; third, the two restiform bodies; and, fourth, the two posterior pyramids.

The grey, or vesicular matter, is principally contained in six ganglionic centres—three in each half. These centres form the *nuclei* of the olivary body, the restiform body, and of the posterior pyramidal body.

These parts are connected with the brain above, and with the cord below; but in precisely what manner, is not, in all cases, fully known. The following plate shows their several positions, and their connections with each other.

Plate XXXVI.

THE MEDULLA OBLONGATA CUT THROUGH.



(A) the corpus striatum; (B) the thalamus opticus; (C D) the corpora quadrigemina; (E) the commissure, or band, connecting the quadrigemina with the cerebellum; (F) the corpora restiformia; (P P) the pons varolii; (*s t*, *s t*) the sensory tract of nerves; (*m t*, *m t*) the motor tract of nerves; (*g*) the olivary tracts; (*p*) the pyramidal tract; (*o g*) the olivary ganglion; (*o p*) the optic nerve; (3 *m*) root of the third pair of nerves—motor; (5 *s*) the sensor root of the fifth pair of nerves.

This plate shows very well how the different fibres—motor and sensor—cross and intermix with each other. All the fibres, it will be seen, terminate in the corpus striatum and thalamus opticus; the sensor in one, and the motor in the other, as before explained.

In the ordinary spinal nerves, the two roots unite, just beyond the ganglion; and, the common trunk thus formed, divides into two portions: the anterior, going to the front part of the body, and the posterior, going to the back part. Each of these parts contains both motor and sensor nerves, which chiefly ramify in the skin and muscles. The ganglion is always situated on the posterior trunk, and the anterior trunk is the one that communicates with the sympathetic nerve.

The nerves of the medulla oblongata are, some of them, similar to the ordinary spinal nerves, while others, (the cranial nerves,) are different; each one having some peculiar structure and function. The nerves of special sensation are also cranial nerves, but each is connected with a special ganglion of its own—and not with the medulla. Some of the cranial nerves connected with the medulla oblongata are sensor, and some are motor; and the two kinds are often intermixed, so that some fibres have one property, and some the other. Thus, the fifth pair, or *trigeminus*, has two distinct sets of nerves, and on one of them is a ganglion, as on the spinal nerves. The first and second parts of this nerve go mostly to the skin, and the mucous surfaces, while only a few fibres go to the muscles, and most of the fibres of the third part go to the muscles alone. This would show, from analogy, that the two first parts are sensor, and the third part motor; and experiment proves this. Thus, if some of the branches of the trigeminus are cut, sensation is lost in the parts they go to; while if others are cut, motion is lost.

But the fibres of all the cranial nerves are connected with each other, and intermixed, in the most intricate manner, so that it is scarcely possible for the effect of any sensation, or motion, in the head to be confined exclusively to any one part; but, what is done, or felt, in one part, influences more or less all other parts.

Physiologically considered, therefore, the medulla oblongata is merely a portion of the spinal cord, and all general observations on the functions of the cord apply to the medulla as well. The whole cord, as before explained, is both an independent nervous centre and a medium of communication between the brain and the spinal nerves.

General Observations on the Functions of the Spinal Cord.

When we consider the independent functions of the spinal cord, we find that they are entirely *reflex* and *non-conscious*, and are essentially concerned in the vital or organic processes, by which *life* is maintained. All the openings into, and out of, the body, are controlled by the spinal cord, which regulates the action of the throat in swallowing, of the heart in propelling the blood, and of the *sphincters* of the anus, bladder, and other outlets. It is true the *will* exerts a certain amount of influence over the action of the fundament, and neck of the bladder, but that influence is limited. In fact, it only slightly affects the action of the spinal nerves, by which alone these parts really act. Thus the action of the bladder, and intestine, can be retarded, or hastened, or even suspended, by the will, to a certain extent; but eventually, involuntary action ensues in spite of the will. A man may determine he will not breathe, and can really *hold his breath*, for a time, but in spite of him the spinal nerves will at last force the act of respiration. If the spinal nerves going to the bladder, or anus, be cut, those parts immediately lose all power, and act quite involuntarily—no effort of the will having any effect upon them then.

The emission of the semen is another instance of excito-motor, or reflex action. When the seminal vesicles are surcharged with semen, the sensor nerves convey the impression to the spinal cord, from which an influence immediately runs, down the motor nerves, to the muscles of the penis, causing *erection*, and finally, if the impression be powerful enough, ejaculation, or seminal emission.

If the lower portion of the spinal cord be separated from the upper, these actions may still take place, providing there be plenty of healthy semen, but there is *no sensation*, because there is no connection with the brain. Sensation, or feeling is not, therefore, necessary to erection and seminal emission.

If, however, the lower portion of the spinal cord be *destroyed*, or if the nerves leading from it to the genital organs be cut, the power of emission and erection is entirely lost.

The will only exerts a limited and *regulating* influence over the genital functions, but the essential nervous power, on which they depend, comes from the spinal marrow. With plenty of healthy semen, and the organs properly connected with the spinal cord, by the proper nerves, erections and emissions will occur, in spite of the will. This is a fact that must be duly considered, both medically and socially, and taken fully into account when treating these matters, either in connection with bodily disease or with social vices. It is no more possible, in certain conditions, to prevent erection, and emission of semen, with its accompanying *sensations* and desires, than it is to prevent urination when the bladder is full.

A sexual *thought* may cause action of the genital organs, but only when they are in a proper condition. If there be no semen present, or if the nerves connecting the genitals with the spinal cord be cut, no mental effort, nor any exciting object, can cause the slightest sexual manifestation.

The act of child-birth, like that of swallowing, is, in its first stages, to a certain extent, influenced by the will; but when it has progressed to a further stage, the spinal influence is excited, and the rest of the process is involuntary.

The spinal cord, however, has something more to do, besides merely maintaining the functions which are necessary to life. There are certain actions called *protective*, which are not always essential to life, but the non-performance of which, under certain circumstances, would lead to bodily injury. Coughing, and sneezing, to remove offending substances from the throat or nose, are actions of this kind, and so is the instantaneous closing of the eye when threatened by any object, or when a strong light flashes upon it. Such actions all result from the spinal cord, and may be effected quite involuntarily, and without our even being conscious of them. An experiment of Dr. M. Hall proves this. He found that the eyelids would close, when irritated on their edges by a feather, even after the brain was removed, so long as the spinal cord and its nerves remained perfect. There was no *will*, nor consciousness, in the case, but still some power in the cord to cause such an action when necessary. The action of *winking* is commonly a voluntary act, but it is also involuntary, and is all the time being performed, without our knowledge or will; probably it is necessary in some way or other to the healthy action of the eye. The eyelids are kept open by the will, and immediately that ceases to act, as in sleep, the spinal influence closes them, and keeps them closed. This, with other illustrations before given, prove, as was formerly stated, that the spinal system *never rests!* It is the *brain* only that *sleeps!* The spinal cord, and its nerves, are *always awake*, while we live.

In the organs of the special senses we have a mixture of nerves. In the nose, for instance, there is the olfactory nerve, which gives the special sense of *smell*, and there are nerves of common sensation, derived from the fifth pair. When any irritating substance touches the lining membrane, it excites an impression, which is conveyed by the nerves of common sensation to the spinal cord, and from thence emanates the influence which excites the muscles to the act of *sneezing*, to remove the offending body. The nerve of smell is not concerned in this act, for the irritating substance may have no smell at all.

The *sensations* which precede or accompany various reflex actions, have no direct part in producing them, though it is commonly thought that they have. The use of these sensations seems to be to act upon the brain, and to cause will, or determination to do certain things, which are necessary to bring about certain reflex and voluntary actions. Thus, the sensation of *hunger* leads to the taking of food, and the sexual sensation leads to the propagation of the species. Conception can take place without any feeling on the part of either sex, but the act of coition would not be often performed, if there were no pleasurable *sensation* connected with it.

The movements of the limbs in man are generally voluntary, and result from mental impulses operating through the spinal cord. Thus, in playing a musical instrument, every motion is calculated, and willed, to produce a certain effect, and all the complicated train of motions are timed and adapted to each other. In dancing, in walking, and, in fact, in all that we *do*, it is the same. All the varied actions that we daily perform have to be *learnt* by trying, or experiment.

The amount of muscular *experimentation* required in learning to play the *violin*, is something prodigious, and so is that which a child has to practice in learning to walk, or even in bringing its hand to its mouth. A number of muscles have to be *tried* before the right ones are found to do the act, and then they have to be used many times before the child always remembers which to use for any particular purpose, and how much force to put into it.

In all these cases, it is the brain that excites the muscles—using the spinal nerves as its instruments. But there is good reason to suppose that the spinal cord itself, in some cases, without the brain, can cause many of our habitual movements without any *will*, and even without our consciousness. Thus soldiers have been known to march while asleep, and musicians have performed on musical instruments while sleeping.

It is also well known that a man may have his mind completely abstracted, thinking on something else than what he is doing, and yet he will continue on walking, the same as if he were in his ordinary state. Now, in this case, the brain has probably nothing to do with his locomotion, and it is performed simply by the spinal cord and sensorial ganglia.

In many of the lower vertebrated animals, it is probable most actions are of this character. This subject will, however, be referred to again, under the head of "Unconscious Brain-Action."

The regular and constant action of the muscles, by which they always exactly balance each other in force, and preserve the body in its natural condition of position, is also kept up entirely by the spinal cord, and not by the brain. If the brain of a rabbit be destroyed, but the spinal cord left uninjured, the muscles will still retain most of their firmness, and the limbs their proper rigidity. But, if the spinal cord as well be removed, the muscles at once become relaxed, and the limbs hang in every direction.

A frog, with his head cut off, will remain sitting; but, destroy the spinal marrow, and he falls over at once.

The functions of the spinal cord may be completely suspended for a time, as we see in syncope or fainting. Such a state may result from any violent impression—either bodily or mental—which acts on the whole nervous system at once, and, for the time being, paralyzes it.

This condition always begins in the brain; but, in the process of recovery, the spinal cord is the first part to return to life. Thus, the patient begins to breathe, to sigh, to weep, and to perform every other reflex action, long before consciousness returns.

The spinal cord, from imperfect nutrition, may act in a partly torpid manner, as we often see in persons afflicted with muscular debility; or the same condition may result from disease, causing a change in the structure of the cord. It may also, on the contrary, act too energetically, from irritation or over-stimulus, and then we have excessive muscular action, as in *lock-jaw!* In this disease, the muscles act with such fearful energy, as to break the teeth and even the large bones of the limbs.

Hysterical convulsions also result in this way, from spinal irritation, and so do many forms of infantile convulsions.

The spinal cord may also be irritated indirectly by the state of many of the internal organs, acting through the sympathetic nerve. Thus, convulsions may result from a disordered stomach; from costive bowels; from diseased uterus in women; and from overcharged testes in men.

Various medicines act upon the spinal cord, in different ways; some decreasing, and others increasing its action. And, what is most remarkable, some of these medicines will act upon one part of the cord only, and others upon another part. It is often supposed that a remedy is acting directly upon some particular organ—as the bladder, or rectum, for instance—when, in reality, it acts only on the spinal cord; but on that part of it from which the organ derives its nervous power, and thus either increases or decreases its energy.

CHAPTER XIII.

FUNCTIONS OF THE SENSORIUM.

The sensorial ganglia, at the base of the brain, have been already described; and it has been shown that they are separate and distinct nervous centres. The peculiar functions of some of them are tolerably well known; some have been made out only partially, and others are quite unknown. Some of them may be defined as small, independent *brains!* each one having some particular faculty, or function, of its own. They are distinct, from both the spinal cord and the brain, standing, as it were, between the two, and partaking, to some extent, of the nature of both.

Like the spinal cord, the sensory ganglia minister to reflex actions; and, in addition to this, they are, as their name implies, intimately connected with special, as well as general *sensation!* In fact, many of the reflex actions of these ganglia have a semblance of consciousness, and of apparent *purpose*, in the actions they originate. Many movements, which we call *unconscious*, but which seem, nevertheless, to be *guided* by *something*, no doubt result from the sensory ganglia, which have enough of a power analogous to that of the brain, to guide us, in certain circumstances, when the brain itself is torpid, or otherwise employed.

The sensory ganglia constitute the whole acting brain in some animals, and provide them with all the guiding power, or mind, which they require. We need not, therefore, be surprised, that, in some exceptional conditions, they should suffice for us. In fact, we often see men doing a variety of things, *mechanically*, as we say, while the brain is hard at work on something else. In these cases, the movements are apparently regulated by the sensorium, or *semi-brain!*

Experiments have shown, as before stated, that many animals,—reptiles, birds, and even mammalia,—may live for months after the true brain (the cerebrum) is removed, providing they are properly nourished. An animal, in this state, can balance itself on its limbs, and get up again properly, if pushed over. Now this is apparently something beyond mere *reflex* spinal action. There is, evidently, not only sensation, but something analogous to *consciousness* and *will*, which probably comes from the sensorium.

If an animal have its true brain, or cerebrum, cut away, it, of course, loses all true consciousness and power of will. Strictly speaking, it has no thoughts, no *mind*, and *lives* only, like a vegetable. Still, there is something left of the *nature* of mind, and which corresponds, in a degree, to consciousness and will. If a bird, mutilated in this way, be laid on its back, it will turn right side up on its feet again, and will even *walk*, if gently pushed along, and fly, if thrown up in the air. A frog, whose cerebrum has been sliced away, will also jump when touched, and will swallow food, when put in its mouth, and even digest it, and pass its excrement as usual.

Magendie tells us of some remarkable experiments upon a pigeon, which had its cerebrum cut away. Not only did it exhibit all the phenomena above described, but it also evidently had the special senses more or less perfect. Thus, when confined in a partly darkened room, it would find out the light parts; and, in walking about, would avoid objects which were in its way. While sleeping, with its eyes closed, and its head under its wing, it would raise its head, in a very curious manner, at any unusual noise, and then return at once to a state of apparent unconsciousness. It would also spend much of its time in pruning its feathers and scratching itself. Now, here was an animal with no true brain, no mind, and no true consciousness, and yet performing movements for a set purpose, and in a definite way.

In another similar case, the pigeon would close its eyelids when a strong light fell suddenly upon them, and, if kept some time in darkness, would turn its head to follow a lighted candle, when it was waved round in a circle.

We often see something like this during deep sleep. The *senses* will be wakeful enough to take note of movements, of light, and of noises, and will mix them up in dreams; but still there will be no true perception, nor conscious knowledge of them. The body will also be turned, while in such an unconscious state, if it be in an uneasy position; or, if any part be pricked, it will be withdrawn.

Now, the state of the pigeon without a cerebrum is almost identical with this; and it is exceedingly curious to notice the appearance and expression of the animal. It looks all the time as if it was in a *waking sleep*—noticing nothing intelligently, and evidently unconscious of everything. It will swallow food, if placed far enough into its mouth to excite the muscles concerned in swallowing, but it will not seek food, nor take it up; though its eyes may be open, and its vision perfect enough to enable it to avoid objects when walking. Digestion, and all the functions auxiliary to it, will go on, if the animal be fed; and thus it may be kept alive.

Now, it is quite possible for a man to be placed in the same state, by accident, or by an operation, and thus be made to live utterly *mindless*. Indeed, children have been born, as before stated, without brains, and yet lived; they were, therefore, exactly in the state of the pigeon in the experiment. The *amount*, and *quality* of mind, in any man, depends, therefore, upon the amount and quality of his brain, and if he has *no* brain, he has no true *mind*.

Other experiments have also been made upon the sensory ganglia, equally showing their intimate connection with many of the ordinary movements of the body. Thus, if one of the optic lobes,—or *corpora quadrigemina*,—be removed, it occasions total blindness, with inability to move the eye, and much muscular weakness *on the opposite side!* If the lobe be partially removed, the blindness, loss of motion, and weakness, will also be partial, and the animal will often exhibit a peculiar tendency to spin rapidly round and round. Irritation of one of the corpora quadrigemina will make the pupils of both eyes contract, showing the sympathetic connection between it and the eyes.

Many cases have been noticed in which tumors have formed, which pressed on the optic lobes, causing blindness, and sometimes a tendency to irregular movements, similar to those produced in the pigeon by the operation. This singular tendency to irregular movements, when the optic lobes are injured, is probably due to the fact that vision has much to do with regulating all our ordinary actions, and when vision is deranged, movement becomes irregular for want of the usual corrective. In some animals, as in pigeons, simply blinding one eye will lead to similar unusual motions, because, in them, motion is regulated more by the sensory ganglia than by the brain, and a little deviation from the ordinary condition leads to great disturbance. In some men even, there is a peculiar sensitiveness of the optic lobes, and looking with one eye only will cause in them a feeling of giddiness. Others are similarly affected by any rapid or irregularly moving body, and this is probably one cause of sea-sickness.

Injuries to certain portions of the hearing apparatus also produce analogous effects to those above described. Thus, if the part of the ear, called the semi-circular canal, be cut, on both sides, the animal immediately begins to jerk its head rapidly from side to side; and, when it attempts to walk, it invariably turns to the right or left, and seems quite unable to go straightforward. If one of the *vertical* canals be cut, the animal moves its head violently up and down, vertically. If both the horizontal and vertical canals be cut, the motions will be mixed, from side to side, and up and down. These curious movements will continue for months.

Irregular movements of this kind are often seen in idiots, and in some diseases, or after accidents,—probably from injury to the parts referred to, or from their malformation.

The effect upon rabbits is more constant even than upon pigeons, but not so violent. If the anterior vertical canal be divided, the animal begins to turn somersaults *forward*; but, if the posterior vertical canal be divided, it turns them *backwards*. While the animal is still it has no tendency to do this, but the somersaults commence immediately it attempts to move, and the more rapid the motion, the more violent the somersaults.

The experiments of this is probably the same as that given for the eye. This animal is accustomed to regulate its movements, to a great extent, by hearing, as well as seeing; and the confusion of hearing, caused by the injury, leads to corresponding confusion, or irregularity, in the movements.

Numerous experiments have been made ont he *corpora striata*, and thalami optici, but not always with the same results. This is owing to the circumstance that these parts are so situated, and so intimately connected with other parts, that no injury can well be done to them alone; and, consequently, when an experiment is made upon them, we are not sure what part is most concerned in the results obtained. It appears, however, to be established, that the thalami optici are intimately connected with *voluntary movement*. An animal may retain the power of standing, and may even walk, after the cerebrum and corpora striata are both removed; but when the thalamus is removed, from one side, all sensation, and power of voluntary motion, seems to be lost on the other side, towards which the animal immediately falls over. If the thalamus, instead of being removed, is merely cut into, and the cerebrum not interfered with, the animal keeps turning to one side, in a circle.

Experiments upon the corpora striata are still less uniform in their results, than those upon the thalami. Sometimes their removal gives rise to singular movements, and loss of sensation, and sometimes not. This is probably owing to the fact, that the different experimenters have all operated in a different way, and often injured more or less the neighboring parts.

Both the thalami and the corpora striata may be cut, pricked, or pinched, without any sign of pain, or any muscular movement. But this is common to the most important nervous centres. The brain itself may be cut, or pricked, without the least pain being felt. This is because the brain proper is not concerned in feeling, but only in *thinking!*

The thalami, and corpora striata, are connected with the medulla oblongata by a series of fibres, commonly called the *crura cerebri.* If these fibres are cut through, all sensibility and power of voluntary motion, in the whole body, is at once lost. If the crura on one side be only partly cut through, in a rabbit, the animal shows a constant tendency to turn towards the opposite side, moving in a circle, which is smaller the nearer the cut goes to the pons varolii. If, however, the crura be cut quite through, the animal at once falls over to the opposite side, because that side is then totally unconnected with the brain, and is, consequently, paralysed. There is a body also called the *tuber annulare*, or sometimes the *mesocephale*, which appears to be, in some way, intimately connected with voluntary motion. Some physiologists have supposed the tuber annulare, and the pons varolii, to be one and the same body, but they are really distinct,—the tuber, being, apparently, a projection from the medulla oblongata. It is found in some of the lower animals, who have no perfect cerebellum. There is a considerable nucleus of vesicular, or grey nervous matter, in the tuber annulare, which makes it a true ganglionic centre, or independent source of nervous power. But for what particular purpose this power is used, we do not know. When the tuber annulare is irritated, or an electric current sent through it, there are excited strong convulsive movements, similar to epileptic fits.

The cerebrum, cerebellum, corpora striata, corpus callosum, spinal marrow, and the olfactive and optic nerves, may be injured without causing *turning;* but, if any of the other centres are injured, turning or rolling results.

The turning is in some cases towards the injured side, and in others towards the opposite side. Rolling seems to result when the injury is excessive, and often follows turning if a new injury be practised.

Injuries to the *facial nerve*, in rabbits and guinea pigs, will cause turning and rolling for a time. Similar results also follow incisions made in the spinal marrow ; the motions being usually on the opposite side to the cut. The slightest puncture, on a certain part of the medulla oblongata, or even of the acoustic nerve, will cause an animal to roll rapidly, or turn, every time it attempts to walk.

Such injuries are not necessarily followed by fatal effects—at least not immediately—for the animal so treated may live a long time, and not exhibit the turning or rolling, unless when trying to walk. In most cases of turning, the body is bent, like an arch, more or less ; but, if certain parts of the pons varolii, or the quadrigemina, be punctured by a pin, the rolling and turning take place, but the body remains straight. Such punctures may also cause convulsions of the eyeballs.

CHAPTER XIV.

FUNCTIONS OF THE GANGLIONIC CENTRES, AND NERVES OF THE SPECIAL SENSES.

The functions of the organs of the special senses are tolerably well known, and can be spoken of with some degree of certainty. Sight, hearing, smell, taste, and touch, are the means by which the cerebrum, or mind, is brought into conscious association with the material world. Without them we should know nothing of the objects and beings around us, and should, consequently, be destitute of all *ideas.* The impressions made upon these senses, when conveyed to the brain, excite there a *consciousness* of the properties, or conditions of the objects which make the impressions, and this constitutes our *knowledge* of them. A stock of such knowledge is gradually acquired and stored up, as it were, in the memory, for the mind to use in future, and thus, ideas of things, which may be recalled, may exist long after the things themselves have disappeared.

The nerves of the special senses are not like the spinal nerves, neither in their action, nor in the manner of their distribution. Except the sense of touch, which resides all over the body, the nerves of the special senses are distributed only to particular parts, which are the organs of these senses. The precise manner in which they are connected with the cerebrum, we do not know.

The first pair, or *olfactory nerves*, convey the impression of odor or smell. They have nothing to do with motion nor common sensation. No pain is felt when the olfactory nerve is cut, nor does irritation of it cause any movements ; it simply *smells.* When this nerve is destroyed, the sense of smell is lost; but common sensation still remains in the nose, which may be irritated by snuff, for instance, till sneezing ensues, although the offending substance is not smelt at all. Many persons, who have little or no smell, have a very irritable nose, owing to an excitable condition of the nerve of common sensation, which is distributed over its inner lining.

The olfactory nerve, and with it the sense of smell, may be utterly destroyed, without any serious results, and, in fact, with little inconvenience. Some persons naturally have no smell, and yet seem to be unaware of their loss. Still, the sense of smell is highly useful, and its loss is a great deprivation, though not equal to that of either of the other special senses.

If a dog be taken, with his eyes bandaged, in the neighborhood of a strongly-smelling piece of meat, he will be guided to it by his sense of smell—providing his olfactory nerve be intact. If, however, his olfactory nerve be previously cut, he may be led up to it, and yet be quite unaware of its existence.

Irritating substances excite the nostrils, and cause sneezing, in those who have no smell, merely by acting on the nerve of common sensation of the lining membrane, which is derived from the fifth pair. Irritation of the optic nerve, as in the case of the olfactory, also causes no pain, nor does it lead to any muscular movements; which shows that it is a nerve of special sensation only. If it be destroyed, there is an end to all power of vision, though the eye may still *feel* as acutely as before; owing to the presence in it of nerves of common sensation.

The optic nerve, however, differs from the olfactory in one particular,—it can excite certain reflex muscular movements, which are necessary for its own action or preservation. Thus an increase of light leads to contraction of the pupil of the eye; and, if the light be very intense, or sudden, it also leads to the closing of the eyelids. In some persons, a sudden gleam of strong light also causes *sneezing*, by irritating the nerve of common sensation in the eye, which, being connected with the similar nerve on the lining membrane of the nose, *that* becomes irritated at the same time.

A number of the fibres of each optic nerve cross over to the optic nerve on the other side, and mix with its fibres, so that they become intimately connected, which explains, in part, why the two eyes act so thoroughly together, and also why an injury to the nerve on one side affects the eye on the other side.

The *auditory* nerve, in like manner, is a nerve of special sensation only, and irritation of it causes neither pain nor muscular movement. Destruction of it destroys completely the sense of hearing, though the ear may still be *sensitive*, from the presence of nerves of common sensation.

The nerves of *taste* are different from those of smell, hearing, or seeing. They are, in fact, only branches of the ordinary sensor nerves,—of the fifth pair, and the glosso-pharyngeal. The sense of taste differs from ordinary sensation, merely from the structure of the *tongue*, which makes the sensation more *acute*, and probably modifies it somewhat. If these nerves are irritated, it causes *pain*, as in the case of any other ordinary sensor nerve.

The nerves of *touch* are found all over the body. Every afferent nerve fibre, all over the body, is connected, directly or indirectly, with the ganglionic centre of general sensation, and thus is concerned in touch; but those, in certain parts, as the ends of the fingers, for instance, are better adapted to receive impressions than others, and so we usually *touch* with those parts.

There is no doubt but that, in all people, the senses could be made much more acute than they usually are, by judicious training; and they might thus become much more serviceable, in many ways, than they ordinarily are. It is stated that some of the wine tasters, in Spain, will distinguish five hundred different kinds of wine, by the taste alone, and name each one. Many *tea* merchants also will distinguish the different classes and qualities of tea by taste, with the greatest accuracy. James Mitchell, who was born deaf, blind, and dumb, distinguished persons by his sense of smell, which was so acute, that he could tell immediately when a stranger entered the room. In this case, as in many others, especially the celebrated one of *Laura Bridgman*, the extra development of one sense is made to compensate, in a great measure, for the deficiency of the other.

In the *Journal of the Learned*, for the year 1684, is mentioned the case of a certain *monk of Prague*, whose sense of smell was most astonishingly perfect. It is said that "he not only knew different persons by the smell, but, what is much more singular, could distinguish a chaste woman, married or unmarried, from one that was not so."

Those nerves which convey sensation most acutely do not, as a rule, act most powerfully in inducing reflex motion—in fact, it is often the reverse. Thus, the par vagum is a great exciter of reflex action, but has little to do with sensation.

The intricate ramifications, and the numerous interlacings of the cephalic nerves, is very important and interesting to trace. They are all mutually connected with each other; and all are in sympathy, if not direct connection, both with the brain, and with every other part of the nervous system.

The sensory ganglia and organs of the special senses, therefore, have certain independent powers of their own, and are also under the control of the cerebrum, and can be influenced by it, like the spinal cord and its nerves. Their special functions appear to be to act as the instruments of those movements which result from *sensation*, and of which we may be either conscious or unconscious. They can influence many actions which we need constantly to perform, without the mind, or brain, taking any cognizance of them. Thus, in the case of a man studying, while walking, the sensory ganglia take care of his movements, and guide him, while his brain is at work on his problems, and pays no attention to what his limbs are doing. In this state, as far as his bodily motions are concerned, the man is in the same condition that most of the invertebrate animals, and even some of the vertebrates are naturally. They have no active cerebrum, and the sensory ganglia in them constitute the highest nervous centre. They are guided by *sensation* only, while man can be guided either by sensation or by reason, which either makes use of the *senses* as instruments, or leaves them to act alone. Many idiots are guided by the sensorium alone, like the invertebrates.

In proportion as the true brain is developed in animals, the independent action of the sensorium is limited; and, conversely, as the brain decreases in functional power, the sensorium increases.. But, even in man, the sensory ganglia may supply all the nervous power really necessary to *life!*

Ordinary spinal reflex actions are called *excito*-motor, because they directly result from some exciting impression, but the reflex actions of the sensory ganglia are called *sensori*-motor, because they directly result from *sensation*—they are also called *con-sensual!*

We are in the constant habit of performing many of these sensori-motor acts, without being at all conscious of them. Winking the eyes, and *yawning*, which generally results from insufficient breathing and weariness of position, are acts of this kind. It is true we *can* yawn and wink the eyes when we *will* to do so, but it is also true that we do both constantly, without *willing* to do so, and even without knowing that we do so. The vomiting which is often caused by seeing some disgusting object, or smelling some vile odor, is also purely *sensori-motor*, and is independent of the will. Sea-sickness also comes under the same category, and so do all those purposeless and irritating movements called the *fidgets.*

In some cases the sensory ganglia are in a state of *irritation*, and then they act with more power. In such cases the senses are remarkably acute, and smell, sight, hearing, or touch, may become preternaturally acute, so that the patient can smell, hear, feel, or see, what nobody else can. In other cases the sensory ganglia are sluggish, or torpid, and then the sensations and actions resulting from them correspond.

Persons who walk about in a state of somnambulism are guided entirely by the *sensorium.* The *muscular sense*, or *touch*, will enable such persons to walk safely over places of danger, which they would not dare to approach when awake. A man may walk steadily and firmly along a narrow plank, while awake, if it be only a little way above the ground, who would certainly fall if it were placed across a deep chasm. And yet the same man may pass over such a plank safely, in the most dangerous position, while asleep. This is because, while he is asleep, his limbs are moved solely by reflex action of the sensory ganglia, and not by the brain, and consequently there is neither thought nor consciousness concerned in the act. But when he is awake his brain is active; he reflects, sees danger, and feels fear, and dare not attempt what he might do safely when alseep.

Many of the apparently dangerous movements of animals, such as goats on the edges of precipices, can perhaps be explained in this way. The animal does not reason, nor calculate whether it is safe or not; he is simply influenced by his well-developed sensory ganglia, which guide him better, in such circumstances, than the best brain could do.

The two senses of *sight* and *touch* are, perhaps, the most concerned in directing our unconscious movements. These senses take cognizance of all objects around us, and enable us to walk safely about while the mind is ruminating upon other matters.

It is thought, by many physiologists, that the brain acts directly upon the muscles, in all cases of voluntary movement, by means of motor fibres, which run direct from the convolutions of the cerebrum to the spinal cord and the roots of its motor nerves. But there is no positive evidence of this; and, indeed, a different opinion is now very generally entertained. It is thought that, in a voluntary movement, the brain really acts only on the ganglionic centres, and that from them proceeds the influence which causes the movement. The brain, therefore, according to this view, acts upon the ganglionic centres, and excites them the same as an external impression would do. The movements thus excited are called *ideo-motor*, in contradistinction to ordinary *excito-motor*, to show that they originate from *ideas*, and not from external impressions.

In cases of somnambulism and reverie, such as those referred to, there is no real *consciousness* of what is being done, nor of the objects around; but merely a *sensual perception*, sufficient for muscular guidance. The movements are due to the *sensorium*, and not to the *brain*. True consciousness is *mental perception*, and may be reproduced by *memory*.

CHAPTER XV.

FUNCTIONS OF THE CEREBELLUM.

Structure and Connections of the Cerebellum.

The Cerebellum, or little brain, is peculiar to vertebrate animals. In the plan of its structure it resembles the Cerebrum, or true brain, being composed of two halves, or hemispheres, made up of nerve fibres in the interior, and of an investing coat of vesicular substance on the outside. There is also a central lobe between the two halves, called the vermiform process, which connects them together, and which is also composed of both fibrous and vesicular matter curiously arranged. The hemispheres are also further connected by the fibrous band, called the *Pons Varolii*, which passes under the medulla oblongata.

The Cerebellum is directly connected also, by nervous fibres, with both columns of the spinal cord, and with the medulla oblongata, but it has no direct connection with the cerebrum.

The following plate will show the relative positions of the different parts referred to :—

In the lower classes of vertebrate animals the cerebellum is only rudimentary, and consists merely of the central lobe, or vermiform process, the hemispheres not being found till we ascend to birds. As we ascend still further, among mammiferous animals, the development of the cerebellum increases rapidly, till in man it exceeds all others. The general rule appears to be that the cerebellum is larger and more perfect, just in proportion to the number and variety of the muscular actions which the animal habitually performs. It is true that many animals surpass man in particular kinds of muscular action, but he surpasses all others in the number, variety, and perfection of the various movements he performs. Even man's mode of walking, in the erect posture, necessitates an incalculable number and variety of minute muscular movements, all working in unison, to retain the balance and effect progression. No animal supported on

Plate XXXVII.

UNDER VIEW OF THE CEREBELLUM, FROM BEHIND.

W, W, the two hemispheres of the cerebellum; *c*, the pons varolii, connecting the hemispheres underneath; *m*, the medulla oblongata, where it is cut off; *p*, the pyramid. Between *p* and *m* is the lower *vermiform process*, or central lobe. *n*, *n*, the amygdalae, or almonds; *e*, *e*, part of the crus cerebri. The figures denote various nerves connected with the medulla oblongata, 7 being the facial and auditory nerve.

four legs requires anything of the kind, nor do those whose bodies are placed horizontally and balanced in the middle, like birds.

Birds who fly constantly and rapidly have cerebellums larger than those of slow habits, who mostly walk; and the same rule holds also in fishes, those having the largest cerebellums who are the most active. In reptiles, who are naturally sluggish, the organ is small.

Experiments on the Cerebellum.

Many experiments have been made upon the cerebellum, from which much has been learned regarding its functions. Unlike some other parts of the brain, it may be removed entirely, without any immediate danger to *life*, and it is so situated that in acting upon it other parts need not be injured.

If the cerebellum be cut or pinched, there are no signs of pain, nor are there any convulsions; but when it is sliced gradually away, the case is different. After a few slices have been removed, the animal becomes restless, and performs a variety of irregular movements, the restlessness increasing with each succeeding slice. Finally, when the last portion is removed, all power of standing, walking, or flying, seems totally lost. The limbs may still be moved, from reflex action of the spinal cord, but the different movements have no sort of association or unity of purpose, but are simply individual and irregular. Thus, if an animal in this state be laid upon its back, it will struggle, but cannot rise, nor turn over; and if placed upright, it will stagger and fall, like a drunken man. If a blow be aimed at it, the animal perceives it, and evidently tries to escape it, but cannot.

The loss of the cerebellum, therefore, does not destroy the power of voluntary motion, but takes away all power of *regulating* movements, of co-ordinating them, or of making them work together for a given purpose.

If one half only of the cerebellum be removed, it affects motion on the other side of the body.

It will be observed that it is only the voluntary motions which are thus affected by injuries to the cerebellum, the organic or vital processes going on as usual, because they are not dependent upon this organ, but upon the spinal cord and sympathetic.

Magendie found that when a deep cut was made into the cerebellum, on both sides, the animal seemed to have, in many instances, an irresistible impulse to move *backward*. This, however, was not always the case; but, when one of the *Crura Cerebelli* was cut through, the animal always fell over on one side, and began rolling very rapidly—sometimes as often as sixty times in a minute—for days together without stopping. The direction in which the animal turns, in these cases, depends upon the locality where the cut is made, so that it may be made to turn any way we choose.

In all these experiments, and in cases of disease of the cerebellum also, the *mind* is not affected in any way, showing that this organ is not connected with the *intellect*, but merely with the function of motion. It may, in fact, be completely softened, as it is in some diseases, without affecting the mind in the least, or its membranes may be highly inflamed without any sign of delirium. But no serious injury can take place to the cerebellum without motion being in some way or other interfered with.

It must, however, not be forgotten that the cerebellum does not *originate* bodily motion, but merely *regulates* and combines the muscular movements which originate from other parts of the nervous system. There may be movements without the cerebellum, but they are irregular, spasmodic, and utterly unconnected. Thus, the legs may move, and so may the muscles of the trunk at the same time, but the animal does not *walk*, because the different movements in no way accord, or work together; on the contrary, they may be opposed to one another.

The cerebellum is, therefore, essentially the organ of *the muscular sense*, by which the bodily movements are regulated and combined.

The Cerebellum and the Sexual Instinct.

Phrenologists consider the cerebellum to be essentially the organ of the *sexual instinct*, and this view was, at one time, very generally entertained. Recent observations, however, do not sustain this doctrine, and it is now held almost exclusively by the phrenologists themselves, and not by physiologists.

The size of the cerebellum, in different animals, is not at all in proportion to the intensity of their sexual instincts. In fact, it is larger in many animals who do not copulate at all, than it is in others of the same kind who do. The male bird of our common fowls, who satisfies, with ease, a harem of ten or a dozen females, has a smaller cerebellum than the male hawk, who contents himself with one. Monkeys are remarkably licentious, and will even commit masturbation if deprived of female society, but their cerebellums are not at all remarkably developed. It is the same with the kangaroo, which has a very small cerebellum, but is very salacious; and so it is with cats, and rabbits, also, who will breed all the time, but whose cerebellums are not at all remarkably developed.

The results obtained by phrenological observations, on the outside of the head, are of no real value whatever, and it may be safely stated that there is *no actual anatomical evidence* whatever to support the doctrine of the phrenologists, respecting the function of the cerebellum.

Actual experiment has, in fact, utterly disproved the theory that the development of the cerebellum is in proportion to that of the sexual instinct. It has been found that this organ is really larger in mares, and in horses that have been castrated, than it is in stallions, while the very contrary should be the case, if it were really the organ of amativeness.

It is true that disease or injury of the cerebellum, is often attended by failure of sexual power; but so also is injury or disease of the spinal cord. It must be remembered also that, in man at least, muscular *motion*, of different kinds, is required in the performance of the sexual act, and a failure in this may very well arise from lesion of the cerebellum.

Some physiologists have advanced a medium theory; they suppose that the *hemispheres* of the cerebellum may be connected with the *motor* functions, and the *central lobe* with the *sexual*. There is no proof of this, however; but rather the contrary, for the central lobe is not found to be any larger in *bulls* than it is in oxen.

Still, there is good reason to suppose that the generative functions are, in some way or other, connected with either the cerebellum or the medulla oblongata, but with what part, or in what way, we do not know. A blow on the back of the head has been known to cause complete impotence, and a tumor on the pons varolii has been known to cause the most uncontrollable sexual frenzy. Great muscular exertion also, as is well known, will lessen considerably sexual ardor, as we should expect if the cerebellum be connected with both the sexual and motor functions. Friction on the back of the head will often excite the sexual instincts, and so will a fly-blister, while the application of cold will tend to subdue it. It should be remarked, however, that similar results have followed similar treatment to the spinal cord, so that the subject is still in doubt. There is, probably, somewhere in the sensorium, a ganglion specially connected with the sexual powers, but it has not yet been discovered.

CHAPTER XVI.

FUNCTIONS OF THE CEREBRUM.

Structure of the Cerebrum.

The Cerebrum, or true brain, is, unquestionably, the most potent and important organ in the body, both from the superior nature of its own proper function, and from the influence it exerts over nearly every other part.

Formerly the brain was supposed to rule absolutely over the whole system, and to habitually control *every* function, both mental and bodily; but careful investigation gradually limited its powers, and proved that many parts of the system act quite independently of its influence. It was ascertained that many of the most important functions, especially those necessary to the support of life, are dependent entirely upon the spinal cord, or the sympathetic nerve, and are carried on perfectly, even when the cerebrum is all cut away. But, after this fact was established, it was still thought that all *mental* operations, and all true sensation, originated from the brain. But this view was also modified considerably, and the functions of the brain still more circumscribed, when those of the sensorium became known. It was then seen that all *con-sensual* acts, and many of those we call *instinctive*, result from the action of the *sensory ganglia*, which are capable of guiding the movements of the body when the true brain is torpid.

Perfect *consciousness*, however, and all true *mental* operations, are unquestionably dependent on the cerebrum, and its true function is to produce *thought*, or *mind* proper. Man can *live* without a cerebrum, or true brain, but he cannot *think* without it.

As a rule, the cerebrum is found only in vertebrate animals, although the rudiments of it exist in some of the higher invertebrates, and probably in all, even to the lowest. It is first met with, in a distinct form, in fishes, and from them upwards its development increases—every increase causing greater mental power—till we reach man, who has the most perfect cerebrum, and, consequently, the most perfect *mind.*

Like all the ganglionic masses of the nervous system, the cerebrum is composed of two different kinds of nervous matter, namely: the vesicular, or grey, and the fibrous, or white matter. There is, however, this difference, that, while in other ganglionic masses the vesicular substance is in the centre, in the cerebrum it is on the outside, and the fibres form the centre. The reason for this will be obvious when we consider what the brain has to do. The nervous power, in all cases, originates in the vesicular matter, and the fibres merely convey, or conduct it where it is needed. But the power of the vesicular matter to engender nervous force, in all cases, depends upon the amount of blood which circulates in it, and upon the rapidity with which that blood undergoes the necessary organic changes. Now the cerebrum, in man, is the largest of all the nervous centres, and the most energetic in its action; its vesicular matter, therefore, requires a proportionately large amount of blood, and must, in consequence, be so disposed, that the blood can be readily obtained. It is, therefore, placed on the outside, where, of course, it has a larger surface, which is still further increased by the convolutions, or folds. The membrane, called the pia mater, which carries the small blood-vessels, spreads over the whole outside of the cerebrum, and follows it down between all the folds, so that the blood is brought, in abundance, to every part. It has been estimated that, if all the convolutions of the cerebrum were unfolded, and laid out flat, the whole surface, in man, would cover about six hundred and seventy square inches! These folds, or convolutions, decrease as we descend in the animal scale, till finally the surface of the cerebrum becomes quite smooth, as in the rabbit.

Mental power, therefore, depends, primarily, upon the size of the *surface* of the cerebrum, and upon the quantity of blood circulating in it.

The interior of the cerebrum, as before stated, is composed of fibres, of which there are three kinds, or sets. First, there are those connecting the vesicular matter with the *thalami optici*, and which are probably *sensory*, second, there are those connecting the vesicular matter with the *corpora striata*, and which are probably *motor;* third, there are those called *commissural* fibres, which connect the two hemispheres together, and also the different detached parts of the cerebrum with each other. These commissural, or connecting fibres, form the great bulk of the cerebrum in man, and in the higher animals, so that all the different parts of the brain are well connected, and can act in concert.

It seems probable, as before stated, that the proper fibres of the cerebrum do not connect directly with the fibres of the great nerve trunks, but only with the sensory ganglia, through which all its impressions are received, and its influence largely disseminated.

Connecting Fibres of the Brain.

The *corpus callosum*, or beam of the brain, shown in the previous plates, is a mass of commissural fibres, connecting the two hemispheres with each other; but, besides this, there are other connecting bands. The corpus callosum is not found in fishes, reptiles, nor birds, and is only partially found in many of the lower mammalia. The fornix, which is placed under the corpus callosum, is another large connecting band, which attains its most perfect development in man and the higher animals. The commissural, or connecting fibres of the cerebrum, constitute, in fact, a very important part of that organ, and are found to be largest, and most numerous, in man and the higher animals. In the lower animals they are fewer in number, and small in size, so that the different parts of the brain have but an imperfect connection with each other.

Mr. W. H. Flower published, in the proceedings of the Royal Society, a very interesting article on the commissures of the brain in such animals as the kangaroo, and other marsupials. These animals, though true vertebrates, and suckling their young, have no placenta in the female, and do not, in consequence, perfect their young in the womb. This shows a great fundamental difference between them and the perfect mammalia, and that difference extends to the brain, especially to the great commissure, or band, that connects the two halves of the brain together, which differs in many ways from the corpus callosum of the true mammals. Mr. Flower remarks, however, that *all* animals that suckle their young, even the most imperfect, have this band, or corpus callosum, connecting the two halves of the brain together, but that *no other animals* have it at all. In neither birds, reptiles, nor fish, has there ever been found a trace of this connecting band; but it is never absent in those that suckle their young, and is most perfect in man.

It is very probable that deficiency of mental power, even in man, may often depend upon imperfect development, or destruction, of these connecting bands. This may especially be the case where there is small power of concentration or, inability to bring all the powers of the mind to bear on any given subject. In these cases, the different mental powers cannot *act together*, because they are not *connected;*—they are like the disconnected wheels of a clock, which may all be in motion, separately, but cannot act together to tell the hour. In fact, a man imperfect in this respect, is, as regards this part of his brain, in much the same state as some of the lower animals, and partakes of their mental imperfections.

As remarked before, *mind* is, in every respect, a result of brain development, and is perfect, or imperfect, just in proportion as the brain is perfect or imperfect.

Several cases are on record, in which examination of the brain, after death, has shown remarkable natural deficiencies in the commissural bands; and in every case there had been, during life, some peculiar corresponding mental deficiency. Thus, in one case—that of a servant girl—there was no proper corpus callosum, but merely a thin sheet of fibrous substance, while the middle of the fornix, and the whole of the Septum Lucidum were absent. The brain generally was healthy, and the middle commissure was rather large.

The mental condition of this girl exhibited nothing very peculiar, except a lack of *forethought*, and an inability to judge of the probable *consequences* of anything which might happen. She had a good memory, a good disposition, and a good temper; her moral character was also good, and her mental capacity equal to that of her class, generally, but she was rather *heedless*.

Now, these are exactly the failings which might be looked for from such a deficiency. The different faculties were there, but they were not properly connected; they, therefore, never acted in concert, and this prevented a proper appreciation of the connection between *cause and effect!* Such a person would naturally be heedless, because she had no proper perception of *probable results;* nor would past experience be of much use to her for future guidance. In all respects, this girl much resembled some of the inferior animals, who naturally have no perfect corpus callosum, and who commonly exhibit a total lack of forethought, and profit little by experience.

Now such facts are of the first importance, as showing us how certain peculiarities of mind, or disposition, may be the direct result of a certain condition of the brain, both in the *sane* and the *insane.* The notion that the mind is something quite independent of the body, and that it can be acted upon by intellectual or moral influences only, is an unfortunate one in many respects. It stands in the way of all practical attempts at the intellectual improvement of our race, through proper systems of training and education, and it leads to the most erroneous treatment of the criminal and the insane. To understand the human mind, and to act upon it, so as to develop it to the highest possible point, we must recognize the fact that it is essentially a product of brain action; and that, consequently, we must first attend to the proper development of the brain itself. Preaching, teaching, or moral suasion, can no more cure mental or moral defects of character, when the brain is imperfect, than they can cure dyspepsia, when the stomach is out of order.

Weight and Size of the Brain.

The weight of the whole brain, or *encephalon*, in men, ranges from forty to sixty ounces; the average being about *fifty ounces!* The largest brains on record have been sixty-four to sixty-six ounces, and the smallest from thirty-three to thirty-one ounces. In *females* the brain averages about five or six ounces less than in men. In idiots, the brain is often much less; being, in some cases, less than twenty ounces.

The proportion of the different parts of the brain may be stated to be, nearly, as follows: If the whole encephalon be divided into *two hundred and four parts*, the cerebrum will contain *one hundred and seventy* of those parts, the cerebellum twenty-one, and the medulla oblongata, corpora striata, and optici thalami, *thirteen*—that is by *weight!* The spinal cord, on the same scale, would weigh about *seven* parts.

It will be seen, therefore, that the mass of the cerebrum is *four times* as much as all the rest of the brain, and the whole of the spinal marrow added together!. It is more than *eight times* as much as the cerebellum alone; *thirteen times* as much as the medulla oblongata and its appendages; and *twenty-four* times as much as the spinal cord.

The proportional weight of the whole brain, compared with the rest of the body, is nearly *one to thirty-six.* This is a larger proportion than in most other beings; for the average of the whole class of mammalia is only about *one to one hundred and eighty-six;* in birds alone, about *one to two hundred and twelve;* in reptiles, about *one to thirteen hundred and twenty-one;* and, in fishes, *one to five thousand, six hundred and sixty-eight.*

As a general rule, the proportion which the *whole* encephalon bears to the rest of the body, is much larger in man than in any other beings; and yet there are some singular exceptions. Thus, in the bird called the Blue-headed Tit, the proportion is only *one to twelve*, and, in the field-mouse, it is *one to thirty-one;* while in man, as above stated, it is *one to thirty-six!* It must be remembered, however, that this refers to the encephalon, or *the whole brain*, which includes all within the skull. The *cerebrum*, or true brain, is not nearly so large, proportionally, as in man, while the *sensory ganglia* are much larger, and form in fact the really active brain of those animals, whose actions are chiefly *con-sensual*, and not reflective. Besides, the bird has no commissural band, as before explained. In the rodentia, and especially in *beavers*, the sensory ganglia are remarkably developed—which shows the source of the wonderful skill which these animals exhibit in building their houses and dams. They work by *brain power;* but it is chiefly by the power of the *sensorium*, and not of the *cerebrum*, as in man. The beaver works chiefly by *sensation*, and, therefore, always works in a similar manner; but man works by *thought* as well, and can, therefore, change his manner of working, and profit by experience.

It is important to bear in mind the difference between the different parts of the brain, as all comparisons made on the whole mass are likely to mislead. In comparing different races of men, in regard to *brain*, this fact should be especially borne in mind. Some races have the *sensorium* proportionately the largest, some the *cerebellum*, and some the *cerebrum;* there are also, in all probability, differences as to the perfection, and amount of the *commissural fibres;* and all these differences in development make permanent differences in character. Thus, the Indians are naturally different, *in brain*, from the white man, the Chinese from the Europeans, and the Negro from the Caucasian; and this difference in brain makes a difference in *mind*, *habit*, *morals*, and *capability of development*, and no efforts of education or training can ever make them all alike. It is the same with individuals of the same race, who must, and do, vary in character as they vary in brain, and never can be made exactly alike. One man, with a large cerebrum, must always *reason* about everything, and *cannot believe* what he cannot *demonstrate* to be true by obvious *facts;* while another man with a brain differently proportioned, believes *without any demonstration*, or even *against actual facts!* This fact, that men *must* vary in character, as they vary in brain, should form the very foundation of education, and should never be lost sight of in our social arrangements, and in our mutual daily intercourse with each other.

The man with large reasoning powers, who can believe only that which he can *prove*, should bear always in mind that there are men to whom, on many subjects, neither proof, nor reason, is at all necessary to the formation of belief, because their convictions are entirely *emotional*, and not intellectual.

The man of ready belief, whose convictions spring from his feelings, or emotions, and not from his knowledge, or perceptions, should be told also that there are other men whose minds are naturally different from his. He should be told that these men *cannot* believe what cannot be demonstrated, by hard facts, and that convictions like his are to them *impossible.*

If both understood this, they would not be calling each other *infidel*, *bigot*, and other unmeaning names, as they do now; but each would recognize the fact that their mental constitutions were naturally different, owing to different development of brain, and that they can never be otherwise than different, without any *fault* in either.

Circulation of Blood in the Brain.

The amazing activity of the brain (as before explained) by rapidly wearing out its substance, *necessitates* a constant process of nutrition, which is effected by the circulation through the encephalon of an immense quantity of blood. No other portion of the organization receives anything like the amount of this fluid that the brain does. In fact, it absorbs nearly one-fifth of the whole amount of blood in the body, and of this large proportion the *cerebrum* gets the largest part.

Each half of the brain is supplied with blood through its own set of vessels, the main trunks on each side being the carotid and vertebral arteries. These vessels, however, though complete for each half separately are, nevertheless, intimately united, by what are called *anastomosing* branches, which cross from one to the other. These connecting branches are very numerous, so that if the main arteries which supply one side were to be destroyed, or become obstructed, that side could still obtain blood from the vessels of the other side, through the anastomosing branches. The importance of this will be seen in a moment, when it is borne in mind that the brain is paralyzed in a moment, if deprived of blood.

There is also another important matter connected with the circulation in the brain, and that is the regulation of the *pressure* which the blood vessels make upon the nervous substance. Sometimes they are much fuller than at other times, and in some cases they are subject to very *sudden* distension, and of course the amount of pressure which they exert depends upon their expansion. Now pressure upon the brain, even slight, may be attended with the most serious consequences, but there is a peculiar arrangement in the structure of this organ which obviates the danger. There is found beneath the arachnoid membrane (as before explained) a peculiar fluid, called the *cerebro-spinal fluid*, amounting ordinarily to about *two ounces*. This fluid, like a *water bag*, operates as a yielding cushion, regulating the pressure exerted by the blood vessels, and distributing it over a larger surface. In some diseases of the brain this fluid is largely increased in quantity, and in other diseases it is decreased. The functions of the brain are often carried on, with but little disturbance, when this fluid is in very large quantity; but any great *decrease* of it usually causes serious disturbance, by allowing the blood vessels to press directly on the nervous substance.

The cerebro-spinal fluid has been found, in some cases, to be altogether absent, and it may vary very much in quantity at different times. Any increase in the size of the brain (or of its blood vessels) may cause more or less absorption of it, permanently; and this is probably one of the conditions which favor headache and apoplexy. Any strong mental or emotional excitement, by causing a sudden rush of blood to the head, and so expanding the blood vessels, and increasing their pressure, may possibly cause temporary absorption of the cerebro-spinal fluid. The excitement of alcohol may also do the same, but such a temporary loss may soon be made up, because this fluid is produced very rapidly when needed.

Strong emotion, protracted study, and alcoholic or other excitement, if too long continued, may, in all probability, cause an absorption of the cerebro-spinal fluid, by keeping the blood vessels constantly too full. This disposes to head-aches and to apoplexy, because there is no longer the usual cushion, or water bag, interposed between the blood vessels and the nervous substance.

When any sudden decrease of the cerebro-spinal fluid is needed, in the brain, it can pass into the *spinal cavity*, and return from thence to the brain, if required. Or it can be totally absorbed, and removed, as rapidly as it is generated.

It appears, in short, to be of the first importance that the brain should be constantly subject to an equal pressure in all its parts, and that any increase, or decrease, of that pressure should not be too great, nor too sudden. In cases of injury to the skull, uncovering a portion of the brain, it has been observed that if this portion so uncovered be pressed upon, unconsciousness is immediately produced, or rather, a state like deep sleep, which lasts as long as the pressure is continued. On removing the pressure, however, consciousness and mental activity return at once, and thus the mind can be put to *sleep*, or *waked up*, at pleasure, in a moment; it being literally *under the thumb!* Thus undue pressure, upon even a small portion of the brain, suspends the action of the whole organ in an instant, and with it all sign of *mind!* The reflex actions, however, and all the vital functions, remain unaffected, because they are not dependent upon the brain; and thus the individual may *live*, but be utterly *mindless.* The touch of a baby's finger, laid upon a small portion of the brain, could suppress the mightiest mind in a moment, and keep it suppressed indefinitely.

From this it will be easy to understand how a small *clot*, forming in one of the blood-vessels of the brain, may cause instant paralysis of the nervous power, or even death. A sudden expansion of the blood-vessels from a fit of passion also, or any other violent excitement, may lead to the same result, and so may a tumor forming within the skull, though in a slower manner.

It must be borne in mind, however, that though *excess* of blood in the brain causes paralysis of that organ, yet a deficiency of it may lead to a similar result. Thus in cases where the heart suddenly ceases to act with sufficient energy, and where, consequently, blood is not sent to the brain in sufficient quantity, *fainting*, or temporary paralysis, naturally results. The same effect follows from an actual deficiency of blood in the body, as we see when people faint from loss of blood. Those who have too little blood, or in whom it is poor and thin, are also apt to faint, or swoon away; and in all these cases the cause is the same, namely, a deficiency of pure blood in the vessels of the brain.

The Cerebrum the Organ of Intellect.

In considering the functions of the cerebrum, we must bear in mind, as before stated, that this organ is in no way necessary to any of the vital functions. The nervous system is complete without it, as far as it is directly essential to the maintenance of our own lives, or even to the continuance of the species. Many kinds of animals have no trace of a cerebrum, and yet live, and thrive, according to their natures; and human beings even have been born, and lived, in the same condition.

The cerebrum is, in fact, merely the organ which produces *intellect*, or *mind*, in its highest sense. By far the largest of the nervous centres, it is placed above all the rest, and, indeed, crowns the whole organization.

The impressions it receives from the material world all travel *upwards* to it, from the nervous organs below, through which also its reciprocal influence is exerted, downwards, upon the rest of the body. The nervous fibres connected with the grey matter of the cerebrum all *terminate* in it, while they *pass through* the grey matter of the other nervous centres; there is, therefore, nothing *beyond*, no *higher* organ; and abstract reasoning, the highest of all the nervous functions, is performed by the cerebrum alone.

We can perform many of the ordinary bodily movements, perfectly, through the agency of the sensory ganglia, as in a state of somnambulism; but such movements involve no reasoning process, nor any choice of ways and means. It is only through the cerebrum that we plan, and calculate the proper means for effecting a given purpose.

The cerebrum, therefore, is not a vital organ; but is the source of *reason*, *intellect*, or *mind*. Its special function is to receive ideas, through the sensory ganglia, and to evolve *thought!* From it also originates decision, or *will*, and the impulse to all voluntary motion.

The movements originating from the other nervous centres are either simply *reflex*, or *consensual*, like those from the sensory ganglia; and these, if any, may be called *instinctive*, simply because they are in no way connected with, or influenced by, any process of reasoning or reflection.

Thus an idiot, born without a cerebrum, or a man in whom it has been destroyed, will eat food *instinctively*, when it is put into his mouth, but will not go to seek it. The acts of chewing and swallowing are simply reflex, or automatic, and are connected only with the spinal marrow, or sensorium; they can, therefore, be performed without the cerebrum. But going to seek food involves *plan* and *purpose*; or, in other words, *reason*; and for this the cerebrum is indispensable.

If we use the term *instinctive*, therefore, it should refer, as above explained, chiefly to those actions which originate in the sensorium, and which are not controlled by the cerebrum. Thus the actions of *insects* are mainly instinctive, or sensorial, because they have no cerebrum. Nearly all that they do, therefore, is done in one way, without essential variation. But birds, who also act instinctively, have a cerebrum, and their instinctive acts are often varied, and they will plan and scheme to carry out that which the instinct prompts. But still, even in the very lowest animals, true acts of *reason*, or real *mind*, are often seen, as will be shown further on.

The same thing is seen also in others of the lower animals; those with the smaller cerebrums acting most *instinctively*, while those with the larger cerebrums act more from intellect or reason. The degree to which an animal can be trained, or educated, for certain purposes, depends upon the development of its cerebrum. Reason, or mental capability, is, in short, in all beings, a mere question of brain, or rather of *cerebrum*.

Size of Brain, as a Measure of Mental Power.

It may be stated, as a general rule, that the *intellect*, or *reason*, of any animal is in direct proportion to the development of its cerebrum. And this is true, not only of different races of beings, but also of the individual members of each kind. Thus, foxes have better developed cerebrums than wolves, and human beings than apes, while some men have better developed cerebrums than other men, in consequence of which they are superior to them in intellect.

It is not, therefore, the whole organ which has to be considered, when estimating mental power by the size of the brain, but merely one part of it—the cerebrum, which alone is concerned in intellectual acts. Nor is it size alone which has to be considered, when estimating the power of the cerebrum, for a small one may be more powerful than a larger one. It is the amount of *grey*, or *vesicular* matter in the cerebrum which determines its *mental* power, and not its mere total bulk. The way in which the grey matter is distributed also has its influence. For the more its *surface* is increased, by the number and depth of the convolutions, the more powerful it will be. Possibly, also, the number of the vesicles themselves, and the perfection of their development, may exert considerable influence.

The different *parts* of the cerebrum are also differently developed in different beings, and there is every reason to suppose that its power is affected by such differences.

All we can say positively, therefore, is, that mental power, or intellect, depends upon the amount, disposition, and perhaps the quality, of the grey, or vesicular matter of the cerebrum.

Very generally the mere size of *the whole brain*, compared with the whole body, is a measure of mental power; but there are many exceptions. Thus, the canary bird has a larger proportional brain than a man; but, when we come to compare the truly intellectual part – the cerebrum—the proportion is changed. It is the same with men; one man may have a larger whole brain than another, and yet have much less mental power, because he has a less cerebrum. But even the cerebrum itself may be larger in one than in another, and yet have less intellectual power, from having less vesicular matter in its composition, or being not so well proportioned, or its parts so well connected.

While it is true, therefore, that mind, or intellect, depends *wholly* upon the brain, we do not know fully all the conditions by which its manifestations are influenced. We know, for certain, that all mental modifications and differences result from modifications, or differences, of brain, and that with no brain, we have no mind at all.

As a rule, therefore, the larger the brain, or rather the cerebrum, the greater the amount of mental power, and the reverse; though there are many exceptions, for reasons above given. A man with a brain below a certain size, however, is necessarily an idiot.

It must also be remembered that some brains are naturally more *active* than others ; owing, probably, to a more vigorous circulation of the blood ; and thus a large brain, with much real *power*, may do less work than a smaller one that is more active.

Nor must we lose sight of the effects of training, and hereditary descent, which operate not only in increasing the size of the brain, but also in improving its *quality*. The children of educated people, if the parents have been properly mated, will be born with superior nervous organizations, so that they will possess more mental capacity than those born of uneducated, or ill-mated parents, though they may not have larger brains. In this way, the accumulated knowledge of one generation may be transmitted to the next generation, in the form of a greater *aptitude* for acquiring knowledge ; so that the children begin, to a certain extent, where the parents left off !

Some savages have large brains, perhaps as large as those of some philosophers ; but they are coarse, so to speak, and unaffected by the refining influence of ancestral training and development. They inherit nothing but rude force, or power, and this is all they exhibit. The possessors of such heads are, however, nearly always the chiefs and leaders of the tribe, and often exhibit a remarkable mental capacity. The savage who first conceived the idea of fixing a sharp stone in stick, to make an axe, or spear, was a great inventor for his time ; and perhaps his simple discovery was as important, to his tribe, as the discovery of the steam engine has been to us. It is easy to see that a tribe armed with such *improved weapons* would have, over another tribe armed only with simple sticks, the same advantage that the possessors of modern breech-loading guns have over those who only possess the old flint-locks.

The discoverer of the stone hatchet might have great mental power, nearly equal perhaps to that of the discoverer of the steam engine, but it would be power in a crude, unrefined form, deficient in adaptive aptitude and variety of manifestation. The difference between the two is similar to that between the brawny blacksmith and the trained artizan. They may both have equal muscular power, but the one can only strike heavy, *crushing* blows, while the other can strike hard or soft, and can vary the action of his muscles in a hundred different ways, from the giant's blow to the baby's gentle touch.

It must always be borne in mind that the power of the brain depends, not alone on its actual bulk, or weight, but on the extent of its *surface*, and that this depends upon the number and depth of the *convolutions*. A very small handkerchief can be made to occupy a large space, if we try to keep it smooth and unwrinkled, but we can put quite a large one in the same space by compressing it closely and folding it. Now, these folds in the handkerchief are like the convolutions in the brain. The two handkerchiefs may appear of the same size; but, when *opened out*, the *surface* of one will be found much larger than the surface of the other. In the same manner, then, may be two brains occupying skulls of the same size, and being of the same weight; but, if one has more convolutions than the other, it will open out a much larger *surface*, and, in consequence of that extra surface, it will have extra power.

The amount and kind of work which a big brain performs depends on the circumstances in which the individual has been placed. Thus, Fisk's brain (the Erie financier), it is said, weighed fifty-eight ounces, Daniel Webster's weighed fifty-three and a half ounces, Cuvier had sixty-four and a half ounces, while Professor Abercrombie possessed sixty-three. Rulloff, the murderer, who was executed at Binghamton, N. Y., had 59 ounces of brain.

The Brain of Man compared with that of the Lower Animals.

It was formerly thought, and taught, that the posterior lobe of the brain, and the posterior cornu of the lateral ventricle, with the *hippocampus minor*, were peculiar to man, and distinguished him from all other animals, especially from the man-like apes. Professor Huxley, however, shows—in his excellent little work, "*Man's Place in Nature*"—that this is a mistake, and that all the apes and monkeys possess these parts, in the brain, the same as man; so that, in this respect, they belong to the same order as man. In fact, the hippocampus is as plainly to be seen in the orang, or chimpanzee, as in man.

Professor Huxley remarks thus: "So far as cerebral *structure* goes, therefore, it is clear that man differs less from the chimpanzee or the orang, than these do even from the monkey, and that the difference between the brain of the chimpanzee, and of man, is almost insignificant, when compared with that between the chimpanzee brain and that of a lemur.

"It must not be overlooked, however, that there is a very striking difference in absolute *mass*, and *weight*, between the lowest human brain and that of the highest ape,—a difference which is all the more remarkable when we recollect that a full-grown gorilla is probably pretty nearly twice as heavy as a Bosjesman, or as many a European woman. It may be doubted whether a healthy human adult brain ever weighed less than thirty-one, or thirty-two ounces, or that the heaviest gorilla brain has exceeded twenty ounces. This is a very noteworthy circumstance, and doubtless will, one day, help to furnish an explanation of the great gulf which intervenes between the lowest man, and the highest ape, in intellectual power."

Professor Huxley, however, shows, that it is not to the brain alone, neither in size nor quality, that we must look for the cause of man's intellectual superiority, but to that in conjunction with other functional peculiarities. Articulate speech especially assists the brain, both in acquiring and conveying knowledge, and thus constantly increasing it. The form of man's limbs, also, adapted to so many different purposes, is an important element in his progressive improvement, since it enables him to carry out the purposes suggested by his mental action.

If a man were born deaf and dumb, with a large and well-formed brain, and were confined to the society of deaf and dumb people, it would be impossible for him to attain to much mental development, because his faculties could not have full play, and could not manifest themselves. Still, if that man's brain were examined, no difference could be detected between it and the brain of a highly-cultivated man.

There may be no apparent differenee between two watches, and yet one may keep good time, and the other not. A little speck of dust, or rust, may make all the difference, and only the watchmaker, after careful inspection, is able to detect that speck. There may be no difference in the *size* or *structure* of the two watches, and yet they may differ materially in their action, from some little accidental interference. Just so it may be with the brain. Undoubtedly the faculty of articulate speech is one of the main causes of man's mental progress and superiority.

The collections of Dr. J. B. Davis, and Dr. Morton, give the following average internal capacity of the cranium in different races: Teutonic family (German and Anglo-Saxons), ninety-four cubic inches; Esquimaux, ninety-one inches; Negroes, eighty-five inches; Australians and Tasmanians, eighty-two inches; Bushmen, seventy-seven inches.

This shows that the actual bulk of the brain is not very much less in the savage than in the civilized man, and sometimes one is found, even among the most barbarous, as large as the largest of the Teutons. Thus, in Dr. Davis' collection, while the largest Teutonic skull is only one hundred and twelve inches, there is an Araucanian one hundred and fifteen, an Esquimaux one hundred and thirteen, a Marquesan one hundred and ten, and even a Negro one hundred and five.

We may even go further than this; for the few skulls we have of pre-historic men, of those who lived in past ages of the world, along with the animals now extinct and fossilized, are not at all inferior in size to those of men of the present day. The one called the Engis skull, which, Sir John Lubbock says, belonged to a man who no doubt lived at the same time with the *mammoths*, is a fair average skull—so Professor Huxley tells us—and might have belonged to a philosopher, or might have contained the thoughtless brains of a savage.

It is, therefore, evident, as before stated, that mental power is not dependent alone upon the mere size or structure of the brain, but upon these in conjunction with other conditions.

Experiments on the Cerebrum.

Experiments made upon the cerebrum of living animals, and observations upon cases of disease, all lead to the same result, and appear to prove that this organ is the seat of *intelligence*, or reason, alone. All the reflex actions essential to life; all the special sensations, and even a certain degree of consciousness, can exist without the cerebrum; but when it is absent, or much *diseased*, there is no manifestation of intelligence at all.

When one entire half of the cerebrum is removed—which has frequently been done—there is usually only a slight and temporary disturbance of cerebral action. The *sight* on the opposite side seems to be lost, and there is, for a time, great feebleness of the muscles, also on the opposite side; but this soon passes away, and the animal seems little the worse, except in its sight. If the upper half of both hemispheres of the cerebrum be cut away, instead of removing one whole half, the effects are different; the animal then seems to be reduced to the same state as if it had no cerebrum, and this state continues for many days, but is gradually recovered from, so that sensation and muscular power return almost to what they were before the operation.

The removal of the whole of the cerebrum causes a total loss of *intelligence*, and of *will*. The animal seems to be in a deep sleep, or stupor, in which all the vital functions, and those of the sensorium and special senses, are still performed as usual, but with no intelligent perception of anything. It is, in fact, mere *life*, without mind or reason.

Many of the observed facts seem to show, however, that there is still, in this state of mental death, a certain amount of *consciousness*, or conscious perception. Thus the pigeon, whose cerebrum had been totally removed, would still turn to the light, when it was waved before his eyes, and would even try to avoid a blow, though in a state of perfect stupor. *Consciousness* would seem therefore to be not seated in the cerebrum, or at least not altogether; and therefore not necessarily connected with reason.

Professor Goltz, of Königsberg, has made some curious experiments upon frogs, which illustrate well many of the phenomena of the nervous system. Among others, he carefully removed the cerebrum of one animal, so that little or no blood was lost, and as little general injury was done as possible. He found that the frog rested in its usual natural position, just as it did before, without any sign of distress or inconvenience, but without any tendency to move, so long as let alone. But on being pinched or pressed, it immediately turned to one side, or leaped forward, and then remained as motionless in the new position as before. It made no noise, so long as left alone, but on rubbing the back with a wet finger, a croak was emitted, as if it were pleased.

A frog in this state balanced itself perfectly, and when a book, on which it had been placed, was tilted up, the animal crawled to the upper edge and hung on by its fore feet. If the book was then tilted the other way, it would turn round and climb up to the other edge, but in no case would it leap off, as a perfect frog would be sure to do.

These experiments tend to show that the *voice*, and the power of *balancing*, are not dependent upon the cerebrum, but probably upon some part of the spinal marrow.

In an animal so mutilated there can be no intelligent consciousness, nor conscious feeling, but all the motions are merely reflex, consensual, or what is usually called instinctive. All the vital functions go on as usual, and the being *lives*, but without knowing or feeling anything.

Voit, of Munich, in repeating similar experiments, on pigeons, has found that the whole cerebrum, after having been entirely removed, will *grow again*, and become as perfect as before! In such cases the brain, and *the mind with it*, are gradually destroyed, bit by bit, and *both grow again* together, bit by bit!

Effects of Disease of the Cerebrum.

A more or less complete destruction of the cerebrum by *disease*, corresponding to the effects of the operations above described, is followed by similar results. But it must be actual *destruction* of the organ, not mere *alteration*, which may be quite extensive and yet lead to little cerebral disturbance. Thus in hydrocephalus, the pressure of the water will often stretch the substance of the brain till it is only like a thin skin; but the mental functions are not impaired in consequence, because the brain is not destroyed, but merely expanded.

All alterations however must be *gradual*, so as to give time for the brain to accommodate itself to the change; for if they are sudden, serious consequences inevitably result. Thus, in the case of hydrocephalus, the pressure comes on gradually, with no bad result; but if, in the ordinary state, even a small quantity of blood escapes from one of the blood vessels of the brain, the pressure which it exerts *suddenly*, though but slight, causes *paralysis*, or apoplexy.

The substance of the brain is sometimes, in disease, remarkably changed in character, so as to appear little more than a mere *pulp*, and yet it will perform its functions tolerably well, so that nothing seriously wrong is suspected. Ultimately, however, a point is reached where its power is totally lost; but in softening of the brain there will frequently be curious alternations, the patient having intervals perfectly lucid, and then again being quite idiotic. Such a disease may not lead to *death*, unless it affect the whole brain, but only to a loss of reason if it affect but the cerebrum.

The important fact which is here intended to be established is, therefore, that the cerebrum is something in addition to all those parts of the nervous system which are necessary to life, and that it gives us *reason*, *in addition* to all the nervous powers possessed by animals below us.

This is well shown in many cases, well established, of human beings who have lived without cerebrums, or with very imperfect ones. Being more or less deficient in intellect, or real intelligence, their actions have always been simply reflex, or consensual, like those of animals naturally deficient to a similar extent. A poor idiotic girl in Paris was violated, and became pregnant. She was delivered naturally, while alone, and it was found that she had *knawed through* the navel string with her teeth, as many animals do. This was an *instinctive* act, resulting from the *sensorium* alone. To *tie*, and *cut* it, would be an *intelligent* act, and would need a *cerebrum!*

Some idiots have a tendency, like cats, to scratch a hole in the ground, when obeying the calls of nature, and afterwards covering it up. Other instinctive acts, peculiar to the lower animals, are also common among them, showing that when the cerebrum is not active enough to create intelligence, they are guided by the sensorium.

Mind is dependent upon the Senses.

It must be recollected, when speaking of intelligence, or mind, as resulting from the action of the cerebrum, that it can never be developed but through the medium of the senses. *Ideas*, which constitute the basis of all mental operations, and of all knowledge, are obtained only through the action of the organs of special sense. A man born deaf can have no idea of sound, nor the least knowledge of any fact which in any way is based on sound. A man born blind can have no idea of color, nor the least knowledge of any fact in which color is an essential element. It is the same with all the senses, upon which all our ideas are based. Any human being born with *every* sense imperfect could have *no ideas* and no *knowledge* of anything, though the cerebrum might be perfect. Without the senses, therefore, the cerebrum is dormant, and there can be no intelligence, and no knowledge of anything whatever.

The nerves from the eye, ear, and other organs of special sense, convey their peculiar impressions to the cerebrum, and create ideas, of which the cerebrum then takes cognizance, reasons upon, and remembers—in short, acts upon them mentally.

Although the cerebrum, and mind, are, in one sense, therefore, above and distinct from, the mere senses, they are yet entirely dependent upon them for their manifestations, for all intelligence, and all knowledge, are based on sensation, and cannot exist without it.

Through the medium of the nerves of special sensation impressions are conveyed to the brain, where they act on the cerebrum through their appropriate ganglia, and form *ideas*, which are the foundation of all we *know*.

These ideas may become more or less permanent, or may be reproduced, constituting *memory!* So that the mind, when it has once become active, can work either with real ideas, directly produced by sensation, or with *remembered* ideas, as in dreaming, or in reflection.

In sleep these stored-up ideas often come crowding together in curious disorder, producing strange, confused *dreams*, which often puzzle and alarm people. This odd mixing-up is owing to the cerebrum being more or less at *rest*, and consequently there is no *intelligence* to arrange the ideas in proper order. It is the same in mental derangement, of any kind, the cerebrum is either inactive, or morbidly active; and consequently ideas come and go, and mix up in wild disorder, because there is no intelligence to arrange and regulate them.

The higher mental attributes, reason, reflection, comparison, judgment, all depend upon the cerebrum, but in what way they are excited we do not know. Whether each particular attribute is connected with some particular part of the cerebrum, or whether they all depend upon the action of the whole organ, is, as yet, unknown to us. It is certain, however, that without the cerebrum there are no true mental attributes whatever, high or low, or in other words, *no mind*. It is equally certain that the peculiar quality or kind of mind, which any being may exhibit, depends upon the peculiar quality or kind of brain they possess. With one kind of brain there will be one kind of mind, and with another kind of brain there will be another kind of mind, and as long as two brains differ, the two minds resulting from them can never become alike.

Consciousness.

The seat of intellectual *consciousness*, or perception of existence, is probably in the cerebrum, though there is also a kind of *sensational consciousness* in the sensory ganglia, as shown by the pigeon that had its cerebrum removed. In fact, there is good reason to suppose that consciousness is the fundamental intellectual condition, and that ideas, emotions, reflection, reason, and all other intellectual attributes, are merely *states of consciousness!*—or, in other words, merely different ways in which we perceive, or become conscious of whatever exists. In fact the primary element in knowledge, or that into which it is finally resolved, is merely consciousness, and nothing more.

Emotions.

Mental conditions are immensely influenced by the *emotions*, or *feelings*, which, in some people, are, in reality, the most powerful of all impulses. Joy, fear, sorrow, anger, love, hope, despair, are, in most cases, much more powerful than reason, and often lead us quite contrary to what experience and reason would dictate. The judgments which most persons form in regard to other people, and even in regard to current events, result more from their emotions, or feelings, than from their rational judgment. It is the same with opinions, or convictions, especially on theoretical or speculative matters, they are scarcely ever the result of rational enquiry, or investigation, but spring from emotion, or feeling. This is especially the case with religious convictions, or opinions, the form of which, in nearly all cases, depends upon the person's emotional condition. In some people hope predominates, in others fear, or even despair, and their beliefs are tinged accordingly. It is very seldom that the intelligence, or reason, has anything whatever to do with such beliefs ; and when it has, the person is apt to be a *liberal*, or, perhaps, a sceptic.

It is of great practical importance to bear this in mind, and to recognize the fact that the mental condition of all persons, in regard to conviction, or belief, on speculative matters, depends altogether upon their peculiar cerebral constitution. Some few *must* reason, and investigate facts, so as to form an *intelligent belief*, it is the *law of their nature*, and they cannot do otherwise! Others again *cannot* reason and investigate, but derive all their convictions from their emotions, or feelings, without any reference to facts;—it is *the law of their nature.*

If this were generally understood, there would be universal charity, and toleration, for every form of belief, or non-belief. The reasoners would not ridicule the men of faith, for their blind belief, and the men of faith would not anathematize the reasoners for their *skepticism* and unbelief, because each would see that the other must be what he is, and cannot possibly be anything else.

Emotion is, in short, an essential element in man's mental nature, equally with reason. It predominates in children universally, and in many adults, especially in females. It is neither possible, nor desirable, to dispense with emotion altogether, but it is very desirable that it should be subordinate to reason, and by a proper system of education it would soon become so. At present it is generally more powerful than reason, and hence people act more from impulse than from intelligence.

There seems to be no doubt but that the seat of emotion is in the cerebrum, but in what part we do not know. There is probably some special ganglionic centre from which emotion originates, and probably this will some day be discovered.

In some cases emotion will act, and cause motion, when *will* cannot. Thus instances have been known, in cases of paralysis, where the patient could not move his limbs by any exercise of the will, and yet sudden *fear*, or *joy* has caused most energetic motion. Strong faith, or hope will also do the same, as we see in the case of what are called miracles, or faith cures.

In *hysterics* the emotional element is in full play, and the reason feeble; hence the wild cries, spasmodic actions, weeping, and incoherent talk which characterize that disease. Interesting instances of this peculiar state are often seen at what are called religious *revivals*, the subjects being completely under the influence of fear, hope, and other powerful emotions, while the reason is perfectly dormant.

CHAPTER XVII.

ON THE DIFFERENT KINDS OF DISEASES CONNECTED WITH THE NERVOUS SYSTEM.

Having now explained the structure, and functions, of the different parts of the nervous system, it will next be in order to explain the principal diseases to which it is subject. Some of these are *organic*, and others are simply *functional.* In the organic diseases some part of the nervous apparatus is in a morbid or injured state, so that its structure is essentially deranged. In the functional diseases, on the contrary, the structure of the apparatus shows no derangement, nor any morbid condition, and yet its *function* is deranged, so that it either acts inefficiently, on in a manner totally different to its normal healthy action.

Thus, in inflammation or in softening of the brain, there are certain *organic changes*, that is, changes in the nervous *substance*, which can be seen, and noted, on examination. But in hysteria, epilepsy, and mania, no organic changes, or alterations of the nervous substance can be observed at all, notwithstanding the functional derangement is so obvious.

All organic diseases lead to functional derangement, and probably every functional disease is really dependent upon some organic change, though none such may have been detected. It is very probable that some of the most serious diseases, such as mania, epilepsy, or catalepsy, may result from very minute changes in the nervous substance, so minute, in fact, that we cannot discover them. Practically, therefore, a functional disease of the nervous system is simply one not connected with any *known* organic change, or morbid condition.

Organic derangements of the nervous system, may also be called, familiarly, *Diseases of the Nerves*, while functional derangements of the nervous system may be called *nervous diseases*, which, perhaps, to many persons, will better explain the difference between them. Both kinds are among the least understood of all human afflictions, although they are so common. The great cause of this ignorance, in regard to functional, or nervous diseases, is the idea still too general, that the mind is something distinct from, and independent of the body. This idea, as before remarked, prevents a true knowledge of mental phenomena from being obtained, and it stands in the way of all attempts to cure mental disease, or to cause a perfect development of the mind by education.

Mental phenomena, of every kind, result from the functional activity of the brain, just as the indications of time, in a clock, result from the action of its machinery. Just as any derangement of the machinery causes the clock to go wrong, or stop, so does disease of the brain make the mind go wrong, or stop altogether. And just as a knowledge of the *machinery* is requisite, to enable any one to make the clock go right again, so is a knowledge of the structure and functions of the brain necessary, to enable one to restore the diseased mind to a healthy state.

Practically, and so far as we know, the mind has no existence apart from the body. It commences with the brain, grows with it, varies with its varying conditions through life, and finally ceases to exist when the brain ceases to act. This is what *facts* show, and we have no knowledge whatever of mind but as a function of the brain.

This, it should be remembered, has nothing to do with any person's *convictions*, or *belief* in regard to mind, because conviction, or belief, has no necessary connection with *fact*, or *knowledge*, but results entirely from *emotion*, or *feeling*. A man's reason, and the facts which he daily comes in contact with, may both be utterly opposed to his belief, without changing it in any way; or they may accord with his belief without strengthening it in the least. The facts here stated, therefore, are intended to increase knowledge, and not to change mere belief, or faith, which is totally distinct from knowledge, and has no necessary connection with it in any way whatever.

CHAPTER XVIII.

FUNCTIONAL DISEASES OF THE NERVOUS SYSTEM, OR NERVOUS DISEASES.

Epilepsy.

Epilepsy, or falling sickness, is generally considered to be a nervous disease, though some have thought that it results from impurity in the blood. It is possible, however, that though, primarily, a blood disease, it may be the nervous system that the impure blood most affects, and thus the manifestations at all events are nervous. Very little is known, however, of its true nature, its causes, or proper treatment; and, generally speaking, little or nothing can be done for its cure, though something is possible, in some cases, in the way of prevention and alleviation.

Epilepsy is peculiarly apt to be *hereditary*, and it also often results from bad habits, especially from excessive sexual indulgence, and from masturbation. It also frequently follows injuries to the head, or disease of the brain; but yet, in many bad cases, on examination after death, not the slightest injury or disease could be detected. In some few cases epileptics have retained their physical and mental powers, and survived to old age, but this is very rare. Some very eminent men—Julius Cæsar, and Napoleon Bonaparte, among the number—have been epileptic to a certain extent.

An epileptic fit shows itself as a frightful convulsion of the whole body, accompanied by total loss of consciousness. The patient falls, as if struck by a powerful blow, struggles violently, foams at the mouth, and clenches the teeth like a vice. The lips become livid, the heart beats violently, and the breathing is excessively labored and imperfect. Very often the bowels and bladder act involuntarily during the fit, and blood may escape from the mouth, nose, and ears. The fit may last only a few minutes, or several hours, and the patient may either recover suddenly, or may fall into a deep sleep, on awaking from which he recovers sensation and consciousness, as usual. Generally, however, more or less exhaustion, with giddiness and headache is felt for some time after.

Some persons are attacked suddenly, with little or no preparatory warning; but usually the fit is preceded by a sense of weariness, headache, buzzing in the ears, palpitation of the heart, and a peculiar *creepy* feeling over the surface of the body. The most general symptom, however, giving warning of a threatened attack, is what is called the *epileptic aura!* This is a peculiar feeling of *cold*, or sometimes *warmth*, beginning in some part of the body and ascending to the head. It may begin in the hands, feet, groins, abdomen, or sexual organs; but generally makes its way upwards to the head, and when it reaches there the fit comes on. It has been known to terminate at the stomach, and even in the womb. There is evidently an affection of the nerves of sensation, on the surface of the body, which, being transmitted to the brain, affects, by reflex action, the nerves of motion.

Both sexes seem equally liable to epilepsy, and it may occur at all stages of life, from infancy to old age. The fits may occur regularly, at certain periods, or irregularly. Two or three may take place in a day, or one in a fortnight, or month, or perhaps only one or two in a year. Some persons have even had but a few attacks during their whole lives, and these always after some obviously exciting cause.

Epilepsy is sometimes mistaken for *apoplexy*, but may always be distinguished by the convulsions and frothing at the mouth, and also by the absence of that peculiar heavy, snoring, apoplectic breathing.

It is more apt, in some cases, to be confounded with *hysteria*, which may resemble almost every other nervous disease. In epilepsy, however, there is always complete loss of consciousness, but not in hysteria, and the convulsions of an epileptic fit are different from hysterical strugglings.

The great danger from an epileptic attack arises from its suddenness, as the patient may fall anywhere, and be fatally injured. On this account, therefore, those who are subject to this disease should never, if possible, be placed in dangerous situations, nor left alone. During the fit but little can be done beyond keeping the patient from injuring himself in his struggles, and especially from biting his tongue, by putting something between the teeth. All collars, corsets, tight wristbands, and other obstructions to the circulation, should be removed at once, and then patiently wait till the attack subsides.

Leeches are often applied, but with no good reason or result; and sometimes blisters to the neck, or behind the ears, but it is doubtful if they are ever of any use. A good plan, advised by many practitioners, is to wet a towel in cold water, and with one corner of it slap the neck and ears quite sharply. This often seems to excite action in the sensor nerves of the skin; and through them the brain is roused and the fit cut short, which is important; for the longer the fit lasts the more tendency it seems to have to return.

As soon as consciousness and sensation return, the patient may be left quietly to sleep, and should not be disturbed.

A careful inquiry should always be made into the history and habits of the patient, and into the state of the vital organs. In many cases such an investigation will reveal some exciting cause, which may be removed, and the fits thus rendered less frequent, if not entirely prevented. Long continued constipation, inaction of the skin or kidneys, vicious habits of various kinds, or violent emotions, often bring on attacks which would otherwise have not been experienced. So does overloading the stomach with indigestible food, or drinking strong coffee or liquor, and the excessive use of tobacco.

The more the general health can be improved, and the more calm and equable both body and mind can be kept, the less liability there will be to epileptic attacks; especially is it important to avoid violent emotions, for nothing is more likely to bring them on. Sudden fright, surprise, rage, joy, or grief, often induce a fit, and the sight of another person in one is almost sure to induce an attack in those disposed to it.

Medication may be confined to such as may be necessary for regulating the vital functions, or toning up the system. Special remedies are numerous enough for epilepsy, but they are mostly useless. The only drug that exerts any real influence over it is *Bromide of Potassium*, which usually arrests the disease entirely, while it is used; and sometimes even seems to remove it, if the general health be also attended to while it is being taken. This salt is the basis of most of the patent remedies for epilepsy lately introduced, and it certainly has been a great boon to the afflicted. It may be taken in doses of from five to fifty grains, three times a day, simply dissolved in water, or it may be compounded with Quinine, or other tonics.

The common *Mistletoe*, which grows on the oak and apple tree, is an old remedy for epilepsy, and really appears in some cases to be of real service. The berries are the best to use, and of these a man may take three or four, three times a day. In case the berries cannot be had, the leaves may be used, mashed to a pulp, and a half spoonful may be taken three times a day, fresh.

Nitrate of Silver was formerly much used in epilepsy, but with no good result. A poor man used once to be about the streets of New York, who had taken the nitrate of silver till his whole body was stained of a dark lead color. He was called *the blue man*, and was an object of curiosity to all who saw him. The stain was irremovable, and he died with it, but his thorough saturation with the silver had no influence whatever over his disease, for he was constantly falling in the streets in epileptic fits.

We read of epileptics in the remotest times, and very generally they were regarded with awe, or even with veneration. Sometimes they were said to be possessed by devils, which had to be cast out, and at other times they were thought to be inspired. Many of the old prophets, and soothsayers, were only epileptics, as they are at this day among the Mohammedans, and other uninformed people. The ancient priestesses, at the oracles, were often epileptics, and the fit was supposed to be caused by the visitation of supernatural beings, who came to tell them of future events. The old religious writings, of all sects, abound with such instances, and show how prevalent was the disease, and how dense the ignorance about it.

When epileptic fits occur monthly, as is often the case, they are apt to come on a regular day, and can be provided against. It is thought by many that they occur oftenest at the new or full moon, but I am not aware that this has been well established. In women they frequently accompany the monthly periods, and some have them only when they are pregnant. In both sexes a fit often follows the *sexual orgasm*, in those who are disposed to epilepsy, and many always have to provide against it whenever they indulge in a connection.

Usually, when attacked, the patient utters a cry, but not always ; he also usually runs forward a little, or turns half way round ; but sometimes he falls straight down, backwards or forwards, without any cry. All this shows some disturbance of that part of the brain concerned in regulating *motion*, and will remind our readers of some of the experiments made on the cerebellum, and medulla oblongata. Apoplexy and paralysis commonly follow epilepsy, sooner or later, and a large portion of those who become insane while young have first been epileptic. Indeed, insanity, or idiocy usually follows epilepsy if it be long continued or severe.

Experiments made a long time ago, by Sauvages, shows that epilepsy may be caused artificially. He observed that the hemispheres of the cerebrum may be cut, or punctured, with no bad result, as previously stated ; but if the roots of the nerves, or the medulla oblongata be injured, epileptic fits are produced. This points to the seat of the disease, and makes it probable that pressure on the medulla, or ganglionic centres, is the true cause of epilepsy.

It must be stated, however, that some eminent Physiologists consider epilepsy to be connected with, and to proceed from the spinal marrow, as well as the brain, and that it may be excited *externally*, through the sensor nerves, as well as internally from the cerebro-spinal centres. Some probability is given to this idea by the fact that, in many men, sexual manifestations will take place, of a very energetic kind, during the fit, and that some women even will have orgasms just when regaining consciousness. This is no doubt from reflex irritation.

Finally, *never bleed* in epilepsy. It does no good, and often brings on apoplexy or paralysis. In mild cases *galvanism* should be tried *thoroughly!*

Hysteria.

This is perhaps the most variable and mysterious disease with which human beings are afflicted. Little or nothing is known as to its true origin or nature, and but little can be done, medically, for its cure. It is generally considered to be a nervous disease, and so it probably is; but in most cases those subject to it are deficient in blood, or have it imperfect and poor. This, however, would directly affect the nervous system, as before explained. In some few cases, persons apparently in good health, and with abundance of good blood, suffer from hysteria; and then there is probably some derangement of the nervous centres not dependent upon the state of the blood.

Hysterical symptoms, in some form or other, show themselves in connection with numerous other diseases, especially in females, with the majority of whom, in fact, hysteria is almost habitual, so that it is considered essentially a female complaint. It is, however, sometimes met with in men, but only in those of highly nervous temperaments, and whose physical systems are weak and delicate.

Those who are familiar with hysteria recognize it very readily, and yet it is difficult to define. In fact, there are very few symptoms that are exclusively hysterical; and very few, of any kind, but what may be met with, sometime or other, in connection with it. There is no actual bodily derangement, or disease, on which hysteria seems to depend, though it often accompanies various forms of disease; and very often the worst cases are met with in those who have—in popular phrase—*nothing at all the matter with them.*

The most characteristic manifestations of hysteria are connected with the emotions, or feelings, which are often brought into play in the most violent manner, without any apparent cause or reason whatever. Laughter, tears, morbid dislikes, fierce hates, maudlin attachments, or groundless fears, succeed each other, or intermingle in the strangest and most inconsequent manner. The various bodily functions may be exalted, suspended, or perverted, and be totally uninfluenced by the usual medical agents.

A refined and delicate female, under the influence of hysteria, will say and do things utterly at variance with her true nature, or ordinary habits ; and which those who know her best will scarcely deem possible. There is nothing, in short, too absurd, unreasonable, or improbable, for a hysterical female to do or imagine, from mere moral helplessness. Thoughtless or uninformed people usually consider these manifestations as mere vagaries, or as wilful moral perversions ; but to the physician they are symptoms of a real disease, as much so as bodily pain or decay.

Perhaps the one symptom more characteristic of hysteria than any other is, *the tendency to imitate, or exhibit the symptoms of, other diseases !* This is called the *simulation* of disease, and it is often so perfect as to deceive the most experienced physicians. The deception may be purposely practiced, and the patient may be fully aware that she is deceiving those around her, and yet she may not be at all responsible for what she does. In the morbid condition in which she is, the mental and moral faculties, and the will, are totally perverted, as much so as in actual mania. This remarkable tendency to simulate disease is both bodily and mental ; that is, it is found both in a peculiar physical predisposition and in a mental desire to impose upon others. In hysteria the body will present all the signs, and experience all the pains, of numerous diseases, none of which really exist, so that the most experienced physicians are totally *deceived.* The patient will thus *pretend* to suffer from diseases, and pains, of all kinds, which have no real existence whatever ; and will do it so naturally as to deceive every one. In fact, the pretence will sometimes be kept up so long, and so perfectly, that a condition of the system becomes established in which, from continued nervous influence, the pretended pains and diseases become real.

This tendency to deceive, and pretend, is *a part of the disease*, or rather, one of the most prominent symptoms to which it gives rise.

Cases are often met with in which there is every symptom of scrofula, liver disease, hip disease, rheumatism, enlarged joints, paralysis, consumption, or other kinds of disease, without there being in reality the slightest trace of the disease. In many instances the patient, though *knowing* she is deceiving, will go through a long and disagreeable course of medication, or even submit to painful operations, rather than give up the pretence. I have known a female exhibiting every symptom of acute inflammation of the brain, allow herself to be blistered, medicated, and even her head shaved, while all the time every symptom was pretended. Many have gone lame for years with simulated hip disease, and others have even remained bed-ridden and helpless, while all the time perfectly able to be up and about, if they only had the disposition.

Probably the great motive at the bottom of all this is, a morbid desire to excite pity, and sympathy, and to become objects of interest and attention. It is a true *mania*, as much so as the disposition shown by others to steal, or to commit homicide.

Very often, by a little management, the patient may be led to commit herself, and the deception may be exposed ; but there is no good in doing this, for it does not remove the disposition to deceive, and the distrust exhibited may so act on the nervous system as to induce real disease. Instead of this the bodily health should be attended to, so as to remove that morbid state from which this disposition to deceive arises. For it must always be borne in mind that all cases of mental or moral derangement, originate from some pre-existing bodily disease, which must be cured first, before they can be corrected.

I once saw a remarkable case of a young lady, who had been helpless in bed for over a year, with her knees drawn up to her abdomen the whole time, in a rigid spasm. No kind of treatment had the slightest effect upon her, while all her medical attendants owned themselves puzzled and baffled. The old nurse she had was quite experienced in hysteria, and made up her mind it was mere pretence ; she accordingly watched her at nights. The young lady slept in a room by herself, and always insisted upon being locked in, while the nurse slept in an adjoining room. One night the nurse asked leave to go out for the night, to which the young lady willingly assented, providing she had a bell rope placed so that she could call another attendant, some distance off, if she wished her. This being done, and the patient locked in as usual, the old nurse posted herself in the dark of her own room to watch, through a hole she had contrived for the purpose. The young lady herself always had a light kept burning. In a very short time the bed clothes were thrown off, the rigid limbs straightened themselves, and the poor bed-ridden girl sprang upon the floor like a cat. Then commenced the most extraordinary series of gymnastics perhaps ever witnessed, which lasted nearly two hours, till the girl, quite exhausted, replaced all the things carefully as they had been, went back to bed, and was soon fast asleep, with her legs drawn up in the usual position. In the morning, on the nurse going in to her, she was still asleep, and apparently had never changed her position. This, in fact, was the way she was always found; for, strange as it may seem, the strained position of her limbs was always retained during sleep.

The nurse told her mother what she had seen, but she would not believe it till actual observation on another night put the fact beyond doubt. Unfortunately, instead of keeping their own counsel, and consulting with the *physician*, they called in a *preacher;* and, all paying a visit to the sick room together, they commenced a course of moral and religious castigation in real earnest. The poor thing was accused of lying, deceit, and other dreadful sins; she was threatened with exposure here, and with perdition hereafter, if she did not at once confess and repent. The result was an attack of real *hysterics*, followed by fainting,—*real enough*,—and finally by an attack of brain fever.

The physician, on being told the whole story, ordered her, immediately on her recovery from the brain fever, to be sent away, among persons who knew nothing of her past condition or history, and where she was placed among entirely new scenes and surroundings.

The result was every way satisfactory. As the general health improved, the hysteria vanished, and with it all the old bodily and mental derangements. Her parents were informed, however, that it would not be safe to bring her again, for some time, among those who had so thoughtlessly exposed her, and who, she would fancy, would be apt to make allusions to the past.

The consequences, in such cases, may easily be *death*, or permanent derangement, for the feelings are peculiarly sensitive, and easily outraged. The true policy is *not to see* the deception, and to show a judicious amount of sympathy for the simulated sufferings, while proper treatment is being pursued. It is as cruel to notice and criticise these vagaries of a diseased mind, as it is to notice the bodily contortions of a poor wretch while twitching with St. Vitus's dance.

The circulation of blood is usually very irregular in hysteria, and also the temperature. The pulse will sometimes beat rapidly, as in fever, and then die away till it is scarcely perceptible, while hot flashes will dart about the body, from one part to another, in the most singular manner. The whole body will perhaps burn, as in a fever, and then become suddenly cold; or the feet and hands will be cold, while the head and face will be flushed and hot, and the change from heat to cold may be almost instantaneous.

Dyspepsia is an almost universal accompanient of hysteria.

and it is generally attended by flatulence, especially during fits of *hysterics!* In fact, in these fits flatulence is one of the most marked symptoms, both before and during the attack.

Palpitation of the heart also is generally met with, and a peculiar restlessness, or state of *fidgets*, usually called nervous excitability.

But besides all these general symptoms there is one peculiar to hysteria, analogous to the *aura* in epilepsy. This is called the *hysterical ball*, or *globus hystericus!* It consists in a peculiar sensation, as if there was a large ball in the top of the throat, which no efforts can dislodge. This gives a peculiar choking feeling, with considerable pain at times, and great uneasiness. The patient cannot swallow, nor speak plainly on account of it, nor even breathe freely; but gasps, and gurgles as if really choking.

In many hysterical people the *globus* will rise from the slightest causes affecting the feelings. Joy, sorrow, fright, or any exciting emotion, sets them sobbing and choking at once. It is apparently a *spasm*, or cramp, of the muscles, probably produced by reflex action—the nervous centre reacting upon the motor nerves going to the top of the throat.

Sometimes even, from no apparent cause whatever, the hysterical person will burst out sobbing, and will choke as if struggling for the breath of life, while the tears will flow, and the whole system will be in a state of excitement almost bordering on delirium. This, however, may soon subside, and be succeeded by a fit of deep despondency and lethargy, which nothing can dispel.

There are many analogies between hysteria and epilepsy, in some of their forms, and the correspondence between the *aura*, and the *globus*, is remarkable. The one, perhaps, may be only a modification, or more advanced stage, of the other.

A fit of hysterics, or hysterical paroxysm, is a curious phenomenon, and often alarming enough to those not familiar with such exhibitions.

The fit may begin with a sudden burst of either *laughing* or *crying*, brought on by any little disturbance of the feelings, or from no obvious cause at all. Then the *ball* is felt in the throat, and choking, gasping, and struggling commence, with, perhaps, loud shrieks, or convulsive movements of the limbs, and an apparent inability to control either body or mind. This want of control often causes great distress, for the patient may be fully conscious of acting ridiculously, or improperly, and yet cannot help it. Sensibility is seldom impaired, and sometimes even exalted.

In mild attacks these symptoms gradually subside after a little time, and the patient becomes quite calm, in fact, more so than before, the fit acting like a thunder-storm in clearing the air. It is wonderful to see, in some of these attacks, how rapidly the subject will pass from crying to laughing, and from the most violent excitement to the most perfect calm, a few minutes being often sufficient to terminate one mood and inaugurate another.

A severe attack of hysterics is a more serious matter, the symptoms being more complicated, and much exaggerated. There may be complete loss of consciousness and voluntary motion, or suspension of the special senses, with convulsive clutchings, gasping for breath, and harsh screaming. The screams often become singularly harsh and peculiar; finally subsiding into a kind of crowing; while the face becomes flushed, and the hands grasp at the hair to tear it out, or clutch at anything in reach. The breathing will seem sometimes to almost stop, so that the lips will become quite livid, and the patient seem in danger of actual strangulation. In many cases, the bystanders will think death inevitable, from the violence and duration of the spasm; but finally it relaxes, breathing is resumed, and the lips resume their natural color—the danger is then over.

Generally there appears to be felt some oppression or pain, at the pit of the stomach, for the patient will pull and tear at the clothing which covers it, as if to get relief. This is probably connected with the flatulence which usually accompanies such attacks, and which often shows itself in violent eructations.

In short, a violent hysterical paroxysm is a somewhat alarming thing to witness, and often makes bystanders, who are unfamiliar with it, anticipate a fatal termination every moment. It usually lasts for an hour, or more, and occasionally even six or eight hours, and it leaves the patients much exhausted, with headache, or soreness about the neck and chest, as if they had been beaten. There is also, in most cases, a copious secretion of urine, pale, and inodorous, almost like water. The need for voiding this is sometimes urgent, and on this account due privacy and convenience should be afforded invariably.

Hysteria sometimes much resembles epilepsy or apoplexy, but may be distinguished from them by attending to the symptoms of each. Thus, in hysteria, there is no distortion of the features, nor frothing at the mouth, such as we see in epilepsy; nor does the patient fall suddenly as if struck dead. There is also no convulsion, coma, or stertorous breathing, such as accompanies apoplexy. In hysteria there is also a peculiar trembling of the eyelids, in most cases, which is not seen in either of the other diseases. In true hysteria, also, there is no sensation in the *epiglottis* or covering of the top of the throat, like there is in the ordinary state, so that, during a fit of hysteria, the finger may be pressed on the base of the tongue, and the epiglottis may be rubbed with it, even, without causing gagging or choking. In fact, the finger produces no effect at all, in true hysteria, which may in this way be always detected.

In the great majority of cases, in females, hysteria is connected with some derangement of the womb, or some want of agreement between the patients' sexual requirements and their actual condition. With a very large number marriage alone will effect a cure, though there are some with whom it is just the reverse, especially when their feelings, and wishes, have not been duly consulted. *Ignorance of physiological facts, at the time of marriage, on the part of both, often leads to moral and physical suffering, which lays the foundation for future hysteria in the female!*

The treatment of hysteria may be summed up in few words. The first thing is, to find out what bodily derangement exists, from which the hysteria comes, and remove it, if possible. Or, in other words, the whole treatment resolves itself into care for the general health. Most hysterical people are below par, in vital energy, with languid circulation, and poor, or impure blood. Whatever will correct this unfavorable condition of the system, therefore, is the very thing to be done. At the same time a thorough investigaiion should be made, to see if there be any organic disease. In females especially the state of the womb, and ovaries, are very important to ascertain, and the course of the catamenia. If there be no organic disease, and if the reproductive organs, stomach, liver, kidneys and skin are put in good working order, there will soon be no hysteria. All special medication is useless; but, at the same time, *natural* medication, in the form of marriage, is often all that is required. Still, it must be remembered, as before explained, that sometimes marriage is improper and hurtful; there must therefore be great caution used in deciding upon such a step.

During a *fit of hysterics* there is absolutely nothing to be done, except to keep the patient from injuring herself or others, and wait till the fit passes off. Somtimes, when it continues too long, cold water may be dashed on the face, or the neck and ears may be struck with the wet towel, as in apoplexy, and smelling salts may be used, and that is about all.

In many cases of hysteria the digestive organs are very much deranged, and the appetite is strangely affected. The patient will not only eat, but fancy, the most unusual things, such as slate pencils, chalk, cinders, egg shells, candles, sealing wax, and many others; and yet, with all this, there may be little or no falling away in flesh.

Total loss of voice, inability to swallow, and all the symptoms of croup, are all commonly assumed in hysteria, and so is *cough*, of the most distressing character. This hysterical cough is, in fact, often attributed to bronchitis, or consumption, and the patient treated accordingly, perhaps for years. The windpipe has even been cut, several times in succession, to save the patient from choking, in supposed croup, while blisters, leeches, and other such remedies, without number, have been borne willingly in preference to giving up the simulated disease.

It is not unusual for the *breast* to become tender, painful, and even to swell, giving rise to fears of cancer, and all from no organic disease whatever, but simply as a result of hysteria.

Hiccough is also common in hysteria, and is sometimes very obstinate. Vomiting is also not unusual, and sometimes blood is thrown up, in considerable quantity. Pains in the hip, knee, and spine, are standing complaints in hysteria, and are always considered to indicate disease of those parts. That great surgeon, Sir Ben. Brodie assures us that four-fifths of the supposed diseases of the joints, in the upper classes, are only hysterical affections. One lady had suffered so long with her knee that she insisted he should cut off her leg, to relieve her; and yet it was all hysteria, and she was finally cured. Some patients imagine they cannot pass their urine, and they will even allow a surgeon to pass the catheter every day for months, while all the time they are quite capable of discharging it in the usual way.

In those cases where great tenderness is complained of, as in simulated hip disease, or inflammation of the knee joint, it is often easy to find out whether the disease is real or not. The hand should be gently laid on the tender part, and then the patient's attention be drawn to something else, and kept there, while the pressure is increased. If the disease be real, the increased pressure will cause increased pain, which will soon be complained of. If, however, it be only hysterical, no notice is taken of the pressure, unless the attention return to it, and then it will be felt again in a moment worse than before. This, however, should never be done to *catch* and *expose* the patient, but only to ascertain the truth,—the *reality* of the suffering should not be questioned. In fact it is real enough, though it has no apparent bodily cause.

In many cases when patients cannot open their mouths, move their limbs, or straighten their joints, they can be caused to do so by pouring a continued stream of *cold water* on the affected part. It is quite amusing to hear the dumb scream out, and to see the lame get up and walk briskly off, under this treatment. The mere knowledge that it will be adopted often wards off attacks. Of course this requires judgment, and is not applicable to all cases. Galvanism, and electricity, also act equally well with some, and I have often known one shock straighten a contracted joint, while the fear of another has kept it straight.

Corsets have much to do with hysteria, by injuring the womb, and interfering with the circulation.

Many persons threatened with hysteria, who have strong wills, can ward off attacks by moral effort alone. Among other peculiar nervous affections, apparently hysterical, we find several connected with *motion*. Thus in some cases the patient cannot move *moderately* fast, but must either move rapidly, or with extreme slowness. Some, again, must always do everything quick, almost with a jerk, while others are just the contrary, and must always move with painful slowness. In some cases their moods will alternate, and the patient will be one moment all bustle and quickness, and the next moment like a snail. One young lady whom I once saw was so troubled, at times, with this tendency to rapid movement, that she would speedily exhaust herself with the simplest duties. At times, even, she could scarcely take her meals, from the rapidity with which she endeavored to fill her mouth, and swallow her food. Nor did she seem at all conscious of anything unusual in her actions while so doing.

Catalepsy.

This is one of those peculiar diseases of which nothing certain is known. It is probably nervous, but whether functional or organic is only a matter of conjecture.

One of the principal symptoms is a stiffening or rigid fixing of the muscles, in whatever position the patients may happen to be, at the moment when attacked. Stooping, standing, sitting, or lying, so they remain, as if they were stone statues.

That this results from some peculiar action of the *nerves of motion*, or some peculiar condition of the nervous centres from which they originate, there can be little doubt, but beyond this we know nothing. Anything which violently shocks, or strongly agitates the nervous system, may induce catalepsy, in those disposed to it.

It often comes on from fright, from intense emotion, and from absorbing attention to any subject which excites powerfully the feelings. Religious excitement frequently causes catalepsy, or a state nearly resembling it, which is usually followed by hysteria, and then the subject is said to have got religion, or to have been converted. In some impressionable people, catalepsy can be induced by mesmerism, or animal magnetism ; but it is then usually confined to some particular muscles, and does not commonly extend to the whole body.

Trance is a variety of catalepsy, in which the body remains fixed and quiet, but the muscles are relaxed instead of rigid. The state of quiescence is sometimes so perfect that the subject seems really dead, and some have even been buried in that state. Sometimes consciousness remains unimpaired, so that the patient knows what is going on, though unable to move; but at other times the trance is complete, and the mind is as totally inactive as the body.

Ecstasy is another form of catalepsy, in which the patient becomes fixed in some impassioned attitude, with the eyes wide open, and with the mind apparently completely abstracted from all surrounding objects. In such a state the patient, in fact, seems mentally *struck* as it were, and will often pour out a flood of talk of the most fervid and excited character; totally unconscious of the persons or things around, and with no regard for coherence, or appropriateness, the *ecstatic* person will threaten, denounce, warn, or prophecy in the most impassioned manner. Instances of this kind are common enough at camp meetings and revivals, where such discourses are commonly supposed to be the result of spiritual promptings, and are regarded with awe and attention. They are usually inconsequent enough, and often absurd; in fact, they would scarcely be listened to from a person known to be wide awake. The prophets and religious enthusiasts of former days were all *ecstatics*, as may be readily seen when reading about them. This state is closely allied to *somnambulism.*

When cataleptic ecstasy is very intense, it becomes closely allied to actual mania, and, in fact, passes into it; but this makes no change in the estimation in which such persons are held. They may declaim any amount of meaningless doggrel, and it will be sure to be considered *inspiration*, and be listened to with wonder and awe. The gift of prophecy, speaking in the unknown tongue, and uttering what the spirit prompts, are all ecstatic manifestations, or mild forms of mania. The Italian *improvisatores*, who will declaim in the most impassioned and poetical language, upon any given subject, are always in a state of ecstasy, more or less complete, when they do so.

Lethargy is also a modification of catalepsy, in which sensation and motion are more or less dull and languid, but not totally suspended. The patient may be roused by violent external excitation, but makes no effort to rouse himself.

Sleep-talking is a modification of cataleptic ecstasy, in which the body is quiet, while the organs of language, and some of the mental faculties are awake. As in true ecstasy, many of these subjects will pour forth torrents of incoherent eloquence, while in this state, and some will even preach regular *sermons*, which are listened to with amazement and admiration. People with strong emotional tendencies always think such discourses *inspired;* but the physiologist regards them merely as manifestations of disease; in fact, as the utterances of a mild form of mania. Some years ago, a Miss Baker made a great sensation in New York, by preaching while in a state of sleep. Crowds went to hear her, and she was generally thought to be inspired. This gift, however, was simply the result of *disease*, and when her physicians restored her to health the gift was gone. It is probable that enthusiasts of all kinds, particularly religious, are more or less subjects of cataleptic ecstasy—especially female enthusiasts. Patients may perfectly recover from all the forms of catalepsy, and enjoy good health after. They are not apt to do so, however, if the attacks are prolonged and frequent, especially if the general health be poor. In such cases the termination is often in epilepsy, mania, insanity, or hysteria. Indeed, hysteria often both precedes and follows catalepsy, as if it were both cause and effect.

In *catalepsy* the patient is always rigidly motionless, and mute; in fact, a mere living statue, with the look of death. But, in ecstasy, though the limbs are motionless, the countenance is animated and full of expression, and the patient sings or declaims with the greatest ardor. The whole appearance indicates a complete abstraction from all immediate surroundings, and a perfect abandonment to the contemplation of some all-absorbing subject. This is the time when visions are seen, and revelations heard; the patient taking the disordered impressions made upon his senses for realities, and becoming incapable, from the morbid condition of the cerebrum, of properly managing and coördinating his ideas. Usually this condition is found only in those who are naturally emotional, and in whom the feelings are stronger than the reason. It is very interesting to read of the seers, prophets, and inspired teachers of old times; and to see how exactly the description of them, and their doings, corresponds with the descriptions now given, in medical books, of the manifestations of ecstasy, epilepsy, and hysteria. Only *then* such conditions were supposed to result from *spiritual* visitations, and were reverenced; but now they are regarded as diseases, and treated medically.

Catalepsy and ecstasy are both favorite diseases for *simulation*, by hysterical patients, many of whom will deceive the most practised observers, by the perfection and persistence of their imitations. Many hysterical females have remained rigidly motionless, and speechless, for hours, in all sorts of attitudes, to obtain the reputation of being cataleptic. Still more have assumed to be ecstatic, and in that state have declaimed poetry, or piety, as the case might be, by the hour together, to the awe and wonderment of those around ; and, no doubt, much to their own gratification.

A celebrated surgeon once hit upon a plan for testing a pretended cataleptic, which succeeded admirably. He hung a weight, by a string, from her outstretched arm, and then suddenly *cut the string*. Immediately the weight fell, *up went the arm*, showing that the muscles had been purposely contracted to bear the burden, and then reacted when suddenly released. Had it been real catalepsy no such result would have followed.

Trance is also frequently imitated, and in some cases has been persisted in up to the point of burial, the patient being supposed to be dead. In real trance there may be danger of premature burial, for the patient may seem really dead, though conscious of all that is going on around. No one should therefore be buried till there are *unmistakable* signs of death. As long as no decomposition shows itself, the body may be kept, and when decomposition does show itself, in any form, there is no possibility of life.

The principal causes of catalepsy appear to be, debility, impoverished blood, or morbid condition of the nervous system, long continued, or powerful emotion of any kind, and intense mental occupation. Prolonged dwelling upon particular abstract subjects, especially religion, also disposes to catalepsy, and so does ungratified desire, or excessive indulgence.

Many bodily derangements, especially of the uterus in females, also predispose to catalepsy, and probably particular conditions of the brain and nerves. Among immediate exciting causes *fright* is, perhaps, the most operative ; and, next to that, powerful sexual emotion.

The whole rationale of the treatment for catalepsy lies in restoring the general health, if deranged, and in finding active healthy occupation both for body and mind. And especially in occupying the mind with *realities* instead of *abstractions*, while the emotions are held in control. During an attack nothing can be done but wait, unless it be very prolonged, in which case proceed as directed in Hysteria and Epilepsy.

It is unquestionably the case that in true catalepsy, and ecstacy, bodily sensation is often totally torpid, so that the subject feels nothing ; the mental and emotional exaltation overpowering all bodily susceptibility. In all probability, many of the poor wretches who suffered, in old times, by fire and stake, on account of their religion, were in this state at the time, and thus did not feel the tortures prepared for them. Fright might do this in some, and powerful emotion in others, while others would be really insane. Those who voluntarily torture themselves, like the ascetics of old, probably often feel little or nothing, because they are in a state of *ecstacy*, in which emotion overpowers bodily sensation. Indeed, we often read of such persons dying the most horrid and lingering deaths, not only without signs of suffering, but even with every indication of intense ecstatic enjoyment.

Chorea, or St. Vitus' Dance,

This is one of the most curious diseases that afflicts the human body, and one whose nature and origin, or proper mode of treatment is but little known. It consists in convulsive movements, of various parts of the body, with no loss of consciousness, and even with some little voluntary control, at least in some cases. The patient, however, seems seized with an irresistible impulse to jerk, or twitch some of the voluntary muscles, and continues to do so with more or less regularity, like a piece of machinery. A violent effort of the will may sometimes arrest, or lessen those movements, for a time, but they soon recur again as before, and go on as if the patient knew nothing about them. He seems, in fact, as if moved by wires, pulled by some one else.

The motions are sometimes very violent, but at others gentle, they are also sometimes quite uniform, and at others just as irregular.

The muscles most frequently attacked are those of the face, and next those of the limbs, on one side, but the whole body may be affected, and every part of it at the same time, so that every muscle may be in constant and violent action at once. When the muscles of the face are affected, the poor sufferer contorts his features, in the most hideous or absurd manner, twisting the mouth, and working the muscles of the cheek as if purposely making faces at some one. Indeed, ignorant people often imagine this to be the case, and many a poor convulsed wretch has been abused, under the mistaken idea that he was purposely mocking. When the limbs are affected, the patient walks unsteadily, jerking his legs in various directions, or throwing his hands around, and twitching them as if he were trying to flirt something off them.

When the whole body is affected, the patient cannot stand, nor even sit, but lies down. Every part is convulsed in the strangest and most fearful manner, causing rolling, jerking, and twisting in every direction. The body will sometimes draw itself into a bow, and then bound upwards like a rubber ball. In such cases much injury may be done, unless the patient be in a padded room, or kept on mattrasses.

These movements are more or less constant and regular, while the patient is awake, but are always suspended during sleep. The disease most usually attacks children, from four to six years before puberty, but occasionally appears at a much later period of life, and is sometimes seen in quite old people. An attack may last from two to three weeks to several months, but may also recur again and again. The common period is from one to two months.

The immediate cause of chorea is, no doubt, some derangement of the nervous system; but what we do not know. While it lasts, the nerves of motion are perpetually stimulating the muscles, in a spasmodic manner, much the same as they do in a *sudden fright*, which we know may make any one start, and tremble, or even spring into the air. Some physiologists have thought the seat of the trouble to be in the cerebellum, others in the sensorium, and others again in the spinal marrow; but possibly it may be in either or all of these.

In all probability, there is always irritation somewhere in the nervous centres, wherever there is St. Vitus' dance, and this irritation may be more or less permanent, making the disease the same. There are also many immediately exciting causes, among which may be mentioned the natural workings of the sexual organs, previous to puberty, teething, indigestion, worms, suppression of the secretions, cold, and general debility. Also, over-mental exertion, or any powerful emotion.

Chorea may accompany epilepsy, or hysteria, but may be readily distinguished from either by not affecting the breathing, nor suspending consciousness, and also by being suspended by sleep. In those subject to this disease there is always more or less debility, and frequently exhaustion, showing an undue expenditure of nervous power in some abnormal manner. Chorea may be associated with, or may terminate in various other diseases, especially rheumatism, epilepsy, and dropsy, or convulsions; but generally, with proper attention, it ends in a restoration to health.

In all probability, hysteria, epilepsy, and chorea, are but modifications of one form of disease, since they all apparently depend upon similar causes, and co-exist together, or pass into one another. Either of them may become epidemic, and afflict a large number of people at the same time, as may be seen by many instances recorded in history; and by some of very recent date, as will be shown further on.

In order to better understand the nature of St. Vitus' dance, in all its varied forms, it will be necessary to refer back to the chapters on the brain, especially those treating upon the medulla oblongata and cerebrum. It is there shown that by wounding different parts of the brain, or removing them, the power of *motion* in the animal is curiously affected. Now, if one part of the brain be injured, the subject begins to rapidly turn round to the *right*, but if another part be injured, the turning is to the *left;* and if the injury be made in other parts, the subject runs *backwards*, *forwards*, or *sideways*. The motion is affected according to the part of the brain that is acted upon. Extensive injury to the cerebellum destroys the power of *co-ordination* of motion, so that no action has any connection with, or dependence upon another; or, in other words, the different movements do not co-operate for any common purpose.

Now it is obvious how much many forms of chorea resemble the effects of injuries to the brain, and it seems highly probable that they result from a similar cause. In all probability, when a victim of St. Vitus' dance keeps turning to the left, or to the right, or backwards, or sideways, as is often the case, there is something wrong in those parts of the brain, which are wounded when similar motions are caused artificially. In like manner injuries to certain parts of the spinal marrow affect the motion of the limbs, just as we see them effected in chorea.

In fact, in many cases of chorea, when the patients have died, dissection has shown that there were tumors, abscesses, spiculæ of bone, or some disease, in exactly those parts of the brain where they might have been expected.

Experiment has made it probable that the *will* results from the action of some part of the *cerebrum*, while *motion* may result from the *spinal marrow* alone, either with or without the concurrence of the will. And this explains many of the curious movements we often see in chorea, some of which are quite involuntary, and some more or less voluntary. Thus, if the spinal marrow alone be affected, though the motions may take place, yet—the cerebrum being sound—the *will* is still active, and may exert a certain influence over them. But if the cerebrum be affected as well, then the motions are quite involuntary, or uncontrolled, because the *will* is enfeebled. Drunkards often exhibit a remarkable feebleness of *will*, so that no reliance can be placed upon whatever they propose to do, or to leave undone; and in all probability this is because the cerebrum is diseased, in that special part which originates the will.

The motions of patients afflicted with this disease are often very wonderful to witness. Some will spin round and round, for hours together; some will stand on their heads, even; and others again will roll incessantly, or draw the body into curves and then straighten it out with great force; while still others will jerk the head incessantly, with such violence that there seems danger of dislocating the neck, or they will do the same with the limbs. All this indicates very plainly disease of the nervous centres, analagous to the artificial injuries before explained. It must, however, be borne in mind, as before remarked, that many of these curious movements may be *started* by something acting powerfully upon the mind, or feelings. But very probably, in such cases, the patient's nervous system is already diseased, to a certain point, so that it requires but little to excite the morbid action. In persons with sound nervous systems no such effects could result from such causes.

Music very frequently affects those subject to chorea in a powerful manner. In some, particular tunes, or tones, will excite irregular movements immediately, while in others such movements are immediately arrested by the very same means. Music, in fact, is often used in cases of St. Vitus' dance, and quite successfully, when employed with judgment.

Mesmerism, or animal magnetism, may also cause or control chorea, in those peculiarly disposed to it, but is so uncertain in its action that it is seldom available to cure.

It is remarkable also that the bite of a certain kind of *spider*, called the *tarantula*, will produce exactly the same symptoms which are observed in some forms of St. Vitus dance. A few hours after the bite, the patient experiences a difficulty in breathing, and feels dull and sad, and eventually falls into a peculiar melancholy, from which nothing arouses him. He hides away in gloomy, retired places, especially church-yards, and sighs, or howls, in the most harrowing manner. Sometimes he rolls upon the ground, runs about, or puts himself into ridiculous and indecent attitudes, and at other times lies perfectly still, as if dead. In some cases, immediately after the bite, the patient falls, as if dead, and remains for an hour or more senseless, and motionless, but on recovering goes through the symptoms above described.

The most curious fact about these bitten patients is, that they are peculiarly affected by *music*. Immediately the musical sounds are heard they begin to move their hands, and feet, and finally the whole body, turning and twisting in the most fantastic manner, all the time sighing, and apparently breathing with great difficulty. This tarantula dance is a very remarkable thing to witness, and is evidently something with which the patient's *will* has very little to do. The motions are usually very rapid, and varied incessantly, being sometimes of the most unusual character. They will continue for several hours, till the patient, bathed in perspiration, falls from exhaustion ; but, after a short rest, commences again, and so continues for four, five, or six days, sometimes, practicing these violent movements ten hours each day.

Gradually the motions become less violent, and of shorter duration, till they finally cease, and the patient recovers, but feels great exhaustion and dulness for some time after.

The music, in these cases, excites the motions, and they seem to work off the poisonous influence of the bite. In those not acted upon by music, and who do not dance, the melancholy and depression continue, and increase, till the patients fall into a permanent state of despondency and vital inaction.

This tendency to dance, or perform fantastic movements, is also seen in people subject to chorea ; and often becomes epidemic, especially during periods of great religious excitement. In the middle ages there were many very remarkable outbreaks of this kind, during which men and women, by hundreds, were all affected as if they had been bitten by the tarantula. They would sigh, and groan, roll upon the ground, dance in the wildest manner, and throw themselves into the most absurd and lascivious attitudes, for hours together. In the midst of some church service, or some sermon of an exciting character, one or two would go off, and then others would follow, till finally the whole congregation would be yelling and dancing like crazy people, which, in one sense, they really were.

Music had an irresistible and immediate effect on these people, starting them in their wild movements immediately, and afterwards appearing to guide or regulate them. Some of the dancers, we are told, would continue their strange movements, in the most rapid manner, for ten or twelve hours at a time. The mad fit usually terminated in complete exhaustion, and profuse perspiration, which seemed to restore the system to its natural condition.

These strange effects were then thought to be due to religious inspiration, and were regarded with awe and admiration. It was not then known that they were the result of disease.

Even in our own day something of the kind is seen occasionally. Thus we have the dancing, shaking, and turning shakers, who, as part of their religious service, will perform movements as wild and unusual as any that are recorded in history. And at camp meetings, and love feasts, plenty of similar cases are to be met with. Some will simply sigh, or groan, while others will roll upon the ground, or tremble till their teeth shake in their heads.

In all such persons there is an undue preponderance of the emotional faculty; or, in other words, the feelings are more powerful than the intellect; and this natural condition, when combined with a feeble or diseased brain, makes them peculiarly subject to unreasoning fits of excitement. The efforts of the preachers, and managers, are also specially directed to produce such effects, which are looked upon as manifestations of religion. The hymn and psalm singing also acts just like music, and often both starts and guides the movements.

Now there are cases of chorea, or St. Vitus' dance, caused by excited feelings, but they are strictly analogous to similar cases caused by disease, or by peculiar blood-poisoning, as in the bite of the tarantula. In one sense, however, all these forms of chorea are alike the result of disease; for, in the case of the religious enthusiasts, though they are directly excited by appeals to their feelings only, still their nervous systems are undoubtedly in a morbid condition, so that they are readily acted upon. The man or woman with sound, healthy nerves, and with intellect and feeling well-balanced,—that is to say, *the hardened sinner*,—is not so easily acted upon, and remains *unconverted!*

Some of these patients take singular antipathies to particular *colors*, or objects, the sight of which will put them at once into a fit.

In Scotland, some years ago, there was a peculiar form of epidemic chorea, called the *leaping ague!* The subjects of it complained first of pains in the head, and lower part of the spine, which was followed by a singular tendency to leap about, run, and climb. They would perform feats beyond the power of any one not so affected, and which they, themselves, in their ordinary states, would never attempt. For hours, and even days together, this excessive activity would continue, till exhaustion and profuse persiration put an end to the fit. With many, however, a little thing would make it return, and the fits would succeed each other for days or weeks at a time.

Single cases of this kind have often been met with, and, in some of them, the patient would be impelled irresistibly to run backwards, or forwards, like the pigeons whose cerebellums had been wounded. In one of these cases, in which a man continued to run backwards till he fell down exhausted, it was found on examination, after death, that there were several tubercles pressing on the anterior part of the cerebrum.

The most surprising thing about these cases is, the amount of violent motion which the patient can practice, and yet come out uninjured, and often but little exhausted.

Some have been known to spin round like a top, so rapidly, that it was scarcely possible to distinguish the features; others to rock backwards and forwards, and others again to stand on their heads, and then let themselves fall, as many as ten or twelve times a minute, for fifteen hours a day, and for four or five weeks at a time. People in ordinary health could not stand this for as many days.

In this country, in the year 1800, in Kentucky and Tennessee, there was a remarkable epidemic of hysterical chorea, originating in a sect of religious enthusiasts. The subjects would contort their limbs and features, dance, sing, laugh, and shout, in the wildest manner, sometimes for hours together, till fatigue overcame them. The sight of one person affected would often set a number of others off in the same way; but, if any one specially wished to be influenced, they would shake hands with the affected one, and that would communicate the impulse at once.

At various periods, since then, particularly in the West, similar manifestations have been witnessed, and they are not uncommon elsewhere, especially among the imaginative Negroes.

Medical treatment amounts to very little in chorea. All that can be done is to regulate all the vital functions, if they are deranged, and keep up the general health and strength. When the disease depends upon some lesion of the brain, or spinal marrow, as it does in a majority of the cases, of course nothing effective can be done. And, when it results from an over-excited imagination, or highly-excited feelings, which it does very frequently, medicine is not called for, but better mental and moral influences.

As long as such forms of disease are considered manifestations of *religion*, or of *spiritual* influence, they will continually be witnessed, because they are considered to be something very desirable and commendable. The desire of notoriety, and love of deception, also frequently causes them to be *simulated*, as in hysteria.

Each case must be studied by itself, and treated upon its own merits, for no two are alike, and one will frequently be made worse by treatment that has cured another.

As soon as the bodily functions are properly regulated, healthy occupation should be found for the mind, and every influence should be removed that can excite the imagination or feelings. *Sensational preaching* causes much of this evil, by its unwholesome influence upon the emotions,—by its studious avoidance of all appeals to the reason,—and by its condemnation of all amusement.

Mania, or Madness.

Mania, insanity, or madness, is perhaps the most terrible of all human inflictions, destroying, as it does, man's brightest and most ennobling attributes.

There are four principal forms of mania, under which all the numerous varieties met with may be grouped.

(1.) *Moral Insanity!* In this form, the feelings, emotions, and propensities are deranged, so that the individual's likes and dislikes, habits and tendencies, are totally different to what they are in the healthy state.

(2.) *Intellectual Insanity.* In this form the mental faculties are deranged, so that the individual's reason and judgment are impaired. He is incapable of connected thought, of reflection, or of systematic intellectual work. The different faculties may work, but not in harmony, or for any common purpose.

(3.) *Imbecility.* In this form, the intellectual faculties seem totally lost, or sunk so low, that the individual can scarcely be said to have a mind at all. There is not a mere derangement of the faculties, but a loss of them.

(4.) *Monomania.* In this form the mind is half sane, and half insane. Some one faculty perhaps is lost, or deranged, while all the others remain perfect. Many instances of this kind are to be met with, where the patient is perfectly insane in regard to one subject, and yet quite sane on all others.

There is no doubt but that madness, in every form, depends upon some diseased condition of the brain ; the particular kind of madness depending upon which part of the brain happens to be affected.

The notion was formerly held that insanity was a disorder of the *mind* only, and not dependent upon the body. It was, therefore, thought, that men could be tempted into madness, by the devil, or by evil thoughts, and that they could be kept from it, or cured of it, by preaching, or persuasion. This view is, however, now discarded by modern physiologists, and the fact recognized that there is no such thing as mind known, practically, disconnected from the body. As explained before, mind results from the action of the brain, just as sight does from the action of the eye ; and a man can no more think without a brain than he can see without an eye. Furthermore, every change, or modification of the brain, modifies the mind ; and, if the brain be deranged, or diseased, the mind is also the same.

Insanity, or madness in any form, is simply a consequence, or symptom of diseased brain, and can be cured only by restoring the brain to a healthy condition.

It should be remarked, however, that the brain may not be organically diseased, and yet the mind may seriously suffer. Impure, or poor blood, as before explained, while circulating in the brain, seriously impairs its power, and so deranges the mind. This is frequently seen in confirmed dyspepsia, and torpid liver, the victims of which are much subject to hallucinations, and to all the vagaries of hypochondriasis. Such persons will often believe themselves to be made of glass, or iron, or to have their heads set on their shoulders the wrong way. Some have believed themselves to be wheelbarrows, or pumps, and one man thought he was a clock, and must stand *ticking* all day. In short, there is no end to the strange fancies which these persons have had. Nothing is too absurd or impossible for them to believe; and on that particular point they may be said to be insane, while all right upon every other matter. All this however, arises merely from oppression of the brain, by the poisonous state of the blood, which, owing to the inactivity of the liver and other organs, is not kept properly purified. Immediately digestion is properly performed, and the liver, kidneys and other associate organs, perform their functions properly, the brain is restored to health, and the mind also, as a matter of course.

In this state of melancholy, or hypochondriasis, the patient will often see visions, or the appearances of persons or objects not really present. On more than one occasion this has happened to men of knowledge, and intelligence, who understood what was the matter with them, and who have left us valuable records of their experiences. One gentleman in particular, tells us how the images of his friends, and acquaintances, would appear to him, at various times and places, so distinctly that he could not tell whether they were real or not, except by speaking to them. Sometimes he saw them sitting in his room, and at other times would meet them in the street, and address them, not knowing but they were the real persons, till they slowly disappeared. An uninformed, or superstitious person would, no doubt, be much alarmed at this, and consider it something supernatural, but he knew it was the result of disease, and that it could probably be corrected. The result showed he was right, for a little judicious medication soon banished all the ghosts.

In many cases, I have no doubt myself, *children* often see visions this way, from overloaded stomachs; and they are then thought to have been visited by spirits, or to have had something revealed to them by way of warning.

In the course of this work, many instances of this kind will be given, some of them of a very singular character.

Sometimes, it is proper to remark, the term *mania* is used only to denote a state of insane excitement, or *violent* madness, commonly called raving. It is, however, better to use the term to denote simple insanity, or loss of mind generally, in any form, whether there be excitement or not.

As a general rule, mania, with excitement, is most common in early life, and imbecility in advanced age.

Hallucinations and Delusions.

The insane are always more or less subject to illusions, or delusions, and take their own imaginings, or deranged sensations, for realities. They hear voices when no one speaks, and see objects that are not present. Hearing is perhaps the sense most frequently deranged, and next, sight, smell, and taste—instances of all of which are given elsewhere. Many patients, on recovering, tell us that in their state of hallucination they heard, and saw, just as distinctly as when they did so in reality. At first they are often able to convince themselves of their own delusions, but when the judgment becomes enfeebled, then they believe every illusion to be a reality.

Mental hallucination, independent of deranged sensation, may take many different forms. Some will see cause for nothing but despondency and sadness, others for gaiety and rejoicing; some will be generous, some avaricious, some benevolent, and others destructive.

While these hallucinations continue, they are perfectly real to the poor patient, and all reasoning, or presentation of facts in regard to them, are utterly useless. Let a man take the notion that he is in deep poverty, and the showing him any amount of wealth belonging to him, will not affect the hallucination in the least. So long as the brain is diseased the mind will be deranged.

Very often patients will have strange delusions as to something taking place in certain parts of their bodies, and these delusions may depend upon actual disease, or suffering, in those parts. Thus, some will imagine they have an *animal* in the chest, or head, which is continually tormenting them. Others will contend they have no head, no heart, or, no stomach; while others, again, believe the devil has possession of those parts. In all these cases there is some disease, and pain, in those parts, and the deranged mind is incapable of forming a rational idea as to what it is. Very often the curing of this disease, and consequent removal of the suffering, cures the delusion. A similar delusion may arise, however, without any actual disease of the part, simply by some affection of the nerves connected with it; the effect upon the mind being just the same in the one case as in the other.

M. Esquirol mentions a patient who complained that the devil was always pinching her entrails, and biting her heart, and that he had bound a cord, tightly, the whole length of the body, which hurt her very much. After death it was found that there had been a state of chronic inflammation in the abdomen, and chest, the suffering from which no doubt created the illusion.

In another case the patient believed she no longer had any body at all—the devil having made away with it. She knew this to be the case, she said, because she *felt* nothing! M. Esquirol at once concluded that there could be no sensation in the body, and to test it he pushed a pin into the arm, put it caused no pain. It was therefore evident that the nerves of *sensation* were paralysed, and the patient, not being able to feel in her body, concluded she had none; and hence the delusion.

In another case, a French soldier, in consequence of a wound, lost all sensibility in his body, and concluded, in consequence, that he had not got one. He used to tell every one that what they had been looking at was not his body, but a kind of machine, made like it, and not well made either. Sometimes he would refuse to eat, saying that a machine had no belly, and did not want food. He would often fall into a kind of trance, lasting for several days together.

Such delusions are usually harmless, but those connected with the special senses are frequently more dangerous. Thus, an insane person often imagines that he sees something fearful, or some enemy that he must attack and overcome; or, he may hear a voice commanding him to kill some one, or do some other injury, and such a command is usually obeyed.

Insanity in every form is usually preceded and accompanied by sleeplessness, or *insomnia.* In fact, this is one of the most invariable premonitory symptoms. Some insane patients will pass days, and weeks, without sleep. There is also more or less disturbance of the vital functions, especially of the digestion, and the bowels are nearly always costive. The skin is usually hot, especially on the forehead, and the perspiration generally has a very peculiar *odor*, by which insanity may be recognized.

Erotomania, or Love Madness.

This disease consists in an excessive and morbid love of some object, which may be real or imaginary. It arises from diseased excitement of the amorous propensity, which becomes so active as to completely overpower the intellect, and all other feelings, just as religious ideas do in religious madness.

The patient thinks of nothing but the beloved object, and is all the time imagining in it all kinds of perfections and attractions, none of which, perhaps, exist at all. The desire to possess, or enjoy this beloved object, becomes the one absorbing idea, and the world seems to contain nothing else worth living for. Very often the struggles of modesty, and the feeling of duty, against this amative impulse, are so strong, that both mind and body are worn out, and death, suicide, or utter madness, results. In other cases, the impulse is so overwhelmingly powerful, that duty, modesty, law, and all else, is forgotten or defied, and the loved object is gained at any and every risk.

What is called *love sickness*, or *erotic fever*, is only a milder form of erotomania. This is often found in young people, of both sexes, who cannot gain the object of their affections, and very frequently leads to great derangement of the general health, to hysteria, and even to hypochondriasis, or insanity.

Erotomania is properly a mental disorder, arising from strong and irregular desire, assisted by a vivid imagination. The object, as before stated, may be purely an imaginary one, and yet the passion for it be just as strong as if it were real.

This form of mania often makes up a large part of the ecstatic fervor of religious enthusiasts, at least among females. Any one who will listen to, and observe them, at revivals, and love feasts, will have plenty of proof of this. They will dwell upon the *beauties*, and *perfections*, of their Saviour, and upon the *love* that exists between them, in the most fervid and impassioned manner. Not only in the language is the amative propensity shown, but in the actions and manner, and in the expression of the features! Frequently they will dwell upon the delights of a mutual *embrace*, and even extend their arms, as if in the act of embracing, while hysterical sighs gush from the breast, and tears rain from the eyes.

There is no grossness in all this, nor do the subjects themselves always know what it is that so moves them. Religious impressions, romance, imagination, and love, are all mixed up together, with no trace of reason, and the result is called *religious experience!* And so it is, for religion is founded on emotion; and the highest and holiest emotions, after all, are those that result from the feeling of *love!*

This religious love madness is often found in those females who have been disappointed, or crossed in love, or in those who have been neglected by the other sex. Unconsciously to themselves, their ungratified amativeness mixes itself up with their piety, and adds to it a warmth and fervor it would otherwise not possess.

In all probability this impassioned and elevated love, for a *spiritual* subject, believed to be all perfect, is an immense gratification, and consolation, to *nuns*, and other females devoted to forced celibacy. It gives them an allowable object, on which to concentrate their thoughts and feelings, and on which they may bestow the tenderest or most all-absorbing affection of which they are capable.

Satyriasis and Nymphomania.

Sexual mania, called satyriasis, in man, and nymphomania, in woman, consists in an over-excitement of the sexual appetite. It depends upon some diseased, or deranged, condition of the sexual organs, which acts upon the brain, through the nerves and spinal marrow, and originates lascivious thoughts, desires, and even actions. *Erotomania* is simply the feeling of *love* carried to excess; but satyriasis, (or nymphomania), is *physical desire*, much exaggerated!

In this disease nothing is thought of but the gratification of the sexual passion, and both chastity, and decency, are lost sight of. The patient will often use the most lascivious language, and act in the most lascivious manner, utterly regardless of who may be present, and disdaining all concealment or restraint.

Disease of the womb, or ovaries, or irritation of the clitoris, sometimes causes nymphomania, in females, even in those most modest, and who are least disposed, when well, to amative demonstrations.

In men, various affections of the testes, prostate gland, and other parts, cause satyriasis, often of the most violent, and uncontrollable character. In some cases the sexual passion is so exaggerated that it overrides all other impulses, and the patient will seek gratification in defiance of all opposition or consequences.

Sometimes this is the case in *old men*, from disease of the prostate gland, or bladder, and they will behave in the most disgusting manner, without the least consideration, or shame. Many, under such circumstances, have been punished as criminals, when they ought to have been simply treated for disease and insanity.

In both sexes, disease of certain parts of the brain, will also cause sexual mania, independent of the condition of the sexual organs, which will originate lascivious thoughts, and express itself in the foulest and most indecent language.

Most distressing instances of this kind are on record, where persons of all ages, and both sexes, who were naturally modest, and correct, in their behavior, have become so libidinous, and indecent, in speech, and actions, that they have had to be secreted and confined.

Persons unacquainted with the subject have considered these to be cases of *moral failing*, and have tried to cure them by preaching, or by coercion, of course with but little good result. In former times the *devil* would have been thought the cause of such a state of things, and prayers, or exorcisms, would have been resorted to; but *now*, *bodily disease* is recognized as the true cause, and a cure is sought for only by curing that.

Over-sexual indulgence, it should be here remarked, will freqently lead to satyriasis, (or nymphomania), by causing a permanent state of chronic irritation of the sexual organs.

Drink Mania; Dipsomania; or, Ooinomania.

Monomania d'Ivresse, or uncontrollable passion for intoxicating drinks. This is unquestionably a true mania, or form of insanity, and can be treated properly only by considering it to be a disease, as it really is.

The mania for intoxicating drinks, in my own opinion, originates from a peculiar condition of the brain and nervous system, which deranges the vital functions, and vitiates the taste and appetite. Sooner or later, if not cured, and if not ended by death, it is apt to lead to general insanity, or rather, imbecflity.

The treatment of this unfortunate propensity has lately been placed on a scientific basis, and asylums for the victims of intoxication are now common, and accomplish much good. In time, however, from the experience gathered in these institutions, the treatment will, I have no doubt, be still more successful than it is at present.

One thing should be especially borne in mind, namely: that the mania for intoxication, like every other form of insanity, is apt to be *hereditary!* And even when it does not show itself in precisely that form, in the children, it may cause a very enfeebled or irritable state of the nervous system. Many observed facts also make it nearly certain that, if either of the parents be intoxicated at the time of *conception*, the child resulting from that impregnation *will be an idiot*, or, of *weak mind!*

This variety of mania is characterized by a persistent tendency to set things on fire, and a love of seeing anything burn. Those subject to it often exhibit remarkable cunning, and dexterity, in indulging their propensity. In many cases, houses, and other buildings, have been set on fire, in the most mysterious manner, so as to baffle all attempt at detection, till finally it has been observed that the fires always followed one particular person, and then a careful watch has disclosed the guilty party. When questioned, these culprits have often avowed their guilt, expressing neither fear of consequences, nor remorse, but speaking of their acts as if they were highly pleased with the recollection of them, and making it evident that they would repeat them whenever there was a good opportunity. In most lunatic asylums there are patients of this kind, who have to be closely watched.

It is also not unfrequently the case, that an uncontrollable tendency to incendiarism is exhibited in pregnant women, and in hysterical young girls; in fact, this form of insanity is chiefly found among females, though occasionally met with in men.

Homicidal Mania.

The tendency to *kill* is sometimes developed in the insane to a remarkable degree, and becomes a fearful danger to all around them. Sometimes the madman will commit his murders with the greatest caution, so as to ward off suspicion, and avoid detection; but at other times he kills with fury, openly and defiantly. Cases have been known where the victims of this form of insanity have gone on committing murders for years without detection, and have been found out at last only by accident.

In most cases there is simply an irresistible desire to kill; and when the patient does so secretly, and cunningly, it is not from fear of being punished, if caught; but merely that he may not be stopped in his career.

Sometimes, however, the madman is influenced by hallucinations, and fancies he is surrounded by enemies, whom he strives to kill; or he hears voices which command him to slay such and such persons, or any one he meets. At other times he hears the command to kill himself, and straitway commits suicide.

In all cases it is hurtful and dangerous, to use violence to insane people, or to irritate them; for if there be any homicidal tendency, such treatment is very apt to intensify it. The poor wretch naturally thinks he is surrounded by enemies; and, acting only from impulse, uncontrolled by reason, he retaliates by killing.

Imitation is also very strong in some insane people; and they will be sure to kill, or try to do so, if they see other people kill.

When afflicted by this terrible propensity children will kill their parents, husbands their wives, or wives their husbands, and even the mother her own children. The mania for homicide may be only occasional, or temporary, or it may be constant. It is also often slight at first, but with a tendency to increase, sometimes at a fearfully rapid rate. Many persons have felt this tendency to kill creeping upon them, and have had reason enough left to make their cases known, and beg to be taken care of. Mothers have had the temptation to kill their children, and servants their masters, but have succeeded in overcoming it, and making known the fact to the intended victim. Some men, on reading accounts of murders, have rushed out immediately and done the same, without any thought or deliberation, but simply in obedience to that terrible impulse to kill, which existed within them, and which the description of the deed had called into play.

I was once told by a man who had travelled overland to California, in the pre-railway time, a curious case of homicidal mania. He was traveling with a man whom he had known for years, and whom he highly esteemed every way, and trusted. The man was not only perfectly sane, but a remarkably keen man of business, and a good-humored, genial companion. One night when they were camped on the plains, after a hard day's tramp, and when he was sound asleep, alongside of his friend, he was suddenly awakened by hearing his name called loudly, with the addition of, "get up quick, for God's sake, get up." It is needless to say he was wide awake and up in a moment, and there stood his friend, with his hunting-knife in his hand, in a fearful state of excitement, flinging his arms round, and stamping his feet, while he all the time kept muttering, and talking incoherently to himself. Suddenly he threw down the knife, fell on his knees, and began to pray. Then he turned to his companion, who stood lost in amazement, and said to him, "Thank God, you are safe, but neither you nor I shall run such a risk again." Then he told him that for several nights he had felt an impulse to kill his friend, while asleep, but had fought against it manfully, and thought that it was overcome; but that night it was so powerful he had to get up and take his knife, with which in his hand, he was creeping along to make sure of his victim, when his better nature asserted itself, and made him call out the warning words. It is scarcely necessary to say there was no motive for this, and no reason whatever why he should feel so. It was simply a sudden maniacal impulse, and which he felt only *at night!* During the day he was full of terror at his own condition, and strove in vain to account to himself for his horrible propensity.

They both consulted together, as two sane men should, what was to be done. It was plain that it would not do for the would-be homicide to be left awake while the other slept, for neither could tell when the fearful propensity

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might become overpowering. They, therefore, arranged that every night, on lying down, he should be tied hand and foot securely, so that he could not possibly do any mischief; and in this way they slept for over two months. During all that time this mania to kill his friend came upon him most nights; and he would lie awake for hours, planning how he could liberate himself and accomplish it. When they got to California; he at once put himself under the care of a physician, who treated him for some time, and finally advised him to return east and go to a good lunatic asylum, which he did, and in six months was entirely cured. His friend never left him till he was well, and took care that he never slept unobserved while on their journey. The tendency in this case was only to kill that one particular person, and no one else.

There is no doubt but that many murders have been committed in this way, from sudden maniacal excitement, without any conscious premeditation, and without any motive whatever.

Some particular states of the system, and some medicines, may excite a sudden propensity to homicide. One gentleman told me that whenever he was dyspeptic he always felt a propensity to *kill*, and he lived in constant fear that he should do so. Another told me that once, after taking a dose of opium, for neuralgia, he awoke in the middle of the night, called up his valet, and ordered him instantly to take his razor, his knife, and a pistol which was in the room, lock them up, and keep the key. The servant was amazed at such an order, but did so at once, his master all the time sitting on the edge of the bed trembling from head to foot. In the course of half an hour he became quite calm, laid down again, and went sound asleep. The reason of this strange proceeding was this: he awoke suddenly with a powerful impulse to *kill*, either himself or some one else, and all the different things in the room, with which he could commit the act came at once into his mind, and where they were. He sat up and began to think which instrument he should use, and who upon; when, fortunately, reason asserted itself sufficiently to enable him to call his valet.

In the morning he was perfectly natural, nor did he ever feel such a tendency afterwards; but nothing could ever in duce him to take another dose of opium.

Alcohol will awaken such propensities, in those who are disposed to them, and thus has led to many murders. Another reason, and a very powerful one, why such an agent should be used only with the greatest caution and moderation.

In all cases where there is either this or any other unnatural propensity, thus intensified, so as to override the reason more or less completely, there is, beyond doubt, something wrong with the brain. The moral irregularity results from some bodily disease, and perfect *sanity* can return only with perfect *health.*

Kleptomania, or Propensity to Steal.

The mania for stealing, from no other motive than the mere love of stealing, without reference to any benefit from it, is one of the most curious among the many vagaries of insanity. Persons of both sexes, of all ages, and of every condition, have been afflicted with kleptomania. Some stealing openly, and without concealment; others doing so with all the cunning and dexterity of practised thieves. As a general rule, the value of the things stolen is of no account; the merest trifles being taken with the same gusto as the real valuables; but in a few cases the kleptomaniac is more particular, and will prefer to take only the most costly articles. Indeed, there is often a preference for particular things; thus, some will take only money, some jewelry, some wearing apparel or books, while others take anything which comes handiest.

There is also a great difference in the way the stolen articles are esteemed; some carefully hiding them, and forming a hoard, while others take no care of them after they are obtained, but seem satisfied with the mere act of stealing.

Many of these kleptomaniacs have gone on stealing for a long time before being detected, causing all kinds of unjust suspicions against other people, and being found out at last only by accident.

Husbands have stolen from wives; parents from their children, or the reverse, and some men have even stolen their own property. In many cases it has been discovered, at the death of some opulent and esteemed citizen, that he had been a general plunderer of the community for a large portion of his life, from no other motive than the mere love of stealing.

A patient of mine once told me of a rich uncle of his who was found, when he died, to have been a kleptomaniac. He had one room in his house, of which he kept the key, in which no one had entered but himself for years, and after his death, this room was found filled with articles of all kinds which he had stolen from his friends. There was the most heterogeneous collection of things that it was possible to conceive; and the wonder was how he had contrived to get many of them there undetected; but he had done it so cleverly that never once had he been found out, nor even suspected. The returning of these articles to their owners caused the greatest astonishment, especially when it was explained how they had been lost; and many an unjust suspicion was thus removed from innocent persons.

There are plenty of instances of this curious mania, and many of them among rich people. Their friends usually arrange the matter so that the propensity is known only to those they go amongst, and the stolen articles are either quietly returned or paid for. The wife of a rich man in New York is a confirmed kleptomaniac, and when she visits a store they simply make a list of what she takes, and send in the bill, which is always paid. On one occasion, however, going into a store where she was not known, she was arrested, and came near going to prison. Like all other varieties of mania, this one also depends on some abnormal condition of the brain, of the nature of which we know nothing.

Besides those above numerated, there are numerous other varieties of mania, which need not be specially referred to. Every passion and propensity of human nature may be exaggerated, or deranged, and become the basis of a peculiar form of mania. In all these cases there is something wrong in some part of the brain, for there can be no mental or moral disease, of any kind, but what results from some primary disease in the nervous apparatus. The mental or moral disorder is but the symptom, or expression, of the bodily disorder.

Affections of the Memory.

Memory is one of the most wonderful of the mental faculties, and one of the most varied. Some persons remember all things equally well, others only particular things; and conversely, the memory fails in some persons for every thing alike, and in others again only for certain things. Very often things will be utterly forgotten for years, and then the memory of them will return as vividly as ever. Even in extreme old age, the memory will often return, with wonderful accuracy and clearness, for the scenes and persons known in childhood.

The value of a good memory, in the acquisition of knowledge, must be apparent to every one; and many a reputation, both in school and after life, is built entirely upon it. But still memory does not give *judgment*, and the most perfect recollection of what has been seen, and studied, may make a person very little the *wiser* if they have not the judgment to make proper use of what they recollect.

Many instances of wonderful memories are on record, both general and particular. Men have been known who would read a newspaper carefully through, and then *repeat the whole of it*, from beginning to end, advertisements, leading articles and all. One man even would do this feat, and then repeat it *backwards* as well as forwards. The celebrated Professor Porson had a most astonishing memory, and as he said himself, *could not forget anything.* He could distinctly remember every word of whole volumes which he had read; and could even say, right off, how many times certain words occurred in the volume. Woodford, the well-known London journalist, would sit and listen to a long Parliamentary debate, for a whole evening, and then go home and write it all down with literal exactness.

Some will remember dates, some figures, and some faces, while others remember voices.

Instances of remarkably deficient memories are more common than remarkable good ones. There are people who can scarcely recollect, from day to day, the events happening; and there are others who can scarcely call to mind the faces or voices of their most intimate friends, unless they see them daily; and yet, these people may be excellent reasoners, and possess good judgment upon most things.

The question then comes, what is memory, and on what does it depend? In answer, it may be said, briefly, that memory consists in a steady continuance, or a ready reëstablishment of a certain state of mind which has previously existed. For instance, a man studies a certain subject, or notices a certain object; and, in doing either, he is, in common phrase, *in a certain state of mind.* While that state of mind *continues* he *remembers* the subject or object, and continues to do so till some other state of mind becomes established, and then he forgets the former. After being forgotten, however, the original state may return again, and is then *recollected*, or picked up again, as it were.

Events or things are usually remembered in proportion to the vividness of the impression they make on the senses or mind. We usually remember a matter in proportion to the attention we bestow upon it, and this depends upon the importance or interest which it seems to possess.

One of the primest elements in a good memory, therefore, is the power of *steady attention* to the one thing under consideration. *Repetition* also *fixes* things in the memory, as every one knows. If we see or hear a thing *often*, we may remember it well, while if we see or hear it but once, it may be immediately forgotten.

Upon what, then, does this continuance, or ready return of a certain state of mind, which we call *memory*, depend? To answer this, it must be remembered that every state of *mind* results from a certain state of the *brain*; and when that state of mind remains, or returns, it is because that particular state of the brain remains, or returns. If a certain state of mind, connected with any particular event, passes away, and that particular state of the brain on which it depended cannot be brought back, then there can be no *memory* of that event, or, in other words, it cannot be *recalled to mind.* In short, *memory*, like every other faculty of the mind, depends entirely upon certain conditions of the brain, and varies with these conditions. In what way our thoughts, or senses, act upon the brain, and thus leave impressions which are never effaced, or which are readily reproduced, we know not; nor do we know by what means these impressions are again made to reappear, after years perhaps of apparent obliteration.

The memory may be lost, improved, or varied, like every other mental faculty, from changes in the condition of the brain, and some of the derangements which it exhibits are of a very singular character. Some persons will entirely forget *names*, and others, faces. Some will forget the days of the week, or the hours of the day, so as to be unable to tell time by a clock; and others will forget, entirely, the roads, or streets along which they have travelled for years. In short, there is no end to the vagaries which the memory may exhibit, nor to the changes it may undergo.

As before remarked, the most deficient memory, either general or particular, may co-exist with an excellent judgment, and be no indication at all of mental inferiority, nor of disease. But this is only when it is *natural*, and *habitual*, with the individual; for when there is a serious loss of memory, or when it becomes deranged in any remarkable manner, it is a sure sign something is wrong with the brain. In old age the memory often fails, like all the other mental faculties, because the brain is worn out, and become partially incapable of receiving or retaining impressions any longer. During insanity some things will be remembered with astonishing distinctness and pertinacity, while others will be as totally forgotten as if they had never been.

It is very remarkable, also, that memory will sometimes end at a particular date, abruptly, so that everything can be remembered back to that time, perfectly, but nothing before then. I knew a gentleman, forty-four years old, who was afflicted this way, after an attack of brain fever. He could remember back to the time when he was twenty-five years old, but *nothing before then!* He could call nothing whatever to mind connected with his life before he was twenty-five years of age; neither persons, things, nor events. He was, in fact, totally unknown to himself, so far as the first twenty-five years of his life went, and was obliged to gain all the information he needed about himself, for that period, from his friends. This state of things continued for nearly four years, and then his memory of the early part of his life came back as perfect as ever.

But more singular than this, is the fact, that memory will, in some rare cases, pass over some particular period, leaving it all a blank, but be quite perfect for everything, both before, and after, that period. Thus, I knew a man who lost all memory about himself, and everything he had known, during two years of his life, from the time he was thirty till he was thirty-two. His memory was very good for everything he had known before thirty, and after thirty-two, but was quite blank for everything connected with these two years. It was, in fact, as if he had never existed for that time, except that it often caused curious confusion in his daily experiences. Sometimes people would speak to him whom he had seen, and known, only during that lost time, and he would know nothing about them. So, also, of things which had happened then; they were all forgotten, and could not be recalled. The chain of memory was broken, and some links lost, but the two broken ends united again; so that the chain was *continuous*, but with not the original number of links. How this lost period could be skipped, and the two dissevered ends united, is a mystery.

When I knew this person he was fifty years of age, but whether this break in his memory was ever repaired, I cannot say. He attributed the derangement to a fall on the ice, while skating, which stunned him for a considerable time. This was in his thirty-eighth year.

The strange thing in both these cases, is this: that the loss of memory should be about a certain part of their lives, but should not occur at that time, nor near it. If the last-named gentle man had lost all memory of his life, from thirty to thirty-two, near that period, it would not have been so strange, but this particular period was lost*years after!* In like manner, the other did not lose all memory of the first twenty-five years of his life, *at* twenty-five, but many years after!

It would almost seem that the mental images of things past, which we call memories, are piled up in their proper order in the brain, as they occur, and that any of them, at any part of the pile, may be slipped out, and lost, as it were, at any time. But the most curious fact is, that, after being so lost, they are often *put back again*, or, returned to their places! Or, if we regard the images as *pictures*, some of them get *dim*, at times, or rubbed out, but may be restored, just as faded photographs often are.

All these singular peculiarities result from mysterious changes in the brain, and other nervous centres, the precise nature of which we, as yet, do not know.

I knew one case of a lady, who, while nursing her baby, suddenly lost all memory of its birth, and of the whole period of her pregnancy. She could not account for the child being there, nor for her then condition, but thought, as she expressed it, that she must be in a dream. She remembered everything before her conception, well enough, but nothing after; and when told that she had gone her full time, and had been safely delivered of the child she was then nursing, she was lost in amazement.

This state of things continued for nearly two weeks after her delivery, when her memory returned again perfectly.

The memory of long-forgotten things will often return in dreams, when the senses are sleeping, and the stream of thought wanders on uninterruptedly, and unguided. Many of these long-forgotten things coming back so, are often regarded as revelations, or, communications from the dead, instead of re-awakened memories. They have been so long past, or so completely forgotten, that the mind cannot at first conceive they had ever before been known.

Thus, persons in trouble have often been told things of great importance, during sleep, by people long since dead, and have, of course, considered it to be a spiritual communication. But the true interpretation is this: the memory of something which had really been told them by the dead person, came back again, in a dream, and was thought to be an original communication. A young man from the West told me that a brother of his, who had been dead many years, came to him one night, in a dream, and told him he had left an ox yoke hanging on a tree, in a certain place. And when he went, next morning, there it was, rotting, and covered with moss. Now, no doubt the brother had so told him, but he had quite forgotten the matter, till memory reawakened in his sleep, and it all came back again. He, however, firmly believed he had never known the fact before, and that his brother came back purposely to tell him, for the first time, about the ox yoke.

Aphasia.

One of the most singular affections of the memory is that called aphasia. A person afflicted with this derangement cannot say what he means, or wishes to say, but always says something different. He *knows* what he wants to say, well enough, but when he goes to talk, other words are uttered, with totally different meaning, or the words are curiously jumbled together, so as to have no meaning at all. In some cases, parts of one word will be joined to part of another, so that nothing is uttered but a confused jargon.

The ideas are right enough, and very often the person can express them properly *in writing*, but not in *speech!* There is some curious failure in memory, connected with the *sounds* of words, but not with their *forms*, when written.

Even in this disease, there are also curious varieties ; for, about some particular matters the patient can talk, and use the proper words, but this is rare, and usually he says one thing while meaning to say another.

Angoraphobia.

This is a peculiar nervous affection which attacks some people, but only when they are *in certain places!* It consists mainly in an undefined fear, or dread of something, or a feeling of horror and anxiety ; often accompanied by a choking sensation, or by a pain in the abdomen and chest, with sudden weakness of the limbs, trembling, and tears. This is never experienced except when the patients go into certain streets, or houses ; but, when there, it comes over them immediately, in spite of all their efforts to prevent it. Many will go miles out of their way, to avoid the dreaded localities, and some have been known to declare they should die if forced to go there,—as indeed it is quite possible they might. Occasionally, the affection is not felt when there is company—even if it be a dog—but more generally it is felt always, by day or by night, in company or alone. The Germans call this *Platzangst*, or dread of places.

Some people experience exactly the same feelings in any other place than their own home, and they, therefore, dare never go out ; or, if they do, they hurry back with the utmost precipitation, feeling no safety or peace till again in the accustomed rooms. So powerful is this, in some persons, that it would be dangerous to force them to stay away from home against their wishes.

Sometimes people will go giddy, or faint when in certain places, or when viewing objects a certain distance off. This the Germans call *Platzschwindel*, or place-giddiness.

Both these singular affections probably result from peculiar conditions of the brain, which is affected, through the senses, by the sights and sounds of the particular places ; but why, or how, we know not. They are both real diseases, and should be treated *medically*,—not by scolding, preaching, or argument.

CHAPTER XIX.

NERVOUSNESS, WITH ILLUSTRATIVE CASES.

General Remarks.

There is a peculiar condition of the system, showing itself in various ways, which appears to depend upon a derangement of the nervous apparatus, but which we are utterly unable to associate with any organic lesion. This is what is usually called *nervousness*, and it is quite distinct from *hysteria*, or any other of the diseases already described ; in fact, it is rather *a condition of the organization* than a disease, though it may simulate, and show the symptoms of a variety of diseases.

The causes of nervousness appear to be various, and its after-consequences may be either trivial, or serious, but in no way proportioned to the severity of the nervous attack. Very often a slight nervous attack will be followed by most serious results, while a most severe one will pass off and leave nothing whatever behind it.

Nervousness may be either acute, and endure but a short time, or it may be chronic, and last for years. It is seldom seen, however, in children, except when constitutional, and still more rarely in old age ; being an affection appertaining principally to adults. Females are more often the subjects of it than males, and they are more especially liable to it at certain periods of their lives, and in certain physical conditions. Menstruation, pregnancy, nursing, and miscarriage, are the conditions with which nervousness is most frequently associated in females, though it may exist independently of all these. Strong emotions, or over-straining of the mental faculties, are also frequently exciting causes, and there are few females who cannot be *nervously excited*, more or less, by bringing into play any powerful passion—such as love, hatred, or jealousy.

In men the most frequent causes are over-mental strain, debauchery of any kind, or want of healthy, *bodily* occupation.

In both sexes many are born with a *nervous temperament*, predisposing them to nervous attacks ; and in not a few cases this tendency is hereditary, or results from the nervous state of the parents at the time of conception. All this, however, will be best illustrated by giving a few *cases*, with illustrative remarks, which we will now proceed to do. Hemorrhoids, when long-continued, are a frequent cause of chronic nervousness, and so is *constitutional syphilis*, though not generally suspected.

Acute Nervousness.

Acute nervousness is rare, but often very severe. The patient usually complains of not feeling well generally ; fails in appetite, or takes a taste for unusual things ; experiences nausea, and sometimes vomits an acrid, watery liquid ; or secretes saliva so rapidly as to give the idea of salivation. The bowels are usually constipated ; there is fever, with much irritability ; and a general failure of all bodily energy, so that the patient keeps in bed, often without daring to raise the head for fear of fainting. The senses are all apt to become preternaturally acute, so that particular sights, sounds, or smells, or even a bright light, increase the irritability, and often bring on nausea, vomiting, or fits of shuddering. The sleep is usually irregular and uncertain, in al-cases or nervousness, and there is a tendency (in most) to frightful dreams, and *nightmare*, from which the patient often awakes in a profuse cold perspiration, and with palpitation of the heart.

Another peculiar symptom, often met with, is a tendency to *hoarseness*, or feebleness of the voice, giving the idea that there is sore throat, or that the lungs are affected. Both throat and lungs may, however, be perfectly sound, and yet the symptoms be precisely those of confirmed consumption, or bronchitis. It is, however, entirely a nervous affection, and may disappear, or come on, at any time, merely from nervous excitement. Many patients have gone through a regular course of treatment for the lungs, or throat, who never had anything the matter with either.

As the disease progresses, these symptoms become more exaggerated ; the pulse increases in rapidity ; the tongue becomes white ; and there are apt to be attacks of neuralgia, with irritation of the brain, accompanied by partial delirium, or by hallucinations and visions. Still later, pains in the limbs are complained of, and the patient frequently yawns, sighs deeply, and faints away more or less completely. Finally, convulsions may set in, and death may ensue—often within two or three months from the first attack —but the most careful examination of the whole body, after death, generally fails to detect the slightest sign of any bodily disease, in any part.

During an acute nervous attack, there is always more or less fever; and, in fact, the disease is often called *nervous fever*, and is variously attributed to derangement of the stomach, liver, or sexual organs; although, as already stated, there may be no obvious derangement of these organs at all.

In many cases, when the spinal marrow is probably in fault, one of the most remarkable symptoms is an uncontrollable restlessness, or a perpetual desire for *motion!* The patient cannot rest quiet, but must either be throwing the limbs about, if lying down, or must be continually pacing up and down, like a wild beast in a cage. This restlessness marks the height of the attack, and it passes off only as the nervousness subsides. It should never be interfered with, for it is undoubtedly the mode in which the over-nervous excitability naturally works off.

Case 1. A young lady about sixteen, well-developed, and previously of good general health, was very badly frightened, just before her monthly period, which for the first time then failed to appear. Nothing special occurred till the time for the next period came round, and then she was taken with a general sensation of uneasiness, with numbness of the limbs, and a feeling as if she was being strangled by something tight around the throat. The bowels ceased to act, the abdomen became bloated, and the genital organs tumefied and irritable. Convulsive movements of the body and twitchings of the limbs set in, so that it was impossible for her to keep still, no matter in what position she might be. The pulse was rapid, the skin red, and the whole body covered with perspiration. She complained continually of thirst, but could not swallow on account of the constriction of the throat.

All the symptoms became gradually worse, especially the feeling of strangulation; she breathed with difficulty, and kept constantly pulling at her throat, with her hands, as if to relieve the constriction. The heart beat very irregularly; being sometimes strong and rapid, and then again slow and weak.

Nothing that was done seemed to afford any relief; and, on the third day, from the time of her first complaining, she *died!* A thorough post-mortem examination was made, but no organic disease of any kind was found; nor could anything whatever be discovered, in the state of her body, that might have caused her sickness and death. She undoubtedly died simply from an acute attack of *nervousness*, brought on by the fright and suppressed menstruation.

Case 2. This was a young lady aged twenty, single, of good health generally, and of a robust constitution. She had been for some time engaged to a young man, whom she expected to marry soon, but was abruptly informed that he had robbed his employer and absconded, in company with another female. She immediately lost all power of standing erect, and was compelled to lie on a couch all the time; though her limbs kept continually moving in the most restless manner. A peculiar shudder shook her whole body every fifteen or twenty minutes, and she breathed at intervals by long gasps, as if choking. A dry, hacking cough began on the second day, with expectoration of bloody mucus, and she complained of a dull, constant pain in the chest and throat. The pulse was sometimes strong—beating one hundred and twenty—and then again quite feeble; beating at seventy-five. The skin was quite warm, and covered with perspiration, which had a peculiar odor, and was distinctly of a *pink color*, The urine was pale, like warm water, and passed every half hour, in large quantities. No appetite, and no movement of the bowels for four days. The eyes were much congested, and she constantly saw visions, usually of a terrifying character. When I saw her, she had been two days and nights without sleep.

The prostration was so complete, and the nervous derangement so severe, that it was evident there was real danger of a fatal termination. The first thing to be done was, evidently, to induce *sleep!* and, for this purpose, she took thirty grains of *chloral hydrate*, at the same time having her feet in hot water. In twenty-five minutes the chloral produced its usual effect, and she slept soundly for five hours. On awaking she was much less restive, and partook of a little light nourishment, but was still unable to rise. She then took two grains of quinine, which was also repeated three hours after. Efforts were also made to act upon her morally, by rousing her pride and indignation, so as to turn the current of her thoughts in a new direction. This partly succeeded, but at the expense of too much excitement of the brain. Twelve hours after waking, she was again put to sleep by *twenty grains* of chloral hydrate, and this time slept seven hours; awaking still more improved. The quinine was then given every six hours (two grains), and she took nourishment freely; principally beef tea. The bowels moved naturally after the second dose of the chloral, and after that she sat up. On the third day after my first seeing her, she could stand erect, and walk about the room, all the symptoms gradually improving; but she had to take fifteen grains of chloral every bed-time for twelve days after, to ensure quiet sleep.

Recovery was complete, except that her eyesight failed from that time, so that she had to use spectacles.

It had been proposed to *bleed* her, when she was first attacked, and to put a blister on the spine;—had this been done, or had a strong purgative been given, or opium,—both of which were proposed,—she would probably not have recovered.

Case 3. This was a gentleman aged forty-five, by profession a banker, of a delicate frame, and a martyr to dyspepsia. With but little physical stamina, he was easily thrown into a state of nervous excitement, and at such times would tremble all over as if he had the ague. At such times it was his habit to use stimulants, and by their aid recovered a certain amount of steadiness of nerve, but always with a fit of depression afterwards, which was terribly prostrating.

One day, on reaching his place of business, he learnt, without any previous warning, that nearly all his fortune was in imminent danger of being swept away. Immediately he was attacked with one of his trembling fits, from which stimulants failed to rouse him, though he took more than usual. Then intense restlessness set in, he could not keep still, but continually wandered about from one place to another, with no particular object, but from mere inability to keep still. This restlessness lasted for a day and a night, during which time he had neither rest nor sleep, nor any kind of nutriment, but smoked incessantly. Suddenly he laid down, and found he could not rise again, although his limbs kept beating about incessantly. His head rolled from side to side, and seemed, as he expressed it, too heavy to be lifted up. His pulse was very irregular, skin hot, and moist, bowels constipated, and urine scanty and high colored. His physician bled him, but with no relief, and then gave him a violent purgative, which seemed to make him worse. When I saw him he had been in this state two nights and three days, with scarcely any sleep.

The first thing done was to put him in a warm bath, and give him a bowl of beef tea while in it, as warm as he could take it; then he was transferred to bed, and took thirty grains of chloral hydrate which in half an hour put him sound asleep. He slept only three hours, and woke much less restless, but otherwise the same, except that his head did not roll about. A soft-boiled egg was now given to him, with a small portion of tender beefsteak and a little bread. In six hours another warm bath was taken, and twenty grains of chloral hydrate after, from which he slept soundly for six hours, and woke much better. His fever now left him, the bowels moved naturally, and the appetite returned for food, but still he could not rise, nor did he do so till two months had passed from the first attack. Frequent warm baths were given him, and fifteen or twenty grains of chloral hydrate whenever he did not sleep well.

Finally he recovered perfectly from the acute attack, and was even less nervously excitable than before, but his left arm remained partially paralysed; this, however, was the result, in my own opinion. of the bleeding, and might not have followed from the nervous attack.

In another very similar case the man died on the fourth day, his death being attributed to heart disease, though without any reason whatever. It is true there was considerable palpitation of the heart, but not more than is often found in acute nervous attacks, and there were no signs whatever of organic heart disease. In fact, the man died from an acute attack of *nervous fever*, brought on by intense mental work, at which he had been incessantly applying himself, night and day, for several weeks.

Case 4. This subject was the wife of a portrait painter of considerable repute, whose studio was always occupied by some lady sitter, for he was noted for his female portraits. She was a perfectly healthy person, every way, and remarkably cheerful and good humored, till some meddling busybody suggested to her that it was dangerous, if not imprudent, for her husband to be constantly in confidential intercourse with other ladies. This awakened within her the demon of jealousy, and one day, having heard that her husband was then painting a lady whom he had formerly admired, she was seized suddenly with an acute nervous attack. She began by a restless and impatient pacing up and down the room, and twisting her hands, which she kept up for two hours, all the time gasping and half sobbing, as if being choked. Then suddenly this ceased, and she threw herself down on the bed and became rigidly motionless, except the head, which rolled incessantly from side to side, on the pillow. She lay in this state about six hours, and then was attacked every half hour or so with fits of trembling, followed by showers of tears, and hysterical laughter; and thus continued, passing from one kind of paroxysm to another for two days and nights. During all this time she neither ate, drank, nor slept.

On the third day she fell into a deep lethargy, from which nothing could rouse her, and which lasted nine hours. There was no sign of pulse, or of breathing, except by very close tests, and the skin was as white as marble, so that any one would have pronounced her dead. On recovering from this lethargy she could not rise from the bed, but kept continually moving her limbs and head, and moaning as if in pain. There was no movement of the bowels, and but a scanty discharge of urine, all this time. This was before the discovery of chloral hydrate; and, as it was thought necessary she should *sleep*, a dose of opium was given her, which brought on stupefaction, if not sleep, and she dosed away for ten hours, when she was awaked and compelled to take some nourishment. Purgatives were also given, and stimulants, but no good result followed. The more violent manifestations ceased, she ate just enough to keep her alive, and so lay in bed for six weeks, all the time groaning and complaining of pain in all parts of the body. She was then suddenly attacked with convulsions, and died in two hours after.

The case was so remarkable that a thorough post-mortem examination was made of the body; but not the least sign of disease or derangement could be found anywhere. All the organs were remarkably healthy, and apparently perfectly capable of performing their functions. She had evidently died from an acute attack of nervousness, brought on by jealousy.

If chloral hydrate, with warm baths, could have been given, she might have been saved, though perhaps there would always have remained a tendency to mental disturbance, or paralysis.

While she lay thus, her monthly period passed off perfectly regular, and with no particular symptoms, except that the special nerves of the eye and ear were much affected. She kept constantly seeing friends and acquaintances coming into her room, and could hear them talk. So perfectly did she see, and hear them, in fact, that she would sometimes reply to what she had heard, being quite unable to tell the visions from real people. This was not from disorder of the *mind*, but of the nerve of the eye, as she herself was aware; for she once told her nurse that the people she thus saw gradually faded away, and their voices became fainter and fainter till she could hear them no more. She was not at all terrified by these visitations, nor did she regard them in any way as mysterious or supernatural, but always referred them to the eye and ear herself. It was, however, the vision of her supposed rival, probably, which caused the final convulsion, for she shricked out her name just before the attack, and seemed to be following her with her eyes round the room.

Chronic Nervousness.

The symptoms and effects of *chronic* nervousness are much the same, generally, as those of acute nervousness, only they are usually less severe, and slower in their development. The patient may suffer for years, sometimes severely, and even die at last, from the continued wear of the disease, and yet the most careful inspection of the body, after death, will not show a sign of anything wrong in any part.

In Chronic Nervousness there is usually great irritability, with marked singularity of conduct and feeling. The sentiments are often much perverted, and the intelligence unduly exalted, but liable to great uncertainty in its manifestations; the patient may be sad and gloomy, or foolishly and unreasonably gay and excited, or both by turns. In nearly all cases the sleep is fitful and unrefreshing, broken by painful dreams, or night-mares. There is a constant complaint of not feeling well and of being too hot or too cold; the head is heavy and dull, and the least worry or attempt at study causes headache or neuralgia. Giddiness, faintness, and sudden failure of strength, are constantly experienced, even to the point of swooning away. Sight, hearing, smell, and taste, may all become deranged in the most singular manner, and the whole body often feels as if the flesh was creeping off the bones. Utter prostration of strength is often experienced, so that the patient seems incapable of the most ordinary exertion; and yet, all at once, if anything rouses the nervous energy, a prodigious strength may be exhibited for a short time. The digestive functions are nearly always badly performed, so that there is pain in the stomach, with nausea, or vomiting, flatulence, and constipation. The appetite is either morbidly ravenous, intermittent, or almost absent. Breathing is usually slow, and there is often a peculiar nervous cough, and a feeling as if breath enough could not be drawn into the lungs. The circulation of the blood is languid and irregular, owing to feeble action of the heart, and finally the blood itself becomes thin and poor, and not unfrequently deficient in quantity. Very often there is palpitation of the heart, and the arteries of the head and neck will beat with violence on the slightest exertion or emotion.

Many subjects gradually fall into a state of general feebleness and waste away, till they finally die from mere inanition. This is called *nervous wasting*, or slow nervous fever.

But in all cases, as before stated, the most careful examination, after death, shows no organic disease, nor gives any clue as to the cause of the patient's suffering and death—the whole trouble has evidently been *nervous*, and nothing more.

Case 5. This was a young man of twenty-two, studying law, of good general health, and correct habits. Ambitious of distinction in his profession he pursued his studies at nights, depriving himself of sleep, and keeping up his flagging energies by the use of strong *green tea!* This, added to want of fresh air, and exercise, soon began to tell upon him; he lost appetite, became habitually costive, could not sleep, and complained constantly of pain in his head and eyes. His character changed completely, so that he became irritable, easily offended, and offensively dogmatic and dictattorial in his manner. His friends all observed these unamiable traits, and some expostulated with him, but that only made matters worse, for he now could not stand contradiction, and took offence so readily that none liked to talk with him. In fact his conduct was so different to what it had been, that people began to think he was going insane, while he all the time insisted that everybody else was changed.

He was constantly troubled with a dry, hacking cough, lost flesh, and was so weak that he gave up walking almost altogether. He was afflicted with frequent and severe palpitation of the heart, and for nights together scarcely slept at all. Everyone thought he was consumptive, and very far gone with the disease. Indeed, one physician that he was induced to consult told him so, after *auscultating* his lungs, and advised him to use the hypophosphites, and cod-liver oil. He however did nothing, and struggled on for two years, sometimes rallying a little, and then falling back, till finally an event occurred which changed his whole life, and cured him. His uncle, upon whom he entirely depended for the means of studying and living, died suddenly, and left him entirely without resources. As he had always been totally unused to provide for himself, and had no one to fall back upon for help, or advice, he found himself compelled to look his situation square in the face, and decide at once what he should do. To his own surprise, as well as to that of others, he found, when obliged to exert himself, that he could do more, both bodily and mentally, than he had ever thought possible; his weakness, both bodily and mental, seemed to leave him all at once, and he determined to set out and walk all the way to Illinois (from New York), to visit another uncle there, whom he had not seen, nor heard from, since he was a boy. The long journey was made, not without weary limbs and blistered feet, but with the best results; for he arrived at his uncle's free from his cough, with no headache, feeling strong, and able to eat a good meal, and take a good night's sleep. In fact he was cured, and in a short time became a sturdy, cheerful farmer. In a year after, he resumed his legal studies again, but more judiciously, varying them with good wholesome out-door occupation, and never continuing them after he began to feel fatigued. Finally, he became quite a distinguished lawyer in Illinois, but he also remained a farmer; and, as he remarked once to me, one pursuit was always made by him a relief to the other, so that he became truly possessed of that greatest of all blessings, a sound mind in a sound body.

In all probability, had he remained at his studies exclusively, or entered upon practice, in the state he was before his uncle's death, he would soon have died. Medical aid might have propped him up for a time, by tonics, and stimulants, but it could not have been for long. The fortunate change which was forced upon him was his salvation, and his case shows what is really needed in nearly all such cases. Medicine can do but little, unless both mind and body can be differently occupied, and the conditions of life changed. The hard-worked faculties, and the over-strained emotions, must be allowed total rest, and others brought into play instead. The past, as far as possible, must be shut down upon, and a new life commenced. If such a change can be made, medicine may help forward the restoration, but it can do but little without the change.

Case 6. This subject was a young lady, aged 19, rather small, and of spare habit, but with tolerable good health, though not robust. A disappointment in love had such an effect upon her that she lost all power to rise from her bed, for three days, during which time she took neither food nor drink, but continued the whole time to throw her limbs about in the most violent manner, so that the attendants could scarcely keep her covered. At the end of the third day she suddenly fell into convulsions, and from them passed into a trance, which lasted ten hours, when she awoke, took some nourishment, rose up, and dressed herself. From that time onward she was utterly changed in character, liking what she had previously detested, and disliking what had previously given her pleasure. Many persons of whom she had formerly been very fond, and whose society she constantly sought, she could not now bear to see; while others whom she had before shunned, and who had been excessively repugnant to her, she now eagerly sought, and delighted in their company. Her irritability, and quickness to take offence, were so remarkable that every one dreaded to come in contract with her, though she had formerly been noted for her amiability. All her senses seemed to be perverted, and she acted in an abnormal manner. She would eat and drink the most unusual things, even some that were really disgusting, and declared she liked the taste of them. Smell she seemed to have lost entirely, for nothing offended her nose; while her sight, and hearing became strangely deranged. She constantly heard people talking around her, and would reply to them, not knowing but that the words proceeded from real persons. She also saw heads all about the room, some of which were like those of persons whom she knew, while others were those of strangers; they all seemed to be cut off level with the top of the shoulders, and they were located in various places, some being on shelves, or bookcases, and some on chairs, while others seemed suspended in the air. So real were these, that they *hid* real objects which were behind them, and what was very remarkable they all had one expression, that of grave and sad resignation.

During this time her appetite was variable, being sometimes voracious, when there was anything which pleased her peculiar tastes, and at other times it was so poor that she declined food for days together. The bowels were habitually costive, and her monthly periods were totally suspended.

Strange to say her bodily strength did not seem much impaired, and she would, at times, walk up and down for hours together, at the most rapid rate. Sometimes she would sleep for ten or twelve hours soundly, and then she would go for several nights with no sleep at all. Her speech was rapid and confused, the words being jumbled together, as if she was in too much of a hurry to get them out in proper order. She took no special interest in anything, except a few household duties, which she daily performed in the most undeviating routine, doing all in a certain order, and each exactly at a certain hour and minute.

Suddenly, after being in this way nearly two years, she was attacked with convulsions again, which passed off with a profuse perspiration, which was *distinctly bloody!* Not merely *red*—from some accidental cause, but unmistakably mixed with blood, which seemed to exude from the pores of the skin, and was in sufficient quantity to stain the body linen. A similar discharge occurred three different times, within two weeks, during which period she remained in bed, sometimes in a species of trance, and at other times beating the bed with her hands incessantly. She took very little nourishment, but drank water all the time, sometimes a pint at a draught.

At the end of the two weeks she rose, and resumed her previous course of life in every particular, but was evidently much fallen away in flesh, and suffered from palpitation of the heart. The true nature of the disease was not suspected, and she was supposed to be going insane. The family physician bled her several times, and applied blisters, and cups, to the spine, besides giving her blue pill and iron, but all with no effect. Her parents, when told that the trouble was only a *chronic nervous affection*, could scarcely conceive it possible, more especially as she had a most distressing cough, and seemed deep in consumption. However, they gladly consented to the proposed treatment, which was commenced immediately.

For a time, as an anti-periodic, quinine was given, with wine, three times a day, and in the evening a warm bath, followed by a bowl of beef tea, made from Liebig's extract of meat, and a small dose of chloral hydrate on going to bed.

The good effect of this was soon seen in a better appetite, regular sleep, and a more equable disposition. In a week she was quite a new being, and more like her former self than she had been since her first attack. She was then taken to the sea side, where she had warm salt water baths, and was kept out in the open air nearly the whole day, riding about, the same general treatment being still continued, except that she now had some of the bromide of potash. Coffee and tea were both forbidden, and in place of them she took claret wine, with seltzer water.

In three weeks she was so far recovered that few could have believed her to be the same person. She slept well, without the chloral, had a good appetite, with perfect digestion, and was regular in her monthly periods. In three months time she returned home perfectly cured, and with all her old amiability of character.

To those who have not studied the relations, direct and sympathetic, between the nervous system and the rest of the organization, such a case will seem singular and inexplicable, but to those who have read and studied this book, it will be clear enough. The emotional *shock*, caused by the sudden discovery of her lover's faithlessness, completely deranged her nervous system, making its action fitful, and irregular, so that none of the organs were regularly and properly supplied with nervous power, and consequently they could not properly perform their functions. As soon as the nervous system became calmed, and regular in its action, all the organs began to resume their functions, and health returned. Till this was done, it was of no use to try to force an appetite, to give tonics to restore strength, or to endeavor to re-establish the monthly flow. All the means for such purposes necessarily failed, while the bleeding, blistering, and cupping, only made matters worse.

This case is very remarkable from the variety of symptoms which accompany it, some of which are seldon seen. The *bloody sweat* is rarely met with, especially in chronic cases, but I have seen it three different times, in three very different subjects. In extreme anguish of mind, or severe torture of the body, it happens more frequently, as might be expected. Often, however, the bleeding is local, being confined to the eye-lids, arm-pits, groins, and thighs; but in bad cases the blood exudes from the whole surface of the body. Spectral appearances before the eyes, and false sounds in the ears, are more common, and so is the extreme restlessness, and throwing the limbs about.

In females a nervous attack is often the cause of a bad leucorrhœa, and sometimes is followed by an attack of *nymphomania!* When this is the case the cold bath should be used, till the excitement is calmed down, then a dose of chloral hydrate given and the patient put to bed, and watched. Some of these cases are very distressing, for while so affected the most modest and virtuous females will make advances to, and even solicit, any men they may fall in with, totally unconscious, morally, of what they are doing. Young females with any such tendency should be watched very closely, especially when they may be in danger of brutal abuse.

In some cases chronic nervousness ends in *nervous paralysis*, which may be as complete, for the time being, as if it arose from real injury to the spine. It passes away, however, with the attack, and may leave not a trace behind.

Vertigo and spasms are common in chronic nervousness; and somnambulism, and trance, are not unfrequently met with.

Faintness, with spasms, headache, and restlessness, with confusion of ideas, and a tendency to see visions, or to see things double, are common among females while pregnant, or nursing.

Among young females a very large portion of their supposed diseases are simply attacks of nervousness, and they should never be subject to severe medication till this has been ascertained. Especially it should be known if they are suffering from any disappointment, from unrequited affection, or from any other cause which may act strongly upon the emotional part of their nature. It is perhaps quite within bounds to say, that nine-tenths of their diseases are really nervous, and connected, for the most part, with *the affections!* Not that they are any the less real on that account, as the cases just given will show; but a knowledge of the fact must influence materially the treatment to which they may be subject. For the most part, the real cause and nature of the disease is not found out and removed, but they are merely treated for some of its effects, with of course no beneficial result. Very often the skill of the physician is baffled, all his treatment is useless, so that the patient is given up, and yet, to the amazement of all, will recover, quite suddenly, and show no trace of sickness whatever.

This is often seen in what is called *love sickness*, which may kill as certain as the plague, and defy all medical skill, but be cured in a moment by the possession of the loved one. A celebrated French physician, noted for his treatment of nervous young ladies, was of opinion that *all* such cases were connected with love; and when a young person was brought to him, perhaps apparently dying, of nervous fever, he would instantly demand: "*Well! Who is he? What is his name?*" Without going so far as this, it is nevertheless true that the influence of the affections, in all such cases, can scarcely be overrated, and should always be suspected.

N. B.—The medication advised, in these nervous cases, is perhaps the best, of the ordinary kind, and is that which would be adopted by the most eminent allopathic physicians. It is here given because, in most cases, it would be the readiest to obtain, and because it would do *no harm*. There is a kind of medicine, however, *the Neuropathic*, which is much better, especially in nervous cases, than the best of the allopathic, and which I should always advise instead, when obtainable. It will be explained further on.

CHAPTER XX.

SOME CURIOUS CASES FROM MY OWN PRACTICE.

Case 1.—The following is the statement made me by the patient himself, in his own words. I give it just as received, making my own comments as occasion requires:

"*Statement of My Case.*

"I am one of the conductors of a daily paper, and my duty is to attend late at night, to receive the last news, and to make comments upon it if needed. I am usually kept till the small hours of the morning, and sometimes till 3 or 4 o'clock, and with plenty to think of and to do. It is my custom to leave my segar-case open before me, and to keep smoking all the time. As soon as one segar is done I light another, and so on till the work is done. How many I may average I cannot say, but I know that sometimes I empty the case, and that holds 6. Perhaps I average twice as many more during the day, but I never kept count. This course I have been pursuing for three years, but for the last twelve months with increasing difficulty and distress. My first symptoms were a troublesome buzzing in the ears, which always began with the writing, and continued more or less till I had finished. Sometimes I would even feel a little deaf with it, and then I also felt a severe throbbing in the back of the head, with more or less pain there. All this used to disappear when the work was over, and on going to sleep it all left me, and I woke up all right.

"Finally, all these troubles got more permanent, and would not disappear on stopping work, nor could I go to sleep as I used to do. Many times have I risen from my desk wearied to death, almost deaf, and with a distracting pain in my head, but it was no use lying down, sleep would not come. In this state I used sometimes to start out for a walk, and after getting well tired, and taking a cup of coffee, could sleep a little, but it was not thoroughly refreshing, and at nights I was but little fit for my usual task. Sometimes a good stiff glass of grog, when I had done, would put me all right, and I conld sleep well, but at other times it made me worse. On the whole, it was evident my condition was getting worse, but still I thought I could keep on till summer, and then take a holiday and get all right again. About three months ago, however, a new symptom appeared, worse than all the others, and which causes me the greatest misery and alarm. It is for this, in fact, that I consult you. It first commenced in this way: One night when there was little to do I was trying to slumber a little on the sofa, in the office, and had succeeded in falling into a half doze, when immediately before me, on the opposite side of the room, lying on another sofa that was there, I saw the figure of a man. At first it was shadowy and indistinct, and I rubbed my eyes, yawned, and roused myself, thinking to make it disappear. All of no use, gradually, but steadily it got plainer to view, and to my astonishment took *my form* exactly. There it lay, my very counterpart in features, but not dressed as I was then, mine being a winter suit, and the figure having on light summer clothes. But most horrible of all, the figure had its *throat cut*, from ear to ear! The neck tie was removed and the collar thrown back, so that the hideous wound gaped wide open, and for a time I could look at nothing else. By degrees, however, my eyes took in other particulars, and then in the left hand I saw a razor. Now, I am *left-handed*, and this circumstance seemed to strike me more than anything else! You cannot conceive how completely this appearance overcame me. I was on my side, my face turned towards the figure, and gazed with such intensity that it seemed as if life stopped within me. With a long sigh, however, my full consciousness came back and I sprang np, feeling sure the figure would disappear if I moved towards it. But it did not. Even when close to the sofa there it still lay, looking up to the ceiling with its glassy eyes, and that hideous wound still gaping as wide as ever. Fully determined to see the thing through I threw myself forward on to the sofa, right on top of the figure, which seemed to sink under me, till both settled into utter darkness, and I became insensible. My faint lasted some twenty minutes, and was ended by the devil coming in with some copy. Thinking me only asleep he called me, as he had been directed, but could not rouse me, and ran for help. By dashing cold water on my face, rubbing my hands, and putting some brandy in my mouth, the night hands at last aroused me, and consciousness returned. At first my confusion was so great that past events were all muddled together, but the first glance at that *sofa* brought all back again, and my eyes closed involuntarily, for fear the terrible figure should be still there. When fully restored it was broad daylight, and I felt much relieved. Sending out for an opium pill, which I swallowed, and taking a light breakfast, I went home to bed, fell fast asleep, and awoke five hours after, feeling pretty well, in fact better than for a long time, but still rather weak and dreamy. After this, a stroll seemed to improve me still more, but I felt still less like work than before. As no one else, however, could take my place I had to go, and by ill luck this was a very hard night for work. Still I went at it, and puffing my segar, with my back to *that sofa*, the pen went rattling over the paper briskly. For awhile the figure was forgotten; but finishing an article, and having nothing more on hand, for the moment, the thought struck me to look. With trepidation and fear I turned, and there was the sofa *unoccupied!* You cannot conceive the relief it was to me. I fairly jumped up for joy, and strode across the room, and to clinch the matter resolved to *sit down* there! Scarcely was the resolve made, and before it could be put into execution, there was the figure again, just as if it had never disappeared. Staggering back I fell into my chair, and sat staring at it, speechless with terror. It never changed in the slightest manner, and all the details of dress and look fixed themselves more and more firmly on my mind. How long this entrancement would have continued I know not, but my old friend the devil again relieved me. Coming in, he laid down the proofs he had brought, and asked me for copy. With a great effort I recovered myself, and asked him to look on that sofa for my pencil. He went at once, and looked, but saw nothing! Still *I* could see all the time! The boy's body seemed not to shut out the view of the figure at all, for in some incomprehensible manner *that* was always visible between me and him. Utterly unable to stay any longer then, I went down into the press room, where the men were working off the First Edition, and there again, on the press, passing with the paper under the rollers, backward and forward, lay my enemy. The printers stared at me as much as I stared at the figure, wondering what ailed me. At last the foreman said 'What is the matter, sir; do you see anything wrong with the press?' No! said I, but I am not well, ask Mr. T—— to fill my place for the rest of the night, and call a coach; I am too unwell to stay longer, and must go home.

"Arrived at my lodgings, I resortedto my old remedy, and took a tumbler of hot punch. This revived me, and finally made me drowsy, but on lying down on the bed sleep would not come; I could only *doze*, and my feelings were wretched. Do what I would, the idea of that figure would not be driven out of my mind; and, at last, the conviction came irresistibly upon me that it was somewhere in the room. This made me afraid to look around, till at last the agony of suspense became so great I could no longer endure it, and sprang up; sure enough there it was, in one corner, on the floor, just the same in every particular. Rushing out of the room, and down the stairs I reached the street, and then walked up and down till daylight. Strange to say, my appetite was good; and, after a fair breakfast, I went to a very celebrated medical man whom I knew, and described to him the principal symptoms under which I labored—but said nothing of the figure. He at once told me I had simply overworked myself, and smoked too much. 'Rest,' said he, 'is necessary, and less tobacco; also, take a blue pill at bed-time, with a seidlitz powder next morning.'

"Well, I managed to get a friend to take my place for a week; took only three cigars the next day; and, as the doctor had also advised a change, I went to the theatre in the evening. The performance pleased me much; and the novelty of having no work to do for the day or night made me feel quite gay. Going home from the theatre I took one cigar, and a single glass of wine, swallowed my pill, and then went to bed, as the clock struck one. My courage was so great, that I actually looked into the corner where the figure laid the previous evening, but saw nothing; and, feeling confidence in my physician, went fast asleep.

"My sleep lasted till five o'clock, when I awoke suddenly. it was quite dark; but, in *that* corner, there lay the figure as before, lighted up with a pale, yellow light, which seemed to surround it like a cloud. The light showed nothing else distinctly, but seemed to belong to the figure alone. Well! there I laid, staring at it, till my heart seemed to sink within me, and the thought came to mind that I should die. It was impossible for me to get up, nor could I turn my eyes away; but lay and stared at the figure till daylight began to show.

"Immediately the footsteps of our porter sounded on the stairs, as he began his round of fire-lighting, I forced myself round and rang the bell. He came to the door, which fortunately was not locked, and came in. 'Jim,' said I, 'is there anything in that corner, I thought something sparkled there?' Jim looked, but reported nothing; and, after lighting my fire, and opening the blinds, left the room. It was now daylight, and the figure had disappeared. With a strange feeling in my head, and downhearted, I got up, took my seidlitz powder, and went to breakfast. The medicine operated well, and during the morning I felt better, so much so, that my spirits came back, and I began to hope my visitor would not return. During the day, I tried to tire myself, took only three cigars, and went to bed early. Slept soundly till three o'clock, waked up all at once and looked round; there it was again, in the old place. Hiding my face in the bedclothes, I lay there till morning, not daring to look out again. The day passed much as the one before, and in full daylight my spirits came back. My appetite also kept up, and I took but two cigars, with no liquor. When night came I went again to the theatre, and afterwards to a saloon; and, on coming home, turned the gas on full height, left it burning, took my pill again, went to bed and slept, awoke again at five, and there was the figure just the same! Well, I need not tire you with daily details. All this holiday week, not a single night passed without my fearful visitor. I took my medicine, smoked little, drank scarcely anything, and did no work; yet still there it was. At the end of the week, it was necessary for me to return to my post; and there, as before, in the same spot, invariably appeared my counterpart.

"Gradually becoming accustomed to it, I lost much of the fright which I had felt at first, but still it weighed on me horribly, and continues to do so. I see it now; not only by night, but also of late *in the day!* A week ago in crossing the street I saw it lying there, and all the people walking over it; but still not hiding it from my sight. I stood there staring at it till a policeman took my arm and asked me what was the matter. Even to-day, before coming to see you, the thing appeared to me in the restaurant, where I went for breakfast."

"Now, sir," said he, "tell me at once: can this thing be driven away, or must I make up my mind to die?—for live with it I cannot!"

"Yes," said I, "beyond a doubt it can be driven away, and you can be cured; *providing* you can, and *will* do just as I tell you. First, however, let me ask you a few questions, and remind you of a few things you have not yet told me, but of which I am aware from your symptoms.

"Your digestion and appetite, you say, are very good, which is very important,—and you do not complain of any steady or acute pain in the head, or spine. When you do sleep, you sleep soundly, and nothing appears to you in your dreams. Your bodily strength also is not impaired; and, during a portion of the day, you feel sometimes nearly in your natural state. All this shows that the derangement from which this appearance results, is not yet very serious, nor confirmed. You also are not a superstitious man, and can, therefore, allow me to assure you that what you see is unreal, and results from something wrong in your bodily condition. When this wrong condition is put right, you will see it no more; and, as I said before, if you *can*, and *will* do as I direct, it certainly *can* be put right—of that you need have *no doubt!*"

"Oh, sir!" said he, "I do trust you are right, and can do all you say, but excuse me if I feel doubtful. *I see it now! There, on that sofa!*"—pointing to one at the other side of the room.

"Exactly," said I; "the very look of your eyes, and the swelling of the veins on your temples, showed me before you spoke, that you saw it. Of course it is invisible to me, but I know it is real enough to you. We can, however, banish it for the present, and finish our consultation." Fetching out my Electro-Magnetic Machine, I at once subjected him to a pretty strong current, enough to shake him up well.

All the time he kept gazing on the figure with the most despairing look I ever saw on a human face. In about ten minutes, however, he burst out into a profuse perspiration, and immediately exclaimed, "Thank God, it is gone! Oh, Doctor, you *have* banished it. And I now begin to think you can cure me. Tell me at once what I must do?"

In the first place, said I, you must abandon your present occupation. That is indispensable, and if you cannot, or will not, it is useless to advise any further. You must leave it at once, and do something requiring but little mental effort, and that will take you out well in the open air, if in a new place so much the better. It shall be done, said he. In that case, the rest is easy. You must neither smoke, nor drink, nor take coffee nor tea, and use such diet as I shall prescribe. Medicine you need but little, and that of a peculiar kind, such as I must prepare for you myself. But first let me remind you of something you have forgotten, or did not like to mention, but which is the most important of all. You have been, at no distant time, too attentive to some lady friend! That is true, said he, I must admit. And further, said I, your attentions were only *partial;* you constantly committed a *fraud on nature!* He started up at this and expressed the utmost astonishment. It is quite true, said he, but I never thought that of any account, and how you found it out I cannot guess. It is my business, said I, to find out such matters, and I knew it from the first. The practice I referred to, has been the chief cause of your trouble, and your over-work, and excessive smoking, have been only auxiliaries. From all these causes combined, there is at present an unhealthy condition of the brain, and that organ secretes unwholesome thoughts and images, in consequence; the same as your stomach, when you have dyspepsia, secretes impure gastric juice. When such a state lasts too long, and the subject is feeble, an organic change takes place in the brain, of a permanent character, and a cure becomes impossible.

But, in your case, as I have said before, the matter has not gone too far.

Further inquiry showed, as I had suspected, that he had, for a long time, indulged to excess with a young lady friend; and that, to avoid the usual consequences of such intercourse, had habitually practiced a fraud on nature. The indulgence alone, though in excess, might never have led to any such results, but the *imperfection* of the act did the mischief, as I nearly always find it do.

In accordance with my advice he gave up his editorship, and took a situation as travelling agent, abandoning also his tobacco and liquor entirely. Of course his female friend was also given up, and I prepared for him a remedy, specially adapted to soothe the irritable brain, and equalize the distribution of nervous power. He was told distinctly that the figure would not disappear all at once, but by degrees, and so he found, for it was six months before he saw the last of it. According to the account he gave me, it continued to appear more or less regularly for a week or two, then only occasionally, and *fainter*, so that at last it was only a shadow, and finally only a *faint light*, which faded quickly away.

As a concluding part of the treatment, I prescribed marriage, and to put no restraint on nature. This completed the cure, and he is now a well, strong man, with a family around him.

This case shows forcibly the evil effect of the practice referred to, which ruins thousands of both sexes, and which is yet seldom inquired about by medical men. In this instance the man's profession, and his habits other ways, made the results worse than we usually find them. It also shows how utterly inapplicable the ordinary medical treatment is to such cases. The man might have been purged, and bled (as one doctor advised), or used tonics or nervines, to any extent, but instead of their doing him good, they would have made him worse. The end would have been *insanity*, and probably *suicide!* When I saw him, the idea was already beginning to enter his mind, that this was a *vision of something to come!* And, had he found himself at any time a little worse than usual, and *dressed* like the figure, he would have certainly cut his throat. Had he done so, and left an account of his experience behind him, most people would have thought that this was a clear case of preparatory warning, or foreshadowing of what was to come.

In all probability he had been thinking much of himself; and, feeling very miserable, thoughts of suicide would not be unlikely to occur. In the then weak state of his brain, images would arise involuntarily, nor could he prevent nor banish them. Fortunately, he neither took much medicine, nor sought *spiritual* advice; had he done either, he would soon have become past help. It was a clear case of *impoverishment of the brain*, resulting from over-excitement, sexual and mental, and undue expenditure of the seminal fluid. He was constantly losing this fluid in the urine, as well as by the imperfect connections, at the same time that the brain was being overworked, and poisoned by the excess of tobacco. As he well expressed it, he was literally *burning the candle at both ends!* He is now quite fat, and jolly, and lately sent me his photograph, to show me how little he was like a *ghost!*

Case 2. "DEAR SIR:—In accordance with your request, I will give a detailed history and description of my case, as far as my disordered condition, and my repugnance for the task will allow. I am a clergyman of the Church of England, thirty-five years old, married ten years, and have two children. My living is situated in one of the pleasantest counties of the south of England, and is, in every respect, delightful; being healthy and picturesque, with abundance of good society, and within easy reach of several large towns. Loving my profession, and situated so pleasantly, it would seem that, in my case, all the conditions of happiness were found associated; and so I thought, and felt when I first went to my vicarage. Naturally studious, and intimately connected with many old companions at the University, who thought of nothing but scholastic subtelties, and investigations, I became a thorough bookworm. All my time was spent in studying old Greek and Latin authors, and in exchanging views with other bookworms similarly occupied. Even my family, dear as it was to me, could not wean me from my studies; and my dear wife, proud of her husband's learning, encouraged me in my course, feeling sure that I should become one of the most famous men of the day.

"It happened, some five years ago, that one of the Fellows of my old college, and one of my regular correspondents, originated a new and startling hypothesis, concerning a disputed passage in one of the old Greek authors. Among the learned and curious this new hypothesis created great excitement; and all set to work to study it, some to oppose and some to maintain. Like many others, I threw myself into the controversy with all the energy I possessed. Several nights in succession were passed without sleep, poring over dusty old volumes, and during whole days I scarcely took notice of anything in the world around me. Those who have never gone through such work, can form no idea how utterly absorbing it is. I forgot to eat, till food was almost forced upon me, and in my walks nothing attracted my attention. The most intimate friends would be passed unnoticed; and often I have wandered, in fits of abstraction, to utterly unknown places, and have had difficulty in finding my way back.

"The consequences, both to mind and body, you can easily conceive. I became thin and feeble, and my mind so wandering that it was impossible for me, at last, to go far from home, or to attend to my ministerial duties. From compulsion, not inclination, my books were laid aside—for a time only, I hoped—and a friend offered to fill my pulpit for a few weeks. I took a journey to the sea side, to try and recover. My family went with me, and I tried to devote myself more to them, and to the world around me, than I had yet done, but with little success. My thoughts would, in spite of me, go back to my books, and to the disputed point on which I had been engaged.

"You are aware that many of the old classic authors are exceedingly licentious, and obscene, to a degree beyond anything we know of in these days. The vilest of our corrupt literature, such as is addressed to the lowest and most corrupt tastes, is far excelled in vileness, and even bestiality, by much of what is called classical literature. How it is that our youth should have such corruption put in their way, as a part of their education, and should spend years in studying it, is now, to me, a mystery and wonderment.

"Well! In the course of my investigations on this controverted hypothesis, I had occasion to refer to one of the worst of these old authors, and to read several pages of his foulest compositions. After doing so, I found, to my vexation, that I could not forget the filthy stuff. At all times, and under all circumstances, it would keep coming again into my mind. In vain I tried to busy myself with other writings, and to direct my thoughts into other channels—nothing availed to any degree. My trip did me but little good; and, after my return, it seemed as if the hated passages were too deeply engraved on my brain ever to be obliterated. Even when preaching, or reading the holy Book itself, they were ever present, and I even found myself repeating them, without being fully aware at first what I was doing. Several times, before I could stop myself, I have recited passages of this kind in the midst of my sermon. Fortunately none of my hearers knew a word of the dead languages, so that they passed merely for learned quotations, and no doubt gained me much undeserved credit. But my fears were so great that some one might hear me who understood them, that I dared preach no longer; but, under the plea of illness, engaged a permanent curate.

"It is impossible for any one who has never had a similar experience to imagine my chagrin and despair. I dared no longer read my Bible; for, if I did, those hated passages would appear, and cover up the words of the holy Book. Neither dare I converse with any of my learned friends, for fear of betraying myself.

"The idea came into my mind that I was delivered over to the evil one, as a punishment for so devoting myself to the profane and wicked works of mere pagans. In vain I tried to pray, for even in my prayers I would involuntarily mutter the foulest obscenity. Shame, and the fear of being thought mad, prevented me speaking to any one of my condition. Besides, I felt no confidence in any one understanding it, and so hugged my misery to myself, living alone as much as possible, and never speaking before any one, if I could avoid it.

"Within the last few months the symptoms have become much worse, for I now find myself *picturing* the images the old Greek so plainly describes,—that is, I imagine the *scenes*,—and they become so vividly portrayed before my mind's eye, as to shut out the realities around me. My own virtuous domestic circle seems obscured by the vision of a beastly Saturnalia; and even my wife, whom I love and reverence so dearly, merges, while I look at her, into a drunken, howling Bacchante.

"It is needless to say that I have struggled, with all my might, and do so still, against this enthralment; but I fear there is no escape for me without other help than I have yet found. Physicians I have consulted, and told them of my insane devotion to study, and of its evil results. I have even told them that I was haunted by *visions*, though without stating their nature. But none of the advice, or treatment, I have received has been of the least benefit. The general impression among my medical advisers, I could plainly see, was this, that I was simply dyspeptic, and hipped, and a little queer. Some advised the old blue pill, and some bleeding, others tonics, change of air, and sea-bathing. At the earnest suggestions of one I spent six months at a water-cure, but all to no purpose; and here I am, still in the same awful state.

"A friend one day put into my hands one of your books, and spoke of you in such a way as made me wish to consult you; and as you make it a condition for me to tell you everything, I have here endeavored to do so. My narrative is far from complete, I am aware, and is probably incoherent; but it is the best I can do, and may be enough to enable you to tell me whether you can hold out any hopes of relief or not. If you cannot, I know not what will become of me. Suicide I cannot commit; but I fear I may disgrace my name, my family, and my holy calling. To avoid this, I have resolved to settle up my affairs, and go away privately to some remote part of the world, under an assumed name. There, whatever I may become, or undergo, it will be only myself who will suffer, and I may die and be forgotten.

"Please write me as soon as you can, and let me know your opinion."

It was absolutely necessary for me to see this patient; and he came a long journey specially to pay me a visit. When I saw him, his condition was pitiable indeed. Pale and thin, with a look of terror in his eyes, he presented the true picture of a man who is haunted by an ever-present fear! The impression made on my mind, on reading his letter, was, that he suffered from some disease of the *sexual organs*, which gave the impure *character* to his thoughts and mental pictures. His intense application to these scholastic studies had probably exhausted his nervous energy, and weakened the brain, so that there was no power of *will*, and whatever tendency was strongest showed itself involuntarily. In such a state, a diseased stomach would cause strange ideas and habits in regard to food, and diseased sexual organs would lead to just such mental conditions as he described.

On seeing him, and making the necessary personal examination, I found my supposition to be correct. He had an enlarged *prostate gland*, and suffered from spasmodic *stricture*. His urine was also scant, and exceedingly acrid and irritating. Here, then, was the explanation of the whole matter.

He was naturally a man of much amative power, but had kept himself remarkably continent, partly from mistaken notions of morality, and partly because he did not wish to let anything draw him away from his studies. The reading of these obscene passages had, in spite of himself, caused increased seminal secretion, and determined an influx of blood to these parts. Not having been relieved, as they should have been, by sexual indulgence, they of course remained in a state of congestion or fever, and so became diseased as I found them. These diseased organs reacted upon the brain, and kept constantly impressed upon that organ the ideas which naturally accorded with their state.

The case was plain enough, and I told him without hesitation he could be cured.

The first step was to throw his musty old classics into the fire; and the next to live with his wife as a hnsband should. The diseased prostate was then successfully treated, and the urine brought into a proper condition, at the same time that every attention was paid to his general health. Tobacco, and wine, he avoided from scruples, but I advised both, and they benefited him. I also insisted upon his engaging in some out-door pursuit, and luckily he had a decided fondness for botany. This was most fortunate, for it was the pursuit of all others most favorable to him. In a short time he became quite absorbed in the collection and drying of plants, and in studying their classification and qualities. He also took out his wife and children with him, into the fields, and taught them the names and habits of the plants, so that they all had a common interest and occupation.

In a very short time the dreaded obscenities presented themselves no more to his mind, nor could he ever create an interest in them. In their place he was now thinking and talking of flowers, roots, and leaves, and he soon became quite an enthusiast in his new pursuit. He is now strong and sound, both in body and mind; and, when I last heard from him, was studying mineralogy as well as botany. "Now," said he, in his last letter, "I find there is more that is worth studying in the very stones I tread on than I had ever imagined." "And," said he, further on, "I deeply regret, every day of my life now, that so much of my time has been *wasted!* Wasted on mere words, while the wondrous world around has been a sealed book to me.

Case 3. "Dear Sir:—My profession is that of a criminal lawyer, and I have been much occupied with very desperate cases. There are few professions more exhausting, and a successful man pays dearly for his success. Many and many time have I spent sleepless days, and nights, in succession, and for weeks together have never known an hour's real rest.

"Of course, this in time told upon my health, and compelled me to relax. But a man with a professional reputation must exert himself, or retire altogether; he cannot rest when he will, but must respond to urgent calls.

"One of those cases occurred which stir the whole community, and excite universal attention and speculation. A case of murder, with a most remarkable chain of circumstantial evidence, but no direct proof. I was appealed to, to defend the accused, and urged by professional pride, and real interest in the case, I consented to do so, though not at all in a properly capable condition. The task turned out much more difficult than had been anticipated, and it was soon evident that my client could be saved only by the most strenuous and unremitting exertions. My professional reputation was at stake, and the life of a man in peril whom I knew to be innocent, and in whom I felt a deep personal interest. With all the energy I possessed, therefore, I threw myself into the case, and resolved that I would triumph this time, and then take a long rest. For two months my labors were never ending, and toward the end I neither eat nor slept, sometimes for days and nights in succession. My sustenance consisted of enormous quantities of *green tea*, made as strong as possible. By the aid of this stimulant, the amount of labor I performed was prodigious, and but little exhaustion seemed to result from it at the time. Suffice it to say my client was acquitted, declared innocent, and the applause awarded me was unbounded. It was truly a triumph, and raised me immensely in general estimation. At first my elation, and real pleasure at the safe delivery of my client, prevented me feeling the effects of what I had gone through; but only for a short time.

"The first night after the trial was over, and all safe, my calculation was to take a thorough good rest, such as I had not had for a long time. There was nothing to prevent it now; no work to do on the morrow, nothing to be anxious about or to think of, but on the contrary merely pleasant retrospection of a task well ended. It was all in vain, however, I could not sleep, except by fitful snatches, and in the morning was anything but refreshed. Neither could I eat to any extent, but was obliged to recur again to my *green tea*. This state of things soon made itself felt and seen. My friends insisted on my seeing a physician, which I did, and told him all. As a first step he gave me opiates, and so forced sleep, and by the use of tonics and fresh mountain air, and exercise, my appetite partly returned. Still my amendment was but partial, and nothing seemed to help me further. It was necessary for me to use opiates more or less all the time, and to take stimulating tonics; without them I fell back again. I even took a sea voyage, and travelled for six months, but remained at the same point. During all this time *green tea* was my chief dependence, and I felt sure that without it I should sink right down.

"On my return home, some twelve months ago, a new symptom showed itself, worse than any I had yet suffered from, and different from any I had ever heard of. Sitting one day in my study, trying to read a work of fiction, I was startled to hear some one *speak*, close to me, as it seemed. *The words* did not impress themselves upon me, but they were distinctly heard, and *no one was near but myself!* At first the thought occurred that I must have been partially asleep, and dreaming, but even while thus thinking, and endeavoring to so persuade myself, I heard again, quite distinctly, a whole sentence, plainly uttered. It was the voice of one of the witnesses on the trial, and the words were part of the evidence he had given, for I remembered them well.

Scarcely were these words uttered, when others sounded, just as plainly,—part of the judge's charge, and, after that, part of *my own speech, in my own voice!* Had I been then delivering my speech, it could not have sounded more plainly and distinctly, and in each set of words, thus listened to, was an exact reproduction, tone for tone, of what I had spoken before.

"At first, this remarkable visitation caused only a vague feeling of astonishment, with lively curiosity and wonderment. There was nothing, as far as I could judge, in my bodily or mental state, in any way different from what was then usual with me, and I could form no kind of conception, or explanation of such an occurrence. All the rest of the day was passed in pondering and speculating on the matter, but with no return of the voices. In the evening, however, as I sat at my desk, trying again to read, I heard quite distinctly, another part of my own speech, and then passages from the testimony of various witnesses, that had been examined. They were never confused together, but each one was delivered clearly by itself, and always with some interval between them. The tones were never too low, nor too high, but exactly such as had belonged to the original utterances. In fact each was an exact reproduction of what had been spoken before. Well, this continued for fifteen or twenty minutes and ended abruptly, the last speech consisting of only a few words. Every day almost, and usually in the evening, was I thus talked to, till at last it became so regular a custom I got quite used to it I cannot say, however, that I got reconciled to it, for my reason told me there must be something very wrong for such a thing to occur. Not being at all superstitious, no idea of its being a *visitation* ever entered my head. That it resulted from my deranged health I felt no doubt; and the fact that the talking was always a reproduction of something said at that time showed me the immediate cause. Beyond doubt I had then, while in a feeble state, over-worked myself; and, in some mysterious way, my brain was so affected, that sounds once heard were reproduced, the same as we commonly see over again what we have once looked upon.

"Still, not having either read or heard of such an occurrence before, I was afraid to speak of it for fear of being thought even worse deranged than I was. On one occasion, however, I did allude to the matter, to a physician, as something happening to a friend of mine. He merely repeated the usual common-place remarks, 'over-worked, sir, over-worked. Imagination active. People in such a state can fancy anything.' But with me it was not fancy, in the sense he meant; the sounds were to me actual sounds, as much so as those made by people really speaking to me. Indeed it has often happened, lately, that while a person was talking with me, one of these impromptu, reproduced speeches would even overpower the real speech that was being addressed to me.

"It was useless to try to shut out, or not notice the false speech, and attend only to the real one; for both demanded equal attention. It was, in fact, exactly the same as two persons talking to me at once. Often I know have I been harshly judged on such occasions, and thought rude and inattentive, or at all events indifferent. But the fact is, I was too confused, and my attention too much divided for me to take in clearly what was being said to me.

"During all this time the voices never came to me in my sleep, nor did I dream about the trial, except at first. Latterly also my sleep has been better than formerly, though otherwise my state is not improved. In fact I begin now to feel drowsy, very often, especially after hearing the voices, and thinking or talking becomes more difficult.

"Here, then, Doctor, you see my actual condition. I am a man haunted by the ghosts of dead speeches, to which I am compelled to listen. They are worse than actual speeches, for I cannot run away from them; nor is it any use to stop up my ears. Strange as it may seem, the voices are just as distinct when the ears are close stopped, as they are at other times, so that there is no escape for me.

"On the whole the voices come more frequently and last longer than at first, and the terrible thought occurs to me that they may end by becoming constant; in which case I should soon cease to hear them at all.

"I try, Doctor, to write about this as lightly as I can, but it is a serious matter to me, as no doubt you can well conceive. It is in fact the great question, 'To be, or not to be'—for with this my existence cannot endure long, and I wish to know, as near as possible, what is the prospect for my release.

"For some time past all medicine has been abandoned, for it is of no use at all now, and my sole reliance is still upon my *green tea*, which I take often, abundantly and strong. It is meat, drink and medicine to me; in fact it is life itself."

This case presents some peculiar features, and others which are common enough with men whose minds are overworked. The exhaustion of body and mind, and general ill health, are such as are often met with among striving men of business, and in the professions. The peculiar feature of the case is the *localization* of the nervous derangement in the organ of hearing. Cases are common enough in which men *see* things over again; but it is rare to find *sounds* thus perpetuated. Still there seems no reason to be surprised at their being so. It is merely *memory* localized in the ear, as it is in other cases in the eye. The vividness of the reproduction in this case was no doubt owing to incipient disease of the brain, in that part more immediately connected with the ear.

When this man presented himself to me, I saw a thin, cadaverous-looking creature, with sunken eyes, and a weary *hunted* look, as if he were all the time conscious of being pursued, and could not escape. His digestion was wretched; his muscles flabby and weak, and his skin dry and harsh, with bile-colored blotches here and there. His hair was also falling off; and his eyes were dim and glassy. His hearing, however, was remarkably *acute*, and sudden or harsh sounds irritated him very much. On the whole he slept better than formerly, but still not well; and he was often very drowsy and dull.

The whole symptoms pointed to threatened softening of the brain, and the case seemed by no means promising. One thing, however, gave me some hopes. I felt sure that one cause, and perhaps a *principal* one, of his peculiar condition, was the abuse of the *green tea!* From this cause I have frequently seen quite as bad effects as from the abuse of alcohol. In certain cases and conditions *delirium tremens*, or something very much like it, may come from the *tea pot* as well as from the wine flask; and many a man's brain has been irretreviably injured by the abuse of a stimulant which he had thought always innocent.

The tea, I felt sure, must be at once abandoned; but something must be substituted in its place. For this purpose I gave him a preparation of the *coco* leaves to counteract the exhaustion consequent on withdrawing the customary stimulant. At the same time he took a preparation of phosphorus, both as a tonic, and to strengthen the brain and nervous system.

For a long time he suffered dreadfully for the want of his tea. But as soon as the system was fully weaned from it, his digestion began to improve, his strength returned, and his mind became more collected, the voices also began to sound *fainter*, and he heard them for a shorter time. Eventually they came less frequently, and at last he would be for days and not hear them at all. This so encouraged him that he began to feel confident himself of his cure, and this frame of mind helped very much of itself. Light reading, gay company, no head work, with wine and tobacco in moderation, soon made him feel *sure* he was doing well, and a voyage across the Atlantic finally cured him. The voices at last would come occasionally, especially if he had been thinking more than usual, or had been excited; but at last they ceased. He became tolerably hearty and strong; but, in accordance with my advice, he never resumed his profession, as I felt doubtful whether his brain would ever again be fit for any great or continuous effort.

Some of the most remarkable cases of nervous affections are found among those in whom the nerves of physical sensation, or touch, are affected. It is well known that in hysteria, which is a nervous disease, there is often, before an attack of hysterics, a peculiar feeling, a sensation, called the *Aura*. This varies much in different persons, sometimes being a feeling as if a strong draft of cold air suddenly passed over the body; at others being a kind of creeping of the skin; and in others again it seems like a constriction of some part, as if some one were powerfully grasping it; this is often felt in the throat, with such force that a kind of ball or crampy *knot* will form there, and the patient will nearly strangle with it.

It is not so generally known, however, that the nerves of touch, or feeling, are affected in other cases than purely hysterical ones.

I have known many instances of this kind, very peculiar, indeed, and such as few other persons perhaps have ever come in contact with. For most persons so afflicted keep their sufferings to themselves, unless they are very ignorant people, in which case they are told only to those of their own class, who usually regard them from a superstitious point of view.

Many of the instances of supernatural appearances, and strange voices which, are constantly being given, and more or less believed in, are due to peculiar nervous conditions. So also are many other kinds of supernatural visitations, as some of the following cases will show:

In the summer of 1856 there called upon me a gentleman from Virginia, who begged me to give him a strictly private interview, and one in which he could speak at his leisure, and as long as he might wish.

"Doctor," said he, "I am going to tell you what I have never yet told to any one, and which I never thought I should tell, for I fear being thought either insane or untruthful. Had I not read some of your books, I should not have come even to you; but should have carried my secret and my misery to the grave with me. Well, Doctor, here it is: Three years ago I had a fall from my horse, and suffered from a concussion of the brain. For two weeks it was doubtful if I should get over it, and my doctor told me afterwards that he never expected my mind would be right again. However, I did pull round, and get quite strong and well, with no other inconvenience than occasional severe headaches, with heavy, drowsy feelings after. About two months after one of these attacks I felt more drowsy than ever, and at last fell into a sleep that lasted twelve hours! On awaking I found myself quite *deaf*, and so continued for two days; then my hearing returned suddenly, with a loud ringing sound, and a discharge of mucus from the nose, as if I had a bad cold. This discharge continued for nearly a week, and when it ceased I first became aware of a peculiar *odor*, or rather I should say I could smell *nothing else! everything smelt the same*; and the odor was the most loathsome you can conceive. It was exactly that of a *decaying body!*—I forgot to tell you, by the by, that when the accident occurred I was on my way back from the *funeral* of a friend, at which I had been one of the bearers. Owing to the body having been kept too long, it was in a state of decomposition, and the smell from it was overpoweringly repulsive! It was *exactly this smell* that was reproduced. I knew it in a moment, and the horror it caused in me cannot be conceived. I thought at first that it was a real odor, from some present cause; but was too soon convinced that no one smelt it but me, and that it was not to be avoided. No matter what was presented to my nose, all smelt the same; there was no escape but in not smelling at all, when it could be helped.

"My worst trouble was with my meals. All the food smelt the same, and it was impossible for me to touch it, owing to the nausea which the smell of it caused. My only resource was to eat alone, and while I was doing so to firmly close my nostrils; then I could eat and drink, but not without. As you may suppose, this peculiarity was soon remarked upon, and people began to consider me queer, and no wonder. On no account could I eat or drink with other people, nor dare I tell them why, for fear they should think still worse of me than they were doing. Well, Doctor, not to make the tale too long, this is my state now. For some time I have not been living with those who know me, nor dare I do so. There are relations of mine who would gladly declare me *insane*, and certainly my behavior would go far to justify them in doing so; and any explanation, if given, would perhaps make matters still worse for me. Now, Doctor, you know, and so do I, thanks to your books, that my strange state is due to something connected with my bodily state, and I want to know if it can be put right? If it cannot, I shall soon be a corpse myself; for life, in this state, is simply unendurable. Even now, *at this very moment*, I am suffering in the way I have described to you; and, smell at what I will, that sickening odor is all I can perceive."

Well, here was a case different from any that had ever yet come before me. And it was requisite to first know whether my patient *was* all right or not. Careful examination and questioning, however, showed me that he was a perfectly *sane* man, with nothing wrong about him but the nose, or nerve of *smell*. I tried him with chlorine, iodine, and even bromine, and strong ammonia, but it was always the same ; he still smelt *the corpse*. Even *Ozone*, in excess, made no change.

My explanation of the case was this.—At the time of his fall his nerves of smell were in an excited state, from being compelled to endure the bad odor of the corpse at the funeral. The concussion therefore affected them more than any of the other nerves, and left them with a *remembrance*—if it may so be called—of what they had experienced.

In other words, a *permanent sense* of that particular odor was established, and remained constantly powerful enough to overcome all the actual odors he came in contact with. Or perhaps his organs were incapable of recognizing any other odor.

This is strictly analogous to what happens when the nerves of the eye are affected, and some particular thing is constantly *seen* ; or when those of the ear are affected, and particular sounds are constantly heard, as in many of the cases described in this book.

Then came the grand question, if this condition was remediable or not? Farther inquiry informed me that when he fell he struck his *face* on a stone, and flattened his nose, making it bleed freely. No obvious injury, however was done to it, nor was any pain felt after his recovery, except occasionally a sharp jerk, as he expressed it. A careful examination up both nostrils, however, showed that some damage had been done. Some of the bones had been shattered, and part of the *vomer* was driven in, till it was buried in the parts below. In fact the small bones lying at the base of the nostrils were all *mixed up* as it were. In such a state of things it was evident that the nerves of the parts were very likely to be injured, so that their functions could not be properly performed. A proper examination at the time of the accident would have made this mischief apparent, and it might then have been corrected; but now the parts were all *fixed*, and grown firmly in their false position, so that it was doubtful if much could be done towards restoring them. About the middle of the left nostril, however, there showed quite a deep depression, at the bottom of which was a firm substance about as large as a grain of wheat, loosely imbedded in the flesh. This it was determined to remove, on the chance that some change might result. The operation was followed, a few days after, by great irritation of the nostril, and a discharge of mucus, as if from catarrh, like what he had immediately after the accident. This lasted four days, and when it was fully gone there *was* a change experienced, and of a most decided character. The patient, now, could *not smell at all!* Nothing had any odor, neither pleasant nor disagreeable, but all were alike scentless to him! Even this, however, he considered an immense relief; and he expressed himself quite content, though he should always remain so, providing his old state never returned.

I was not, however, content to leave him in this imperfect condition, and felt sure that a proper natural condition of the nerves of smell could be restored.

The particular steps taken to accomplish this need not be detailed; but suffice it to say, that by local stimulation with electricity, and the use of proper nerve medicines, his sense of smell gradually came back as perfect as before.

The man's gratitude and joy knew no bounds. "Now," said he, "I will go back and prove to my friends I am not *insane*, by accepting all the invitations to dinner they may choose to give me, and enjoying the best they can set before me."

It is well known that the sense of smell, like all other senses, is sometimes remarkably acute. There are many persons who can detect and distinguish odors that other people cannot smell at all. Sometimes this power is so remarkable as to seem magical or supernatural. I once knew a blind man, who had the sense of smell so acute that he could distinguish one person from another, merely by putting his nose *near* to their hands.

This, however, is only a more perfect development than ordinary of the natural faculty; but, in some cases of nervous disease, the sense of smell seems to acquire an almost preternatural power, that borders on the miraculous.

There is no doubt but that the bodies of all animals, human beings included, emit different odors under different states of emotion, though the sense of smell *ordinarily* cannot detect them. The state of the fluids when a person is in a violent passion, are very different from what they are in a state of peace. So, also, great joy, fear, or erotic excitement, all produce a peculiar *aura* or odor, though but one person in a thousand is conscious of it.

Those who have ever attended many death-beds will know that the breath of the dying person usually has a peculiar odor, resembling *ozone*. This arises from the gradual change in the character of the fluids of the body. Now, it is said that dogs will often seem to know when any one is dying, though not in the house with them; and that they will show their sense of the impending dissolution by distressed howlings. This is a universal belief, and it is quite possible it may have some foundation in fact. We all know how acute the dog's sense of smell is, and possibly he may thus detect the change coming on before human beings can have any knowledge of it.

It is not at all unreasonable to suppose that those peculiar subtle odors, arising from our *emotions*, may mutually affect us, in our intercourse with each other, more than we are aware of. For myself I have no doubt on this point, and I feel sure that many of our unaccountable likes and dislikes to each other originate in this way. The *aura* emitted from one person is grateful, or soothing to our nerves; and that from another the reverse, and in this way men are unconsciously attracted or repelled. This, I have long felt convinced, is peculiarly the case between those of opposite sexes, and is really the chief cause of what are considered unexplainable attachments. We know how often a man, or woman, is enamoured of some one in defiance of all reason as it would seem. There is nothing attractive to either the eye or the mind, nor can they even pretend that there is; but still *that particular one* draws them away from all others, no matter how much more lovable they may every way seem. The explanation of this apparent anomaly is to be found, I think, in the cause I have named.

The dog detects some subtle difference between different people by means of his nose. On coming in contact with strangers he immediately *smells* them, and makes friends with some, while he avoids others, all through what he discovers in this way.

Some human beings possess a similar faculty, and are guided by it in their selection of associates, often more than they are themselves aware of. But in cases of nervous disease, this faculty becomes perverted, and hence arises apparently capricious likes, and dislikes, without cause or reason.

How often do we see patients of this kind suddenly mistrust and avoid their best friends, without being able to say why? Nay, they will even just as unreasonably *hate* those they have loved best.

We call these sudden changes whims, or fancies, and usually attribute them to mere caprice. I feel sure, however, that they arise, at least in many cases, from diseased sensation, and especially from these subtle perversions and exaggerations of the sense of smell.

One instance I especially remember of a young lady who was liable to these sudden *freaks*, as her friends called them. She would suddenly, without any apparent cause, act in the rudest manner to her most intimate friends, avoiding them, and even repelling them, in the most offensive manner. At the same time she would exhibit the strongest likings for most unworthy people, and for those that at other times she herself strongly objected to.

By careful inquiry I ascertained from her, during one of her *rational* periods, that she was liable to attacks of severe headache, accompanied by a peculiar *heat* and *dryness* in the nose, which, as she expressed it, entirely changed the odor of everything, and caused her to perceive smells which no one else perceived, nor herself either at other times.

Here, I feel convinced, was the true origin of the *freaks.* She admitted that the only reason for her dislike to certain people, at those particular times, arose from something *offensive* about them, though she could not say what. Similarly, her strange *likings* to others arose from something pleasing about them, but she knew not what it was, nor was it always present in them.

A proper course of treatment, resulting in a regular and healthy performance of all the natural functions, soon removed this anomalous condition, and her friends had no longer to complain of her whims and fancies in regard to them.

Such a condition is most apt to occur in females, especially in those who are irregular, and in those who remain unmarried.

The sense of *touch* or feeling, like all the other senses, is liable to become deranged, and when it is so there is no end to the apparent vagaries it will play. Most people are apt to think that the sense of touch resides only in the ends of the fingers, because it is there so powerfully manifested, and most commonly exercised. This, however, is a mistake. We touch or feel with all parts of the body, though in different degrees, and it is possible for this sense to become unnaturally acute in *any* part, from disease.

A *shudder* is only a spasmodic action of the sense of touch over the whole surface of the body ; and the peculiarly sensative state called *hair sore* is only another manifestation of over-acute touch or feeling. It is often the case that persons will, during extreme excitement of the sense of touch, feel things of which others have not the slightest perception, and which they themselves could not notice in their ordinary state.

To me it seems certain that we can, during a state of overexcitation, be literally *touched* by things that commonly have no influence whatever upon us.

When people say they feel a *creeping* come over them, in the presence of certain persons they dislike or mistrust, it is probable they really do feel so physically. In other words, something really emanates from these persons, and affects the sense of *touch*, in the same way that thesense of *smell* is often affected, as previously explained.

Some persons have the sense of touch, naturally, remarkably acute, and in others it becomes much developed by cultivation, as we sometimes see in blind people. But the most remarkable of such cases bear no comparison to what we sometimes see in disease, or in those who have naturally a *morbid* condition of this sense.

People who are readily affected by changes in the *weather*, are so through the sense of touch; the whole surface of the body *feeling* the difference in the atmospheric condition. Animals often seem to know of the approach of storms, earthquakes, and other natural convulsions; doubtless, in the same way, the new atmospheric conditions touch them differently, and they feel the change approaching.

We often read accounts, in ghost stories, of people who *felt* some person or thing pass by them, or even *touch* them, though nothing could be seen. Many of these stories have doubtless had a real foundation, and are, in fact, quite simple and natural when understood. Any person with a diseased or over-excited sense of touch, on going into a strange place, is very apt to *feel* the new conditions. And if, while so influenced, the mind is also impressed by a legend about an uneasy spirit, the new sensation is at once referred to the ghost.

It must also be borne in mind that *touches*, or peculiar experiences in *feeling*, may be remembered, and experienced over again, the same as certain sights, or sounds.

A very intelligent lady once told me that her own experience confirmed this in a striking manner. She had the sense of touch naturally, morbidly acute, and impressions made upon it often remained, or reappeared, in the most obstinate manner.

On one occasion, while groping in the dark in a cupboard, she put her hand on a *mouse*, and experienced from it a nervous shock that gave her a month's sickness. But, singular to relate, she would often *touch* that mouse again, as plainly as if it were actually there—that is, the old sensation was reproduced, or remembered, and more than once the very same sickness followed as at first.

This lady had, however, a still more disagreeable experience of this kind, and one which she was very desirous of removing. While walking along the street one day she became entangled in a crowd, and, on enquiry, learnt that it was caused by a poor man being just picked up, who had fallen from a roof. He was then being carried to the hospital, and, in spite of her efforts to get out of the way, the poor fellow was brought close by her, so near, in fact, that his hand, which he was convulsively moving, touched her hand. That *touch* she could not get rid of! Whenever her health was a little out of order she would feel *that touch* again, palpably *feel it*, as at first, and experience the same horrors that she did then. When I saw this lady she was over forty-five years of age, and had thus had this disagreeable experience for five years. I told her it was possible that, if *the change of life* took place with her naturally, she might experience a change in other ways, and so she found it. By the time she was forty-seven the change was fully established, her health was improved, and she became quite fat, though previously the reverse. What was more important, however, was the removal of that unusual condition of the sense of *touch*. It was still acute, but not *morbid*, and she no longer felt either the *mouse* or the poor man's hand.

My advice was once asked in the case of a young lady who firmly believed herself *haunted*, or *persecuted*, by a *ghost*. And in this instance the actual occurrences seemed to confirm her belief. She was both chlorotic and hysterical, and highly romantic besides, with her head full of ghost stories, in which she firmly believed.

The account she gave of her own special visitation was this: She was one night lying wide awake in bed, and, it being warm, had her right arm, uncovered, thrown outside the bedclothes. While lying thus, she distinctly felt a hand laid upon her's, and passed up to the middle of the arm, which it grasped with great force. Her fright was so great she was speechless, and remained thus, as she supposed, for ten minutes or more, when the grasp relaxed and she was relieved. A loud scream then soon brought her mother from the next room, but it was a long time before she could tell what had happened. Her terror was such that her mother really feared for her reason, and sent immediately for a physician. An examination of the room showed that no living being could possibly have been there but herself, but this only made matters worse, for she was now fully convinced it was a *ghost*. Reasoning with her was of course useless, and besides there was proof positive of the truth of her story, for on her arm was a distinct red mark, with some swelling, just such as a strong *grip* might make! Nothing could therefore be plainer; the ghost had *pinched* her!

After this she could never sleep alone, nor in the dark, for fear of another visitation. But in spite of such precautions it came, and this time it was in *broad daylight*, *too!* She was lying on the sofa, talking with a couple of young lady friends, much like herself, to whom she had often related *that night's* wonderful experience, when suddenly she screamed out, and they of course did the same. Help coming in, she was gradually quieted, enough to tell them that the ghost had grasped her arm again, as it hung over the back of the sofa. On examining it, sure enough there was the same mark as before, and it remained sore and tender all day after. After this several other such attacks were experienced, and she became so affected by them that both her life and her reason were in danger. The fact that her ghostly assailant was invisible made matters worse, because it made the thing more mysterious, and left more to be *imagined.* Unfortunately a clergyman was called in, and his ministrations, though well intended, only left matters worse. Like most of his class, unable or afraid to refer to *material* causes for moral or mental conditions, he could only treat the matter *spiritually*, and in this way confirmed the impression already made.

When the case was brought under my notice, this condition of things had lasted some eighteen months, and in that time she had had twenty-two visitations, occurring mostly at night, but sometimes in the day time.

On enquiry I found that her periodical functions had entirely ceased, that she had no appetite, and was so feeble that she could walk but a very little distance, and seldom went out of the house. Her bowels were obstinately costive, not moving sometimes for a week or ten days, and her feet and hands were constantly cold. Her sleep was short and broken by dreams, usually of a terrifying nature. In short, there were all the usual conditions of a confirmed case of hysterical chlorosis.

She stated further that she had noticed, though not till lately, that before one of the ghostly attacks there was always a peculiar tendency to *sigh*, and a feeling as if she would *choke.* This would sometimes be felt for a day or two, and sometimes was accompanied by bursts of weeping, so violent that, as her mother said, it seemed as if her very heart would burst.

The *elements* of the case were here plain enough to be seen. The girl was chlorotic and hysterical. The *ghostly grip* was nothing but a *muscular cramp*, caused by a morbid excitement of the nerves of touch or feeling. It was in fact the hysterical *ball*, or globe, in the arm instead of the throat, where we usually see it.

A voyage to Europe, and the use of the Homburg waters, soon improved her condition, so that her strength returned, the natural functions were restored, and the ghost came no more.

PART IV.

MISCELLANEOUS FACTS AND INFORMATION CONCERNING THE NERVOUS SYSTEM.

CHAPTER XXI.

Subjective and Objective Mental Perceptions.

When a man mentally *knows* about anything external to himself, or mentally *perceives* it, for the first time, he does so through the medium of his senses, as already explained. For instance, a footstep falls close by him, and the sound it makes, acting on the nerve of hearing, causes it to convey a certain impression to his brain, which awakens in it a perception, or knowledge, of the fact that some one is approaching. Wishing to know further who it is, he turns and looks at the person ; his eyes receive the image and convey another impression to the brain, through the nerve of sight, which causes a perception, or knowledge, of what person it is, from his appearance.

And so it is with our perceptions, or knowledge, of all external or material things ; the senses alone are the means by which such knowledge is first gained. A human being deprived of *every* sense can acquire no knowledge of anything, for no idea can be formed about anything which has neither been *seen*, *heard*, *smelt*, *tasted or felt!*

These mental perceptions, thus acquired through the direct action of real objects on the nerves of sense, are called OBJECTIVE perceptions, because they are directly derived from the impressions made by the objects themselves. Such perceptions constitute our only real and positive knowledge of the external world.

The impressions which the brain acquires, through the senses, can be stored up, as it were, called back again, or *remembered*, and combined together in endless variety. Sometimes the ideas which thus reawaken, in the mind, seem so strange and new to us, that we fancy they are original, and that the mind has formed them at the moment, without previous knowledge of them. A litttle reflection, however, will show that the oddest waking thoughts, or the strangest and most confused dreams, are merely reproductions, or remembrances, of things we have known before, through the senses; only the ideas are disconnected and jumbled together.

The evidence of the senses, as to the existence and properties of things around us, is not only the sole evidence we have in regard to them at all, but it is usually considered conclusive. Thus, in the case above referred to, the man would say, "I knew some one was coming, because I *heard* him walking, and when I looked I knew it was A., because I *saw* him!"

People in this way depend upon their senses for knowing about everything outside of themselves, and rely fully upon them. Thus, every one will say, "If I *hear* footsteps I know that some one is walking; and if I *see* a man before me I know there is a man there!" *This, however, is not necessarily true*, strange as it may sound, except with a person in perfect health; for we may hear footsteps when there really are none, or see men, or other objects, when none are *really* present! Not *imagine* that we do so, be it remembered; but *really hear and see them*,—when subject to certain bodily derangements.

To understand how this is, attention must be called to what has been stated before, as to the connection of the senses with the brain. We hear a sound because it makes a certain impression on the nerve of hearing; and we see any object because it makes a certain impression on the eye, and optic nerve, and similarly with all the other senses.

These are called *objective* impressions or perceptions, because they are caused directly by the objects themselves which we see and hear; but exactly such impressions may be made on the senses, and be followed by exactly similar perceptions without the objects themselves, at the time, acting upon the senses at all!

Every mental state depends upon a certain condition of the nervous system, and if a similar condition can be brought back at any time, then a similar mental state is brought back. This is the case when we recollect things,—the mind gets again into its former state, simply because the brain returns to its former state. The same is true in regard to the senses, for there is *memory of sensation* as well as of perception. Thus, when we see a person we know the brain takes cognizance of a certain impression made on the nerve of sight, through the eye, and if that impression can be brought back, no matter by what means, the image of that person is seen, in his absence, just the same as though he were there. It is the same with hearing, and with all the other senses, the impressions we have once derived from them may return, long after the original causes of these impressions have disappeared. A particular sound, such as the voice of one much beloved, will often be heard distinctly, though that person may be far away. This arises from the fact that the nerve of hearing, from some unexplained cause, assumes the same condition in which it was when that voice was really heard.

The ganglionic centres of the special senses may be acted upon in two ways, externally and internally. Ordinarily they are acted upon only externally, as when we see any object, for instance, and the optic ganglion is acted upon by the impression made through the eye. But besides this, in certain states, the brain may react, in a direct manner, upon the optic apparatus, and recall the impression, formerly made by a real object, with such distinctness that the real object seems to be before the eye again. In other words, reversing the usual process, a similar *mental* state to what once existed brings back a similar *sensual* state to what once existed. The *mind* remembers, and, by direct action, causes the *eye* to remember. And in this way we see objects, or hear sounds, over again long after they have really vanished.

These impressions of things *backwards* as it were, by the mind reacting upon the senses, are called—

Subjective Impressions, because they result from the action of the mind when dwelling upon *subjects of thought*, and not from the influence of real objects.

Objective impressions on the senses, and the perceptions they give rise to in the mind, are caused therefore by real objects, or things, while subjective impressions are caused by the idea or thought, reacting, in a direct manner, on the organs of sense.

The *thought*, or mental impression, may be so powerful as to affect the organ of sense as strongly as the real object itself could do, so that the subjective, or ideal impression, may be as vivid as the objective or real one.

Thus there are some persons, as before stated, who habitually see people before them who are not there, and so distinctly that the false appearances cannot be distinguished from the real. A person whom I knew very well was affected in this way, and very often, when meeting an acquaintance, he would astonish him by saying, "Are you really there or not, for I cannot tell!" Many times no reply would be given, and then he would perceive that the person was really not present, but that it was a subjective instead of an objective impression. Such occurrences are more common than is supposed, and have often given rise to tales of supernatural visitations, warnings, and so forth. In like manner sounds may be heard when there really is no sound.

In all these cases, however, there is a certain morbid state of the nervous system, and consequently of the mind. In perfect health there is nothing of the kind. Persons strongly emotional are especially liable to receive subjective impressions for objective ones, and to take the mere products of their over-excited brains for objective realities..

These subjective visions are commonly called *ghosts* or *spirits!* They may easily be distinguished from real objects in the following manner:

If the side of the eye be pressed with the finger, with moderate force, any *real object* looked at will be seen *double*, but any mere subjective vision will not be doubled. We may therefore test, in this way, any unusual vision; and, if it be doubled, we may be sure it is a real material object we are seeing, but if it remain single we may be sure it is only a subjective impression, caused by some unusual condition of the brain or optic nerve. Ghosts and spectral illusions of all kinds may be tested in this way.

If the eye be pressed while closed, very peculiar combinations of light and color are produced, sometimes of strange form, and this often happens in various forms of disease, where there is pressure on the optic nerve. Some persons, on merely looking vacantly into space, see crowds of variously-formed objects floating around, all of which are simply subjective, and not real objects. Hundreds of ghosts and spectres have been thus produced, especially in individuals predisposed to see them.

An excellent illustration of this is found in the immortal Shakespeare's *Macbeth!* Macbeth sees the *dagger*, and Lady Macbeth sees the *spot* on her hand, in both cases because such things were the *subjects* of their thoughts.

A person well informed as to the action of the nervous system, and the way in which impressions upon the senses are produced, will know how to distinguish the false from the true; but one who is not so informed will be apt to accept all that he sees, or hears, as objectively real, or as something supernatural.

The religious enthusiasts, of all times, but more especially of long-past periods, have been mostly people of this kind; with little knowledge, and with imaginations wrought up to the highest pitch, they were constantly seeing and hearing things which had no actual existence, though real enough to them.

There is a state of mind, not unfrequently met with, in which the imagination of one person can be so readily acted upon by another, or by surrounding circumstances, that they can be led to see, or hear, anything which is suggested to them. Indeed numbers of persons can be so acted upon, at the same time, and made to see things, and honestly testify to them, which really never took place.

An excellent instance of this, as I have somewhere seen related, occurred during the Spanish conquest of Mexico.

At one time the Spaniards, a mere handful, were surrounded by such a countless host of enemies that their destruction seemed certain, and no escape possible. The priests, however, assured them that if they would boldly begin the attack, though the enemy were hundreds to their one, yet they would certainly be victorious, because *Saint Jago*, so it had been revealed to them, would be seen to descend from heaven on a white horse, and fight at their head. Accordingly so it happened, at the moment of the attack every man *saw* plainly the saint on his white horse, leading them on, and, as they firmly believed *he* could not be defeated, they felt no fear, but charged the enemy, routed them, and gained a complete victory. The whole army testified to the fact that the saint did so appear and fight, and no doubt every man *did* so see him ; nor is it so very wonderful when all the circumstances are considered.

These were a body of ignorant, pious men, full of enthusiasm, in imminent danger, with a firm belief in whatever the priests told them, and with the idea fixed upon their minds that the saint certainly would come, as was promised. There was no room for doubt, and the mental prepossession was so strong that it reacted upon the optic apparatus, and caused the eye to see *subjectively*, just as clearly as if the real object had actually been there.

This process of *leading the mind*, as it were, and causing persons to see objects and people not really present, and to witness actions not really performed, or to hear sounds which do not exist, is often exemplified in what are called mesmeric, and spiritual phenomena. People with a certain constitution of mind, or in a certain morbid condition of the nervous system, can readily be so impressed that they cannot distinguish false, *subjective* impressions, from real objective ones, but believe all things which they perceive to be real alike.

Thus, a short time ago, I saw a statement, from several well-known and estimable people, to the effect that a celebrated spiritualist medium had, in their presence, laid his face down upon a brightly-burning fire, and then put some of the red-hot coals upon his head, and yet was not in the least burned, nor even inconvenienced. This, it was said, he did repeatedly, and even brought the burning coals in his hand to show them. Now that these persons *saw* this wonderful thing I can readily believe, but that it really took place I must regard as impossible. Human flesh *will* burn, with a certain heat, and anything which does *not* burn at that heat is not human flesh, because it lacks one of its qualities. But, as I said before, the people who so testified might easily have *seen* the phenomenon, though it did not take place.

With them it was a *subjective perception*, caused by their peculiar mental condition at the time, and was to all intents and purposes as real, to *them*, as if it had really taken place. It must be borne in mind that all such wondrous phenomena as these, occur in peculiar circumstances;—there are usually few but *believers* present, the room is closed, and probably darkened, while all are kept on the tenter-hooks of anxious expectation for the wonders which are to come. It is seldom that anything of this kind is attempted in the light of open day, with no mystery or previous preparation, and before a promiscuous audience. In the case above referred to, the impossibility of the thing strikes every one who is unprejudiced, but still they cannot account for really honest and worthy people testifying to its truth, and saying that they saw it! The explanation here given, however, will show how this might easily occur, and will further show also that though *seeing* may be *believing*, as is commonly said, still it may not be at all a conclusive *proof!* In fact there are few things less to be relied upon, in certain circumstances, than what people *see* or *hear*. And further, there are but few people who can describe, truthfully and intelligently, what really passes before their eyes, as may be readily tested by getting a number of eye-witnesses to testify, independently, to some event, witnessed by all alike.

In all probability if the medium above referred to were to say, before a promiscuous audience,—I am now going to put my hand in the fire,—and make any pretence of doing so; there would, if believers were present, be many who would *see* him do just what he said he would do, and who would honestly testify to the fact afterwards. The fact that others did *not* see it, and testified afterwards just the opposite, would not shake their belief in the least, because they really *saw* the thing done. In fact I remember just such an occurrence, when a medium announced that he would lift himself up in the air, without any support, and many present *saw him do it*, though myself and several others, also present, could not see anything of the kind! The believers saw him *subjectively*, in the *air*, where he told them he would be, while the unbelievers saw him *objectively* on the ground, where he really was.

Now this is real honest misconception, which is more common than many suspect; and when to this is added all the trickery, and deception, practised in such matters—and there is plenty of it—we need not be surprised at the wonderful tales we hear about spiritual, mesmeric, and other phenomena, in which all the known laws of nature seem set at defiance.

Let a man appear before a large promiscuous audience, in some public hall, with a pan of red-hot coals, and then and there, without any trickery, place his hand upon it a sufficient time, and afterwards go round among the audience and show he is not burnt. This would be a fair test, and it is such a one as unbelievers have a right to expect. Or, as some one suggested, if a man can make himself *specifically light*, so as to float in the air, let him, before such an audience, fasten a rope round his neck, tie it round a beam, and *float off!* If he can really float in the air, as many have asserted they can, there will be no danger of his hanging.

Both these things might be done, in the usual manner, before believers, or be said to be done, and many would really *see* them, and believe them to be real. In fact there is *no limit* to what may be seen, subjectively, when once a certain frame of mind is attained. Nothing is impossible, for all the known laws of nature are set aside without any difficulty. Fire will not burn, heavy bodies will not fall to the ground when unsupported, and the most ponderous objects can be moved by merely pointing at them. Indeed improbability, or even impossibility, only increases wonder, with true believers, and never raises doubt, as I once saw well exemplified myself. A very powerful medium, as he was called, professed to lift from a table, up into the air, a large pail, full of water, and keep it suspended there for two or three minutes, by merely touching it with his finger. Being curions to see this, I managed to be present at one of the *seances* where this feat was to be performed, and watched the proceedings as closely as circumstances allowed. In the first place, however, the room was darkened, so that the outlines of objects were but dimly visible, and in the next place no one was allowed to approach too near, nor ask too many questions, as the medium was absorbed communing with the spirits. After waiting some time it was announced that the performance was going to take place, the medium touched the pail, some one called out—*there*, *there*, *see*, *see*, *oh! how wonderful:* well *I* could see nothing move, nor could a friend who was with me, though we watched till the medium, with a heavy sigh, took his finger away, as if weary with the labor, and sank back in a seat. Many of these present, however, asserted that they distinctly saw the pail move up into the air, and hang there, and I have no doubt they *did see it*, though at the same time I am certain it never stirred from the table. Without expressing any dissent, however, another *seance* was arranged for, in which the same thing was to be done, but on this occasion one of the unbelievers, who had access to the room, prepared matters by screwing the pail *fast to the table!* Well, the performance passed off just as successfully as before, and the same believers saw the pail lifted up, and poised in the air, clear away from the table! Nothing was said at the time about what had been done, but when the medium and his friends were gone, the master of the house, a very staunch believer, was shown how the pail had been all the time *screwed fast!* But did this undeceive him, or shake his belief? Not a bit of it;—*why*, said he, *that makes it more wonderful still!* So far from any doubt being excited, his faith was made all the stronger, for he had *seen* the thing done, and *seeing was believing!* Now that he did see it I have no doubt—in the way before explained—but his belief and testimony, or that of any number of eye-witnesses, can never establish it as a fact.

In all these cases a subjective impression, caused by a morbid state of the nervous system, is taken for an objective one, and the person sees what is not, in reality, before him.

It is the same with *hearing*. A person may hear a voice, distinctly, when there is really nothing of the kind, but merely a peculiar condition of the auditory nerve, and brain, which gives the same impression, subjectively, as if a voice were really sounding objectively. People of strong religious convictions, when of an emotional temperament, are peculiarly apt to be affected in this way. Thus we often read of them saying: "*I heard a voice from heaven*," or "*the angel of the Lord called to me*," and so forth. Now, in all these cases, the words are first in the person's own mind, and their impression of them is so strong, subjectively, that it reacts upon the auditory apparatus, and produces the same effect as a real voice. The person *hears* beyond doubt, thongh no one really calls.

The same phenomenon figures in many visions, and ghost stories, in which things are often both *seen*, and *heard*, beyond doubt, though there is really nothing either to see or hear, except subjectively, from the peculiar condition of the individual's nervous system.

The other senses may also be similarly affected, and people may taste, smell, and feel, what has really no existence, instances of which have already been.

Many of those who honestly believe they have *spiritual communications*, really take their own subjective impressions, of sights and sound, for real objective impressions caused by external agency. They make communications *to themselves*, without being aware of it.

In a state of complete subjective existence, a person is, in fact, *out of contact*, as it were, with the external world. Their subjective impressions are so strong that they overpower all objective impressions, so that what is really going on around is not seen, or heard, at all. A person in this state, in fact, can see and hear only what is reflected from his own mind, and may be perfectly unconscious of things about him, which other people see readily enough. Thus he may have the impression that a person is floating in the air, who is nevertheless all the time standing on the floor, as all those can see who are in a normal state of mind.

It is therefore no proof, in all cases, that a thing is really present because a person *sees it;* no matter how real it may appear to be. And there are people who are peculiarly disposed to see what is really not present, or what they are merely told to see.

In an assembly of strongly-excited people, as in a negro prayer-meeting, for instance, if it were stated that, at a certain time, an angel would call out certain words, numbers would distinctly hear them at that time, and be willing to testify that they did so. In fact there is no more reliance to be placed upon what people *hear*, in certain circumstances, than upon what they *see*, for both sight and hearing may be affected as strongly from their own mental condition as from real sounds or objects.

CHAPTER XXII.

ANÆSTHESIA AND HYPNOTISM.

Anæsthesia.

When chloroform or any other anæsthetic is given, it is well known that the individual loses all consciousness, and sensation, while the influence of the agent lasts. It would be a mistake, however, to suppose that this influence extends to the whole nervous system, except when an overdose is is given.

When a person is put to sleep, by chloroform for instance, it is simply the brain that is acted upon, and chiefly that part of the cerebrum which is the seat of consciousness. The spinal and sympathetic systems are unaffected, so that all the functions which depend on nervous influence from those parts go on as usual. The subject knows and feels nothing, but the heart continues to beat, and the lungs to act, as usual. In short, *involuntary* nervous action is not interrupted, but only consciousness and *voluntary* movement. That is, when proper and safe doses of the anæsthetic are given; but when an overdose is administered, then the other parts of the nervous system are acted upon, and the involuntary motions are suspended, so that the heart and lungs cease to act, and death ensues.

Dr. Richardson illustrated this matter very well in the following manner. He administered ether to a pigeon, till it was fully put to sleep, and apparently without consciousness or sensation. Then he passed a current of electricity through its body, from head to foot, and immediately the pigeon rose up, opened its eyes, and expanded its wings, as if about to fly. The current of electricity was then stopped, and instantly the bird became as sound asleep as before.

Now, this experiment showed that the muscular power was there, all perfect, but there was no *will* to set it to work, because the brain was asleep; but the electricity took the place of the brain, and excited the muscles to act just as the will would have done if the brain had been awake.

Another pigeon was put to sleep by *freezing* the brain till it was apparently lifeless; but on passing the electric current through its body it arose and flew about the room. On stopping the electric current it instantly became lifeless as before.

The precise way in which anæsthetics act is not known; but there seems good reason to suppose that they destroy the power of *conduction* in the nerves, so that the nervous current cannot pass through them.

Hypnotism.

A curious instance of the way in which one part of the nervous system, under peculiar conditions, may affect the whole, is afforded by the phenomena of what is called *hypnotism*.

Mr. Braid was the first who called attention to this subject, and who gave a public exposition of it. He showed that when the eye, and the attention at the same time, are fixed steadily upon some object, a sense of heaviness is felt sooner or later, which finally causes the eyes to close and sleep to set in.

The attention and eye must be fixed on that one object alone, and nothing else noticed in any way. The effect is almost certain in every case, if the gaze and the attention be steady enough; but it may be much hastened by placing the object at such a distance as to strain the eye as much as possible, in looking at it.

In some of his lectures Mr. Braid put dozens of people to sleep in this way, in the public hall, by simply directing them to look steadily at some bright object which he hung up, and to *think* about it intently.

He remarks, in his book on *Neurypnology*, that the pupils of the eyes become, at first, contracted, but shortly after expanded with a kind of wavy notion, till finally they close, generally with some quivering or vibration. The subject is then soon sound asleep, and in ten or fifteen minutes is even partially *cataleptic*, the limbs retaining exactly the same position in which they happened to be. When not so fully affected as this the patient may be softly spoken to, and will place the limbs in any desired position, and they then soon become more or less rigidly fixed, the pulse at the same time becoming much quickened.

All the special senses, except sight, become more acute, and some of the mental faculties even become much exalted, as if the subject had been taking wine, or opium. This excitement, however, passes off, and is followed by a state of depression, or torpor, deeper than the soundest natural sleep, from which, if left alone, the subject gradually recovers, and resumes his natural state.

It is, however, a remarkable circumstance that, while in this state of torpor, any muscle, or organ, may be instantly awaked, and brought into a state of intense action, by simply directing a current of air upon it, so that one part of the body may be in a state of intense activity, while the rest is in a condition of perfect torpor.

The explanation of these curious facts is, that the eye, and that part of the brain acting with it, become wearied and tired out, so that they fall asleep, and thus entirely upset the balance of the sensual and mental action, till the whole nervous system becomes deranged and wearied, and finally falls into a state of torpor. The action of the current of air, in awaking and exciting any organ or muscle, is owing to its action upon the nerves of sensation, ramified in the skin, which convey the sensation to the nervous centre and cause a reflex action.

Here again we have our explanation of many recorded cases of religious devotees, and others, going into trances, and having visions while praying, and seeing sacred objects. Suppose one of these persons to fix the eyes, and the attention, steadily upon the cross, or an idol, as they often do very intently, *hypnotism* would be very apt to ensue. The person would go into a trance, perhaps become cataleptic, see visions, and hear voices, all of which would be considered supernatural.

Steady reading, when the brain is tired, soon sends people to sleep, in exactly the same way; the eye and the attention both are directed to the book, and a state of hypnotism naturally ensues.

CHAPTER XXIII.

THE NERVOUS AND SEXUAL SYSTEMS.

Connexion between the Brain and the Sexual Organs.

The brain is connected with every part of the organization, either directly by its own special nerves, or indirectly through the other nervous centres. In consequence of this connection, it is influenced by the peculiar condition of every part, and returns back to every part a peculiar influence in return.

There are, however, certain organs between which, and the brain, this mutual sympathy is more strongly manifested than between any other parts of the system.

The sexual organs, in both sexes, from infancy upwards, influence both the development and functional action of every portion of the body. But they particularly influence the nervous system, and especially the brain, and are strongly influenced by it in return. The net-work of nerves connected with the genital organs is both extensive and complicated, more so perhaps than we find in connection with any other organs. This large mass of nervous matter is not only directly connected with the spinal marrow, but also, through numerous branches, with the nerves of every other organ in the body, and therefore influences, and is influenced by them all, as will be seen by reference to the plates previously given.

This large mass of sexual nervous matter is placed at one extremity of the body, and the brain at the other, and they are connected by the spinal marrow, along which a nervous current is perpetually passing from one to the other. Sometimes the brain preponderates over the sexual system, and at other times the sexual system preponderates over the brain; but always there is a mutual influence exerted, more or less, by each upon the other.

We see this fully exemplified in youth; for if the sexual organs be then destroyed, the development of the whole system is changed, and the character of the individual becomes abnormal.

In mature life, also, the loss or serious impairment of the sexual organs exerts a baneful influence upon every other part of the system. In fact, at every period, up to old age, the same thing is shown, in some form or other, There are, however, many ways in which this mutual sympathy, between the brain and sexual organs, is manifested, which are not generally recognized, except by physicians and physiologists.

A large number of nervous diseases, especially in females, are caused by the spinal marrow and brain being irritated, sympathetically, by the peculiar condition of the sexual organs. The monthly action of the ovaries and womb, even in health, makes the female, periodically, a changed being, different, bodily and mentally, to what she is at other times. But when the womb or ovaries become diseased, their influence becomes still more strongly manifested, and sometimes in very peculiar ways.

In fact the female may be said to be, for most of her life, completely under the domination of the sexual system. Her thoughts, her feelings, and the peculiar bent of her mental faculties, are all influenced by it, though unconsciously to herself. Most of her diseases also, are either directly connected with the sexual system, or materially influenced by it, especially those of a nervous character.

In fact, the workings of the nervous system in the female are, for the most part, merely a reflex of the working of the sexual system. So much so is this the case that, in treating female nervous diseases, the condition of the sexual organs must always be ascertained first, because there may be the cause of the whole trouble.

It is not, however, the physical condition of the sexual organs alone that must be considered, but the moral state of the patient as influenced by them. The passion of *love*, according as it is gratified or not, exerts a preponderating influence over the female character, and, by nervous influence, over the bodily condition also. This powerful passion—the ruling one in females—may either destroy or restore health, cause various forms of mania and insanity, or lead to the sublimest acts of heroism and devotion.

It is, therefore, absolutely necessary in young females, especially when there is no obvious physical sign of disease, to ascertain her condition morally, in reference to this passion. For want of doing so medical science, and medical men, have often been put to shame, and compelled to own that there was an influence operating more powerful than any that medicine could exert.

It is the same, though to a less degree, with the other sex, especially in early life, and the cause of many mysterious derangements, both bodily and mental, must often be sought in the sexual system, and the passions therewith connected.

Influence of the Nervous Condition of the Parents, at the Moment of Conception, Over the Nervous System of the Child.

The general doctrine of hereditary influence has been already stated ; but there is one way in which it is often shown, which must be more specially mentioned ; and that is the peculiar influence which is exerted, over the future child, by the nervous condition of the parents at the moment of conception ! That such an influence is exerted, at that time, seems well established, nor is it anything but what might be expected.

At that supreme moment, when the first rudiments of the new being have their commencement, when the foundations of its future constitution are laid, the conditions of the parental organizations, from which it springs, must be of the first importance. In the father there is the vital fluid itself, the semen, with its mysterious living animalcules ; and in the female, the ovum, or egg, which, by its union with the semen, originates the embryo. If either of these be in any way imperfect, the resulting new being must be imperfect also ; and nothing is more likely to make them imperfect than a diseased, or disordered, state of the nervous system.

For instance, several cases are on record in which women have conceived while in a state of intoxication, and the children have been *idiots!* Similar results have also followed from the father being intoxicated at the same time ; and those who have read my "*Marriage Guide*" will readily understand why this should be. It is there shown that the seminal *animalcule* is indispensable to impregnation, and that it probably forms the basis of the *nervous system* in the future child.

Experiment has also shown that these animalcules, like human beings, are affected by many kinds of drugs, in very peculiar ways. Alcohol, for instance, will *intoxicate* them, and leave them afterwards weak and powerless. The intoxication of the father therefore, probably, affects the animalcule which impregnates the egg, making it feeble ; so that the resulting child starts from a bad foundation, and never becomes perfectly developed.

So also if the woman be intoxicated, at the moment of impregnation, the ovum, or egg, will be correspondingly imperfect ; and then, though the semen may be healthy, still, from not having a perfect ovum to develop in, the animalcule cannot originate a perfect organization.

In either case, the future child starts under unfavorable conditions, and in all its after-life can never escape the consequences, bodily and mental, which have been entailed upon it by the condition of its parents at the moment when it was conceived.

It is not only such extreme conditions as intoxication, however, that operate at this time, but any unhealthy or disordered state of the mind, or feelings, no matter from what cause. Many observant parents have assured me, as the result of their own observations, that they could distinctly trace some peculiarity in their children, mental or moral, to something connected with themselves at the time when those children were conceived; and I have no doubt but that similar observations would be made oftener, if the attention of parents were directed to the subject.

None but healthy men and women ought to become parents at all; and when mankind become more fully enlightened on such matters, none others will. But particular attention should be paid to the condition of the parents at the time of conception, and especially to the condition of the nervous system. In this way, disease can be avoided, and a complete, healthy development secured of all the faculties, both bodily and mental.

At the present time insane people, epileptics, drunkards, cancerous, scrofulous, and all other kinds of diseased people, propagate and perpetuate their imperfections, without a word being said against it. No one dares to hint that such people should not become parents; and yet, in the interest of mankind at large, they never ought to be so. Proper control over this matter would *prevent*, in one generation, more disease and suffering than all our medical skill will ever be able to cure, and would ensure more mental development immediately than education alone can effect in a century.

In the mean time, parents themselves may bear this fact in mind, and remember that the mental, as well as the bodily constitutions of their children depend, in a great measure, upon them; and may be, to a great extent, just what they choose.

In times of great public terror and anxiety, as in wars, revolutions, and persecutions, numbers of children are born imperfect, either bodily or mentally; and more would be so, only the same causes lead to frequent miscarriage, and thus the number of living births is diminished.

I once knew a very energetic, clear-headed, successful business man, who had two sons just like himself, and another with a feeble, nervous organization, weak in purpose, irresolute, and incapable of any continued mental effort whatever. The contrast was remarkable, and was a matter of common observation among all who knew the family.

When talking with the father one day he alluded to the matter himself, and said, "I will tell you, Doctor, what is the cause of the singular difference between my son S. and the others. Your explanations of what occurs at the moment of conception have made it plain to me, and the explanation will, I know, be interesting to you.

"Well, the facts are just these: In the summer of 18— I failed, owing to my rogue of a partner running off with all our money. No man, perhaps, ever felt such a misfortune more keenly than I did, and it seemed to me I should never get over the shock. I was completely unmanned, and feared I should go crazy. Well, during this state of things my wife conceived, and *there is the result!* Poor S! He inherits just the state of mind I was then in."

This was a very interesting confirmatory case, and I have met with many similar ones; the influencing condition being sometimes in one parent, and sometimes in the other; though mentally, I believe, the father's influence is much more frequently seen.

The actual influence of the sexual system over the nervous system, and over the whole body, in fact, especially when there is sexual disease, or derangement, is fully shown in my other books, "The Marriage Guide," and "The Male Generative Organs."

CHAPTER XXIV.

INFLUENCE OF MIND UPON MIND.

Every one is well aware that one mind does affect another by association or suggestion, or by that singular influence which the mentally powerful exert over the mentally feeble.

In all such cases, however, the minds come into actual conscious contact, either from personal association or from ideal suggestions, and each one knows when and how he is influenced by the other.

It has been stated, however, that one person, by an act of his own will, can affect another person's mind without any contact, or tangible communication, and without that person's knowledge. In other words, it is said that the *will* of one person can be controlled by the will of another person, without any intercourse taking place between them, and without the person so influenced knowing anything about it.

Persons who are said to possess this remarkable power, in an unusual degree, are called *mediums*, and those who are most readily affected by it are called *subjects!*

The power exerted by a medium over a subject is said to be, in some cases, almost absolute, so that the subject really has no will at all of his own, but is moved entirely by the will of the medium. Thus, a man in New York may, according to this theory, make a man in Boston, or anywhere else, do just as he wills him to do, without the one so influenced being at all aware that he is so acted upon.

The explanation given of this assumed influence is, that the nervous power acts just like *magnetism*, without actual contact. Thus, a powerful magnet will cause a needle to move a long way off, and even if there be solid objects between. In the same way, it is said, a powerful *will*, which is only one form of nervous power, may affect another will, even at a considerable distance, and just as the magnet acts upon some bodies, and not upon others, so does the nervous power act upon some minds and not upon others!

It is assumed, that there is, all the time, emanating from every active brain a certain amount of nervous power, which is sometimes called *the brain wave;* and that this affects every other mind within its influence. Of course there must be a mutual action, and reaction, but the stronger wave masters the weaker one.

How *far* these brain waves are capable of acting, or at what distance, and in what circumstance one mind can influence another, is not known. In fact, the whole thing is, as far as I can ascertain, a mere theory, unsupported by any solid facts whatever. No one, perhaps, would be justified in saying that there was no such mutual brain influence; but certainly the evidences of it, so far, have been very scant, if there have been any at all.

Sometimes one person will think about another suddenly, and find afterwards that the other one had been, *at the same time*, thinking about them; or, there will be vivid thoughts, or even subjective visions, of some one at a distance to whom something happened at that precise moment, and all such cases are regarded as proof that there must have been some mysterious connection between the two minds.

All such incidents may, however, arise from simple coincidence; and when we take into account the crowd of thoughts that pass through every one's mind, every day, it can hardly be surprising that similar ones should be in different minds at the same time. Nor is it at all wonderful that one man should think about something happening to another, a distance off, at the very time when just such a thing does happen to him.

We imagine thousands of things which do *not* happen, and think nothing of them; but if by chance one *does* happen as we imagined, we think it something supernatural. The only wonder is that our thoughts, and actual events, do not correspond oftener than they do.

What are called *presentiments* are also attributed, by many, to some influence outside of our own minds. Thus, when a man imagines that a certain event is going to happen, and it does so, it is thought that some spiritual or mental influence has given him a warning. But, in many of these cases at least, it is merely the unconscious workings of the man's own mind, following out a regular train of ideas, which leads naturally to the so-called presentiment. It is really the result of study and investigation, going on unknown to him—*unconscious cerebration*, in fact.

But, besides this, thinking as we do, all the time, about so many different things, it must happen, *sometimes*, that our thoughts correspond with something that takes place afterwards. It would be strange, indeed, if they did not, and, as remarked before, the wonder rather is that they do not do so much oftener. People overlook the fact that we imagine, and have presentiments, about things that do *not* happen, all the time; and for one instance where the presentiment is fulfilled there are thousands where it is falsified. But if there were only one case fulfilled, and a million falsified, people would fix their attention on the one, and refuse to consider the million. At least most *emotional* people would do so.

It is contended that some persons are affected by others, when near them, without actually knowing of their proximity. It is said that they experience a peculiar feeling, or kind of nervous impression, caused afterwards by some influence emanating from the other person, and which affects their nerves. But all this is too vague, and, being unsupported by any obvious facts, cannot be tested.

On the whole, there is no positive evidence whatever, as far as I can ascertain, that one mind can influence another in any way other than the usual way; that is, by the communication of ideas, or the exciting of emotions, of the source of which the mind so acted upon is always conscious.

That one person does often affect another in a peculiar way, merely by their presence or close proximity, is, I believe, well authenticated; but this arises, probably, from peculiar gaseous, or electrical, emanations, and not from mental influences, as is shown in another part of this work.

Pscychic Force.

Besides the assumed action of mind upon mind, in the manner above explained, it is also said, by some, that mind can act upon matter, and overcome what are called the natural forces. Thus it is stated that heavy objects can be deprived of all weight, so as to float in the air, and be so changed in nature as not to burn when put in the fire. Men are said to have floated in the air, and to have put their hands and faces in the fire without being burnt; and all by the influence of what is called *pscychic*, or *mind* power.

It is sufficient to say, about these alleged phenomena, that they take place in such equivocal circumstances, and so capriciously as to time and place, that it is impossible to properly test them. When we wish to test any alleged discovery in magnetism, electricity, or pneumatics, we can always do so with a certainty as to the result. We know that certain things act in certain ways, in certain circumstances, and that *they always do so;* the magnet does not refuse to act because certain people are present, or certain others absent, nor does it require a darkened room, or any special contrivances; it is always the same, and so likewise with all the other natural powers. But when we come to *pscychic force*, or *mind force*, we are told that it did certain wonderful things, for Mr. So and So, in certain circumstances; but when somebody else tries the same thing, in exactly the same circumstances, nothing takes place. Nay, even the same person, when asked to repeat the phenomena, cannot do so—the force has all left him, or the baneful influence of unbelievers present prevents its being manifested.

In short, no reliance whatever can be placed on this assumed pscychic force. We can never find it when we want it, and therefore can never test it, as we do other natural forces. It is too capricious, and tricky, and too much disposed to exhibit itself only to a chosen few, and in the semi-darkness.

Having tried to fix this assumed force, and cause it to show itself clearly, in open daylight, but without success, I have determined in the future to let it alone, till it can be shown, and experimented with, like the other natural forces.

My own impression is that most of the pscychic phenomena we are told about, when there is no deception, are simply *subjective mental phenomena*, such as have already been explained.

CHAPTER XXV.

UNCONSCIOUS BRAIN WORK.

Unconscious Cerebration.

Usually, when our intellect is at work we *know* that it is working; or, in other words, we are *conscious* of the fact, and few persons think it possible that the brain can work without our knowledge. There are, however, some facts, well known, which seem to disprove this, and favor the idea that the brain can go on with a train of thought, or pursue a subject of investigation, without our being aware of it, till the mental process comes to an end.

Thus, for instance, something will strike us as being strange, and we will try to make it out, but without success, till at last we drop it altogether, and think of something else. Then, after the matter has been forgotten, and seemingly passed from our minds entirely, perhaps for a long time, it will suddenly return, and we will see through it clearly all at once! Or, we may endeavor to call something to mind we have forgotten, and try hard to bring it back, without success, till at last we tire of the matter and go to something else. Then, hours after, while we are busy thinking of other matters, up comes the thing we had been trying to remember, and we call out, "*That's it; that's what I was trying to recollect!*"

Every one must have had this experience often, and yet few perhaps have thought how it is to be explained. Here is something we cannot remember, when we try to do so; and yet, after we have given up thinking about it, and are busy with other things, up it comes without any notice, just as if some one came into the room suddenly and announced it to us.

Again, in another way, we often see this unconscious brain-work exhibited. A person will be thinking of nothing at all, as we commonly say, just lazily day-dreaming, perhaps half asleep, when suddenly a brilliant idea comes into his mind, fully developed, about something he has paid no attention to for a long time.

Sometimes even, the subject will be something quite new to us, and about which we have never previously occupied ourselves, or but slightly. Now in such cases it seems almost obvious that the brain *has been* at work, though we were not aware of it, till the work was successfully ended.

If this be so, then *consciousness* is a distinct faculty, which may not always be in action; so that we may often be mentally at work without knowing anything about it; and, indeed, onr daily experience makes this extremely probable.

Many physiologists explain it thus. They say that, when the mind sets to work in this way, to make something out, certain parts of the brain are concerned in the process, and continue to work at it, even after our direct attention is withdrawn from it, or even turned to something else. Or, in other words, after we are tired of tryiug to make out this particular thing, and are busy with other matters, these parts of the brain still keep working at it, though we are unconscious of the fact, and finally they work it out, by themselves, as it were, and then announce to us the result! This is called *unconscious cerebration*, or the brain working without our knowledge.

Whether this is the true explanation of the phenomenon or not, it seems very plausible, and it certainly appears to be the best theory yet given.

Mathematicians will often puzzle over a problem for a long time, and then, after forgetting all about it, and while busy with something else, the solution will come to their minds all in a moment. So, also, with inventors; they will often try in vain to discover something they want, and at last give it up in despair; but eventually, perhaps long after, the very thing will come into their minds in an instant.

Now it certainly does seem as if the brain had been at work in these cases, unconsciously, or without our knowledge, trying, as it were, to make matters out, and announcing to us the conclusion, when arrived at.

Another fact similarly explained also is this, that we can go on with several different trains of thought, or can be doing one thing and attending to another, at the same time!

Thus some persons will play a complicated piece of music; and, while they are playing, will keep up a conversation with those around, without letting the music and the conversation interfere with one another.

Now, in these cases, it would seem as if different parts of the brain were employed, one with the music, and one with the subject of conversation, and this is what many think is really the case. In some cases, the player will be so interested in the conversation as to *forget* all about the music, and yet *keep on playing it correctly!*

This would seem almost to prove that part of the brain was at work *unconsciously*, while another was at work *consciously!* Sometimes even more than two subjects will be thus considered at the same time, and yet all will be duly attended to.

Lord Brougham had a wonderful faculty of attending to many things at once; he would write a letter, listen to a speech, and talk to those around him, all at the same time, and do each thing well, neglecting nothing, and letting nothing escape him. In such a case it almost seems as if each part of the brain acted independently; and that there were, in fact, as many separate *minds* as there were portions of the brain at work.

This, however, is sometimes explained in another way. It is supposed that, in all these cases, there is really no unconsciousness, but that all that is going on is known, only the attention bestowed upon some things is so slight, compared with others, that it escapes our notice. The conscious attention, in fact, is supposed to be divided amongst all the things which are done; but some things receive so much more attention than others, or we are so much more fully conscious of them, that the others seem to have no attention at all. Thought is supposed to be quick enough to fly, as it were, instantly from one thing to another, backwards and forwards, and so to be directed to a number of things at the same time apparently. It is contended, however, that this is *only apparently;* and that, in fact, the mind never attends to but one thing at a time, and that there is always an interval, however short, between the doing of one thing and the doing of another.

Such are the different views entertained upon this matter; but I believe the majority of physiologists, at the present day, believe in the process of *unconscious cerebration*; or, in other words, in the brain working upon trains of thought, and pursuing investigations, without our being necessarily conscious of what it is doing, and even while we are doing and thinking of something else.

It is very probable that there are great individual differences, and that some persons habitually reason, and investigate, unconsciously, while others do so only occasionally, or not at all.

It has been suggested also, in connection with this subject, that perhaps the double nature of the brain may have something to do with this phenomenon. The two halves of the brain, as already shown, though connected, are still perfect, each one by itself. In fact each half is a real brain, independent of the other half, and possessing every part requisite for the full performance of all its functions. One half may be much injured, or even completely paralysed, and yet the other may remain unimpaired, and capable of perfect action, in every way. It is thought, therefore, that *possibly* one brain may attend to one thing, and the other to another, at the same time, though ordinarily they both work together at the same thing.

The real use, or reason for, this double state of the brain is unknown, nor do we know how far the two halves are really connected functionally, or are independent.

The whole nervous system, it must be remembered, is equally double, in every part, the two halves being exactly alike,—with the exception of the *sympathetic nerves*, which are single. The *doubleness* extends to every part connected with the *animal* life, but not to the parts connected with the mere nutritive, or vegetative life.

Perhaps the two brains act in concert, like the two eyes, and enable us to understand a thing better, from the double attention, just as we see a thing more perfectly from the double vision. It has also been suggested that possibly they may act alternately, one resting while the other is working; but the fact is, we know nothing about it, and can give no reason why the brain is in two equal and similar parts, instead of in one uniform mass.

Introspection.

The facts above given show that, in many cases, at least, the process of *reasoning*, *studying*, or *thinking out* any matter which we wish to understand, may go on *unconsciously*, that is, without our *knowing* that it is going on; just as the process of digestion can go on without our being aware of it. Probably because *reasoning* results from the action of one part of the brain, and *knowing*, or mere *consciousness*, from another part, and the two may not always act together!

Ordinarily, it is true, we know when we are studying, or reasoning upon any matter, and we can even watch and guide the process more or less; but every one's experience shows that this is not always the case. Very often, for instance, we ponder upon, and study at some subject with all our might, without making anything out about it, till finally we give it up, and forget all about it. And yet, perhaps a long time after, the whole matter immediately strikes us all at once, perfectly plain and clear. In such a case, it is evident, that the *reasoning* part of the brain continued working away at the subject, *by itself*, after the *knowing*, or *conscious*, part of the brain had lost sight of it. Such experiences are of constant occurrence with every one, though their true significance has only lately been understood. When we have forgotten anything, or when we cannot make it out, we commonly say, "Oh! it will *come to my mind* by-and-by;" and so it usually does, sooner or later! The attention is taken away from the matter, we are no longer conscious of it, and the reasoning faculty silently makes it out by itself, better perhaps than if we had been all the time watching the process.

We can, therefore, reason either *knowingly*, or *unknowingly*, and some persons habitually do more unconscious reasoning than they are aware of.

The sudden making out, or seeing into things, which have puzzled us—when we are thinking perhaps of something quite different—which so frequently surprises us all, is arrived at in this way, by the unconscious working of the reasoning powers.

It has been well said, by a celebrated physiologist, that *consciousness*, and *will*, bear the same relation to the *intellect* that the *rider* does to the *horse!* As a rule, the rider directs, and the horse obeys; but the rider may be abstracted, may forget altogether he is in the saddle, and yet the horse will go steadily on his journey, if well trained, just as well without his master's guidance as with it, or sometimes even better. The man may suddenly wake up from a deep reverie, and find himself at home, the horse having taken him there while he was unconscious; just as the intellect often takes us through all the steps of some difficult problem, till we arrive at the solution, without our having been at all aware what was going on.

It may even be the case that the rider may be lost, and not know which way to go; and his best way then may be to let the horse go by himself, trusting to his instinct to find the right path. Many a lost traveler has thus been brought home safely by his steed, who would never have arrived there if he had insisted on *guiding* the animal.

In the same manner we should often act wisely, when *lost* about any matter we have been studying, to leave the intellect alone, and let it work itself, while we turn our attention to other things.

In fact, the very best reasoning we do, in many cases, is done in this unconscious way, and paradoxical, as it may seem, we often see clearer into a matter by *not looking at it!* That is, by not fixing the attention upon it, and trying to force the intellect to consider it in a certain way. The more we do this, and pore at it, the less clear it becomes to us; but after we have let it alone for some time, and forgotten all about it, the intellect suddenly presents it to our view clear and plain. The reason, like the horse, often finds the way best when left to itself.

As a rule, the best way to thoroughly understand any difficult subject, which requires much close reasoning, is to first fill our minds with all the information about it that we can get, and then turn the attention entirely away from it to something else. When this is done, the intellect will usually, unconsciously to us, arrange the facts that have been accumulated, go through a course of systematic induction, work out the conclusion, and suddenly present it to us all complete!

Such a process is very similar to the ordinary process of *digestion*, in which we first fill the stomach with food, and then leave it to gradually concoct, and finally digest into perfect nutriment. We need be in no way *conscious* of what is going on, and in fact had better not be, but we know when the result is finally attained.

The facts with which we fill the mind, when studying any subject, may be considered as *mental* food, which we leave the intellect to digest at leisure, without it being necessary for us to be conscious that the process is going on, and which in fact, usually goes on better when we pay no attention to it.

If a man, after a meal, be all the time watching his stomach, and trying to make out how it is going on, noticing every motion, and wondering if all is going on right, he is pretty sure to hinder digestion and make himself dyspeptic.

In like manner, if a man, after a mental meal of *facts*, will persist in constantly watching the course of *intellectual digestion*, and arbitrarily interfering with it, he is pretty sure to spoil the process, and make himself mentally dyspeptic.

In fact this is the way, often, that men become only the more *muddled* about any subject the more they study it. If they would forget all about it, and turn the attention to something else, the unembarrassed intellect would gradually make all clear to them,unexpectedly.

In such a case, to refer to our former simile, the rider is confused, and has lost his way, and the best thing he can do is to give his horse the reins, and let him find the right track, without interference.

Children are often worried about their lessons, and forced to attend to them, as it is called, till they come to know nothing about them, from mere confusion of mind. If left alone, and not forced to attend, or be conscious, they frequently understand them much better. And this explains why children who do not attend to to their lessons, often learn them better than those who do.

Teachers and parents are not always aware that there may be *too much conscious attention*, and that a lesson may be often better understood if it be *forgotten* for awhile.

The Diagnosis of Disease.

This principle of unconscious cerebration may be advantageously applied to *the diagnosis of disease*;—that is, to the tracing out *what* the disease is, or what organs are affected, and how! In fact it is the only true way to study an obscure disease, and the only one which will enable us to fully understand, and properly treat it. The physician should first ascertain all he possibly can about the patient, gather all the *facts* as to his bodily and mental condition, and make a thorough examination of him, mentally and bodily, as far as possible and necessary. Having done this, he should then let his intellect work upon the case, taking its own way, and its own time, uninterfered with by the will, or by any set rules. Very possibly he may become, for a time, quite unconscious of the patient's existence, and may forget all about the case; but sooner or later its true nature will become apparent, and he will see clearly what is the matter, and what to do.

This method is very different to the ordinary medical process of going by set rules, or guessing *hap hazard*, of which we see so much; but unfortunately there are but few persons who can practice it.

In fact, this power of unconscious reasoning, or *mental digestion*, if it might be so termed, is an attribute only of a certain order of mind, at least in its more perfect form. Every one, it is true, does more or less unconscious cerebration, but some people do it *habitually*, and *systematically;* and can at any time apply their intellectual powers in this way, to any subject that interests them. It is a peculiar gift, and one that has been possessed by all men who have made themselves intellectually great.

A very proper name for this remarkable mental process is *Introspection*, or the power of looking within.

The rapidity with which the intellect, in some people, when left alone, will run over all the facts of a case, string them together, and draw from them the proper deduction, is astonishing; and all may be done without the person knowing or being conscious of it till the end is reached. This is really what is called *genius*, and in former times *prophecy*. It is also the foundation of what there is real in clairvoyance, animal magnetism, mesmerism, and psychology.

The majority of those who profess to deal with these subjects, both professionally and as amateurs, are mere pretenders, who practice upon the credulity of those who consult them. By using indefinite language, and by dealing in vague generalties, suitable to all cases, they manage to impress upon the patient that they are describing his particular case, *psychologically*, and he wonders how they could possibly find out so much. Generally, also, they manage to obtain all the information they really need from the patient himself, without his seeing how they do it. Some well-arranged *leading questions* elicit replies that tell much, to a shrewd mind; and these, with a few vague utterances, which may be taken either as questions or statements, draw out all that the Professor really requires to know. It is, in short, for the most part, a victory of cunning over credulity; and the patient is simply astonished to receive back, in a *mesmeric* revelation, the very information he has just been unwittingly giving himself. Besides this, the patient, if a believer, is in such a state of mind that he cannot distinguish between what is *objective*, and what is *subjective*, as will be readily understood by referring to the foregoing chapter on objective and subjective impressions.

When a firm believer, or a man who is naturally credulous, goes away from one of these mesmeric consultations, there is, in his mind, a strange jumble of what he has heard from the Professor, what he has said himself, what he has imagined, what he has previously known, and what has been suggested to him! He cannot separate one from the other, nor give a clear and intelligible account of what has taken place.

With the man who has had a proper scientific training, and who has the scientific habit of thought and examination, the case is very different. Such a man always requires the examination to be conducted in such a way, and with such tests, as he would require in the study of any alleged physical fact, and to this the professor usually demurs.

Some of these professors have, however, the power of *introspection*, more or less, and can really make out much that is obscure to ordinary means of investigation. But when this is the case, they are apt, too frequently, to mix up what is real, in their practice, with much that is fanciful or even deceptive. Many of them soon discover, from experience, that it is much more easy to impose upon those who consult them, than to really enlighten them; and that it is not worth while to *introspect*, when mere ordinary unmeaning generalities give perfect satisfaction.

It must not be forgotten that, in certain mental conditions, a man can easily be made to believe that he has seen, or heard, anything whatever that those who have impressed him wish him to believe.

A mesmeric, or clairvoyant examination, is a very instructive and amusing experience, to a scientific student of the human mind, and shows clearly how mere subjective impressions create conviction of objective realities.

All the professors, of these different so-called sciences, profess to give information without being told anything. But, in fact, they do no such thing.

As already explained, they obtain information in an indirect way, and then give it back again. When they are *told* nothing they can *say* nothing, except what would apply to any one of a dozen different cases. With introspection, or unconscious cerebration, it is quite different.

In the introspective process the practitioner commences by gaining, *first*, all the information he can, of every kind, about the patient, and the case; and, from the knowledge thus acquired, proceeds to gain more. From what is *known* he proceeds to make out what is *unknown*, and the more knowledge he starts with the more he arrives at. He must also be a thoroughly educated man, well versed in a knowledge of the human body, and of its different diseases, and the various modes of treatment. If he be not a man of this kind, the knowledge he gains of the patient's condition must be very limited, nor can he make any good use of it.

Many of the mesmeric and other professors are quite ignorant upon such matters, nor do they profess to be otherwise, but pretend that their wonderful second sight enables them to dispense with such knowledge. This, however, is a fallacy, and a mere pretence to cover up their ignorance. Some of their explanations of the human interior, and of the condition of its different parts, are most amusing, and fully prove what they say, that they *do not gain their knowledge by dissection!* I have heard one of these men, after professing to have been examining the inside of an absent patient, and stating the condition of the different parts, ask very gravely if it was *a man or a woman?* And yet the person who was asking for the information could not see the absurdity of the question. Let any one imagine, however, the professor asking the *sex* of a human being, whose inside he had been roaming about at his leisure, for ten minutes or more! If a man can examine the inside, as they express it, of an absent patient, or even the *outside*, they do not need to be told if it be male or female; and the very fact of their first asking the *sex* should show any one that they cannot make any such examination.

There is, then, a fundamental difference between *introspection* and mesmerism, or any of the kindred sciences so-called; all of which profess to give information without receiving any. Introspection, on the contrary, commences with first gathering all the information that can be got at about the case, and from this preliminary information, by a strictly inductive, though unconscious process, obtaining still further information, such as could never be arrived at by any ordinary mode of investigation.

All the changes, or phenomena, that occur in nature, both mental and physical, are linked together in a regular order, or sequence, called cause and effect. One change, or phenomenon, follows another, like the links of a chain, so that all are connected; and no one can take place by itself, but must depend upon something which has preceded it, and connect with something which follows.

In order, therefore, to arrive at a knowledge of any change or event unknown to us, we must begin with those links of the chain that we really hold in hand, as it were; and from them pick up, link by link, till we arrive at the one we want. The great point is *to keep to the chain*, and not miss a link; for if one be missed the chain is broken, and we never can be sure, afterwards, that any part we may take up again is connected with the part we started with.

So long as we can *see* the links, or otherwise recognize them by our senses, all is easy enough; and this is as far as ordinary investigation usually goes. The difficulty begins when we can no longer do this; and when this point is reached, with most people, any link is laid hold of that comes handiest, and assumed to be the right one. In ordinary investigation, when certainty ends *conjecture* begins, and that which is only *imagined* is at once attached to what is really known, and considered of equal value.

A truly inductive mind, however, can, in favorable conditions, arrive with certainty at much that is unknown, by working with what is known. And no mode of mental action is so favorable, for this purpose, as that of *unconscious cerebration, or introspection.*

A thoroughly-educated and experienced physician, for instance, after *studying* a patient, and informing himself of everything relating to his case, so far as he can, is in a condition, if he have an inductive mind, and the *introspective habit*, to learn much more. He can then turn his mind within, as it were, and, by introspection, study the case as if it were his own, till his knowledge of the patient's true state becomes as perfect as if he had his body dissected before him.

CHAPTER XXVI.

INFLUENCE OF THE MIND UPON THE BODY.

The explanations already given have shown how all the organs of the body are dependent, for their power to act, both voluntarily and involuntarily, upon the influence they receive from the great nervous centres. But, besides the ordinary necessary nervous influence which they exert upon them, it is also certain that the proper and especial functions of the brain itself, that is *thought* and *emotion*, can influence, to an almost unlimited extent, the whole organization.

Not only does the general condition of the body affect the mind, by the influence it exerts upon the brain, but the mind, in return, reacts upon the general bodily condition, by the influence it exerts upon the different organs.

And this influence of *mind over body*, has now to be carefully studied, and its consequences and importance pointed out. Mental influence is often more powerful, over the bodily condition, than any other influence, and may completely counteract the effect of medicines, or act fully and efficiently in their stead. The old proverb is literally true, that conceit can kill, or conceit can cure, and proofs of it are constantly seen. We all know the almost magical influence of *hope*, and *confidence*, in promoting a cure, or of despair and doubt in preventing it. It is a common remark that *faith* is all that is needed, in medication, and every physician's experience must have convinced him of this. It is but little matter what a sick person takes, if he has confidence in its power to cure, while without this confidence, it is nearly always useless.

I well remember one remarkable instance of this. A patient afflicted with fits, for many years, had some pills given him which arrested them at once, though nothing else he had tried ever had the least effect upon them. He was, of course, delighted at his deliverance, and was anxious to make sure of always having a supply of the pills on hand. His physician, however, had no recollection what the pills were, having given him some old ones, that he knew were harmless, merely to give him *something*, and to satisfy him at the time. Not liking to tell him this, he gave him some more, perfectly simple, being only sugar and gum, telling him they were the same, and they were *just as effective!* For ten years he continued taking these pills regularly, having no fits while he used them, but sure to have an attack if he neglected them.

Now in this case it was undoubtedly the *confidence*, or *faith*, that operated on the nervous system and warded off the attack, and it was therefore just as effective as the medicine had been at first.

It is highly important, however, to understand how this is so, and to see the reason for it. Most people, though acknowledging the fact, attribute it all to *fancy*, or *imagination*, and are not aware that there is a real physical, or organic action, in these cases of *faith* cure, the same as there is when drugs are used. The same influence works in both cases, but in a different way, as will be shown further on.

To explain this we must refer again to reflex and direct nervous action, upon which the explanation depends.

The simple action of moving a man's hand, for instance, may be brought about in two different ways. In the first place he may merely *think* of moving it, and then a current is sent from the brain along the nerves of motion, which sets in action the proper muscles, and the hand is moved. The action here *begins* in the brain, and the nervous influence operates *directly* on the moving muscles.

In the second place, we may suppose the hand to be too close to the fire. Then the nerves of sensation, which are distributed on the hand, immediately inform the brain that the hand is burning, and the brain sets the muscles in action, through the nerves of motion, to take it away, the same as before.

Now in this case it will be seen that the action *begins* in the nerves of feeling in the *hand*, and that the brain is excited *from without* to act upon the muscles to take the hand away. In both cases the moving power emanates from the brain, but in the one case the action begins there, and in the other it begins on the surface of the hand. In the one case the *thought*, in the brain, is the first step, and in the other it is the *feeling* on the hand.

Now this is exactly what may occur in any part of the body. Take the eye, for instance, and we shall see how tears may come from it in both ways. Suppose some dust blows in, the nerves of feeling at once inform the brain, and the order comes back to the lachrymal gland to pour out tears, to wash the dust away. This is indirect, or reflex action. But a sudden emotion, like pity, or some distressing thought may do the same thing, by *direct* action from the brain.

So in the stomach, if we swallow some nauseous substance, as an emetic, for instance, the nerves of sensation inform the brain, and the order comes back to throw out the offending substance by vomiting. The action commences here in the nerves of sensation of the stomach, and is excited by the emetic. But we also know that nausea may be excited directly, without anything being taken *into the stomach* at all. The mere *sight*, or *thought*, of some disgusting object often causes vomiting, and the mere idea of an emetic will act as well, with some persons, as if they swallowed one. Now in these cases the action begins in the *brain*, and is excited by the simple idea, or thought; which shows how an *idea*, or, as we often say, the *imagination*, can *cause the same action as a powerful drug!* Here, then, is an explanation of the way in which *conceit cures*, or *kills;* and we see why the gum and sugar pills acted as well as those made of real drugs.

In all cases the cause of action, in any part of the body, is the nervous influence, and this may be excited either from *without*, or from *within;* either *indirectly*, by a sensation coming from the part, or *directly* by a mere thought. Whether we employ medicines or imagination, therefore, the moving power is the same, only it is set going in a different way. And this explains the whole mystery of faith cures, conceit, and imagination.

It also shows why some kinds of nervous disease are so *catching*, that is, so easily propagated from one to another. It is simply because many minds are influenced in the same way, at the same time. If one person in a company has an epileptic fit, all those who are disposed to epilepsy are nearly sure to follow suit. And so it is with most other nervous attacks. All those similarly disposed are liable to be similarly affected from the same influences. Numerous instances of this are seen in what are called religious revivals, where hysteria passes current for devotion. One subject going off, a dozen others will follow, with the same cries and convulsions. In all these cases the thoughts and feelings emanating from over-excited brains, act on the nerves of motion the same as doses of strychnine would.

We read in history that, in former times, when people were more ignorant than they are now, whole communities would be attacked with some wild form of craziness. A single subject would begin to sing, or dance, in a maniacal manner, and straight way hundreds did the same. In some instances these fanatics scourged themselves, till the blood streamed from their bodies, and in others they even drowned, or burnt themselves. Of course all this was considered simply pious devotion, and the poor maniacs were objects of envy and admiration. They were, however, simply diseased, crazy, in fact, from an over-excited and deranged condition of the nervous system, which caused the same effect as poisoning with drugs.

Such people see visions, hear angelic voices, and are the subjects of miracles. Medical men know well that there are numerous cases of *lameness*, and loss of power in particular parts of the body, which are purely nervous, as before explained. I have myself seen most distressing and obstinate cases of *hip disease*, which were of this kind. In all such cases a powerful nervous influence may cure in a moment. Simple faith will do it, if strong enough, and the patient only needs to be *touched*, or *commanded* to rise and walk, and straightway is able to do so. *Fright* will often succeed just as well, and has frequently caused the crippled and bed-ridden to leap up and run, as if nothing were the matter with them. Joy or anger may do the same, or, indeed, any powerful emotion. Conversely the very same influences may *cause* disease, and loss of power, as numerous instances show. Fear can, literally, strike a person dumb, or powerless; and even great joy will do the same, while violent anger has often caused death.

Females are especially under the influence of the emotions, and often suffer from incontinence of urine, diarrhœa, or leucorrhœa, after a fright, or from a few moments of anxiety.

In all these cases, the irregular bodily action results directly from derangement of the nervous system.

It has thus been fully shown that every organic action, healthy or diseased, is due solely to a nervous current sent from one of the great nervous centres; and it has further been shown, how this current may be set in motion in two ways, either indirectly, by reflex action, or directly, by thought, or feeling. And, though the fact is generally acknowledged, that the mind and feelings have much influence over the body, yet few know how that influence operates, or to what extent. And this is the reason I have dwelt upon this matter so much, because it should be fully understood.

This influence is, in fact, within certain limits, unbounded. Every organic function can be hastened, delayed, or totally suspended; and life itself even can be destroyed, by a thought, or an emotion, as certainly as by a powerful drug! *Mind* alone, *can*, beyond doubt, in numerous cases, *kill or cure*, as surely as medicine.

CHAPTER XXVII.

CONNECTION BETWEEN THE NERVOUS POWER AND LIGHT, HEAT, MOTION, AND ELECTRICITY.

To understand more clearly this mutual relation between *mind* and *matter*, and the way in which they act, and re-act upon each other, reference must be made here to what are called the *imponderable agents* of Nature, namely: *Light*, *Heat*, *Electricity*, and *Motion!* These all-pervading agents are concerned in every change of matter that takes place; they exist everywhere; and are mutually *transformable one into the other!* In other words, they are but modifications of the same agent, or different forms only, which may, and do, pass into each other.

The influence which these agents, especially electricity, have over matter generally is analogous to the influence which the nervous power exerts over the body. And, in fact, the nervous power itself—there is good reason to suppose—is but a further modification of the same, all-pervading, agency.

Light, *heat*, *electricity*, *motion*, *and nervous power* are, in fact, mutually interchangeable, one into the other, and are probably only various exhibitions of one general all-pervading *force*, *power*, *influence*, or *agency*,—just as we choose to term it.

It is this power (to use a convenient name) which originates *form*, *organization*, *life*, *thought*, *sensation*, *and emotion!* It is, in fact, the *active force* of matter, the *living principle*, or what the ancients called *the soul of the world!*

Whenever *chemical change* takes place, either electricity, heat, light, or motion, are produced invariably, singly or combined, and sometimes all at once. And, when either electricity, heat, light, or motion, act upon matter, they produce in it a chemical change.

In like manner, the various transformations constantly occurring in the living being all originate heat, motion, electricity, and nervous power. And conversely, either heat, motion, light, electricity, or nervous power, all cause changes, or transformations in the bodily material.

The bread that a man eats, the water he drinks, the air he breathes, or that even touches his skin, the light of the sun, the temperature and electrical conditions of everything around him,—all act upon the substance of his body, and modify it more or less. In other words, they cause chemical change—which, in its turn, re-acts and causes heat, motion, electricity, or nervous power. Either, or all of these agents are being continually produced in the human body; and, in conjunction with light, are continually acting upon it.

That peculiar modification of the universal force, which we call *nervous power*, is originated by the organic action of the *nerve matter*, especially the brain. The nervous apparatus, composed of two different substances, the *white* and the *gray*, is a true *galvanic battery;* and the chemical actions occurring therein, originate the nerve force, and cause thought, feeling, and emotion. In other words, these chemical transformations of the nervous substance cause, and maintain, the activity, or *life*, of both *body and mind.*

Here then, we begin to see, how mind and body act and re-act on each other. The chemical changes occurring in the body, from whatever cause, produce nervous power, and nervous power in return re-acts upon the bodily substance, and causes in it chemical change. Thought, feeling, and emotion, are only exhibitions of nervous power, and, of course, act upon the bodily substance and cause changes in it, just the same as the current from a galvanic battery might do.

The influence of the mind over the body, and over all its organic functions is, therefore, as natural, and as necessary, as that of the body over the mind; and quite as easy to understand, providing we study the matter by the light of fact, and observation.

The action of *light* upon certain parts of the body produces *thought*, or feeling—just the same as it produces mere chemical changes when it acts upon other parts. For instance, when a person looks upon an object, a picture of that object is *photographed*, as it were, on to the retina of the eye. In other words, the rays of light from the object are projected upon the eyeball, the same as they would be on to a lens, and there form an image of it. But the eye is connected with the brain, by the *optic nerve*, and the rays of light thus thrown into the eye act on that nerve, which transmits the impression to the brain, where it is converted into *perception, or thought*, as exhibited in a consciousness, or knowledge, of the object looked at. Thus light is converted into thought, or mind; and so can heat be, or motion, or electricity, because they are all convertible into nervous force, which, going to the brain, exhibits itself as thought.

The exhilarating effect of sunlight, after a dark and gloomy spell, is familiar to every one. The light, acting on the body, is converted into nervous force, and then into thought, or emotion. On such occasions, the whole being will seem to be suddenly changed; dulness and low spirits being succeeded by joyous emotion, and the most vivid imagination. The *light* has, in fact, been changed into a new supply of nervous force, or *mind*, and *emotional sensation.*

Similar effects may follow warmth after cold, or may result from a *brisk walk*, and thus *motion* and heat are converted into nervous force, or *mind* and *emotion!*

The electrical changes of the atmosphere also act in the same way; sometimes making people sluggish and dull, and at others brisk and lively.

The *oxygen* and *ozone* of the air we breathe, by the chemical changes they cause, also influence the amount of nervous fluid produced, and consequently, the amount of *mind* exhibited. Every one must have felt this, who has noticed the depressing effect of breathing a close, dull atmosphere, and the sudden change on passing into the fresh, pure air.

In these cases, the oxygen and ozone of the air, acting on the bodily fluids and gases, cause chemical changes, which originates electricity; and this, transmitted to the brain, is then changed into thought and emotion, or *mind.*

Many curious speculations might be made upon this fact; and, if I make one here, it is only for the purpose of better illustrating the subject.

Thus it can be shown, strange as it may seem, that a man's *mind*—that is, his thoughts and emotions—at a given time, may be merely the *sunlight* of millions of years ago, reproduced in the form of nervous force.

Suppose, for instance, that a *gas-jet* suddenly shines upon a man who has been long in the dark—what follows? Why, he then *sees* objects which he did not before, and consequently, has *thought* and *emotion* excited about them; or, in other words, mind is produced by the *light*, as before explained. But the gas which gives the light is produced by distilling *coal*, and coal is the product of vegetation which existed perhaps millions of years ago. Now, the growth of plants results directly from the action of sunlight, which decomposes the carbonic acid of the air, in the cells of the plant, and deposits the carbon in the solid form, as wood. Every vegetable growth, from the smallest moss to the mightiest tree, is produced in this way.

The sunlight is tranformed into chemical force, which is stored up in the form of solid wood, and this is afterwards converted into coal. When the gas produced from that coal is burnt, we have the light of the sun, which shone perhaps a million years ago, reproduced, in another form. But the light, as we have shown, may produce thought and emotion, or mind, and thus the *sunlight* of past ages may be changed into *mind* in this !

The heat, electricity, or motion, produced by the combustion of that coal, and the chemical changes it gives rise to, may also produce similar effects ; and thus it will be seen how light, heat, motion, electricity, and nervous influence, are continually changed into, and connected with each other, every moment, everywhere, from the remotest periods down to the present day, and in all future days.

It will, therefore, be seen, that thought, feeling, emotion, or *mind*, as we term it comprehensively, is not something distinct from, and independent of matter, but is intimately connected with, and dependent upon it ; the same as electricity, light, or heat. It is, in fact, merely one form of that universal agent which pervades all nature, and which is ordinarily exhibited to us as light, heat, electricity, or motion ; but, when exhibited through the medium of *nerve matter*, shows itself as thought and feeling, or *mind!*

This explanation is necessary, before it can be understood how mind originates from the action of matter, and how it may act, in return, as a *positive medical agent*, the same as any material substance.

We all know how the mind will sustain the body, and how high resolve, and firm determination, will give more power, and endurance, to the feeble and delicate, than is possessed by the strong and robust. In numerous instances of shipwreck, and other accidents, where men have been exposed to terrible hardships, this fact has been strikingly shown. Very often a weak, tenderly reared, perhaps sick and feeble officer, has been known to endure more, and last longer than, the strong, rough men. In many such cases, he has even had to encourage them, to set an example of energy, and determination to struggle to the last, and never to despair. This is the result of *education*, which, by judicious and systematic training, strengthens the mind, by developing the brain. In such cases, the officer has that wonderful galvanic battery, the brain, *well-developed* ; and, from that, his system could draw supplies of nervous force, enough to keep it going for a long time without food.

The immense importance of mind, in carrying a person safely through disease, and suffering, is also well known. Confidence, and a firm determination, or *will*, are more effective than any medication, in sustaining a sick person through a crisis; while fear, or despair, will make him inevitably fail in spite of all that can be done. In the one case, there is plenty of nervous influence, or *mind*, and in the other, it is deficient.

A sudden powerful emotion, or vivid thought, may give an instantaneous impulse to the system, like that from a violent electric shock, causing the most astonishing results. A Spanish gentleman once told me a remarkable case of this kind. A friend of his, an Englishman, who lived with him in Peru, had the utmost terror of *earthquakes*, which were very frequent and violent there. This man was attacked by inflammatory rheumatism, and was made by it completely helpless. His joints were swelled, and so painful, that motion was torture to him. He could not rise, and had laid bedridden for ten months, with no prospect of getting better. One day, without a moment's notice, there came a violent shock of earthquake, accompanied by a loud, rumbling noise. The house *heaved up* so much, that the bed on which the Englishman lay, was *overturned*, but *not with him in it;* for the moment the motion was felt, up he sprang, rushed out of doors, and ran for near half a mile in his shirt! He recovered the use of his limbs from that moment, and never felt a trace of the rheumatism afterwards. Now this was simply the result of the powerful nervous shock, from the brain, produced by his fright. His *mental* battery was powerfully excited, and sufficient nervous fluid was sent forth to work a cure *at once*.

Numerous similar instances are on record, where many, who have been cripples for years, have thrown away their crutches while under the influence of powerful emotion, and have run, or leaped, as if nothing had ever been the matter with them.

One instance was related to me, in Scotland, of a mother, who had been two years a cripple from hip disease. She could just drag herself round by the aid of her crutches, and one summer day, to enjoy the sun, had managed to reach a seat in the garden, overlooking the river, which ran through a meadow, close to the garden hedge. While sitting there she saw her little grandson, about seven years old, who was playing by the bank of the river, suddenly fall in, and with a loud scream sink under the water.

In an instant she sprang up, ran to the hedge, got over some how, and leaped into the water, which was up to her chin. As he came up again she seized him, dragged him out, and carried him into the house! As she said herself, she could not tell, nor imagine, how she did it; and if any one had told her, before, that it was *possible*, she could not have believed them. She never used the crutches again, nor suffered from anything more than a little stiffness in the hip. No inconvenience whatever followed her wetting.

Now, if this lady had been simply wet through, by a shower, or had even got her feet damp, in the ordinary way, her disease would have been made much worse; as it often had been by such causes. But here she was wet through, and remained for nearly half an hour with her wet clothes on, caring for the child, and no bad effects whatever followed!

The reason was simply this: her *mental excitement* was so great, that the *brain* emitted nervous power enough to maintain every function in full action through it all, and surplus enough to cure her into the bargain.

Exposure to wet and cold seldom hurt, unless the person is exhausted or low spirited. With plenty of energy, and a *joyful mind*, such things can be suffered with impunity.

Persons who thoroughly *enjoy* themselves, and whose *minds* are active, are seldom injured by being wet, or cold, at pic-nics or other merry makings. But those of the party who are low-spirited, and take no interest in it, are sure to suffer, because their *minds* do not act to sustain their bodies.

Depression of mind is one of the chief causes of liability to disease, because it checks the production of nervous fluid by paralyzing the brain. And this explains why drunken men, and crazy people, will go unhurt through what would be almost sure death to others. Idiots, it is well known, *never catch cold*, nor suffer from atmospheric or other changes, like sane people.

In these cases the brain produces enough nervous influence for ordinary use, and there is no *mental depression* to paralyze it.

Hypochondriacs, on the contrary, are preternaturally sensitive to all hurtful influences. Their *mental depression* makes the brain *torpid*, and it secretes too little nervous fluid. A powerful *mental shock* will often cure such people at once.

Persons who pass dull, monotonous lives, without change, unless they are of sluggish temperaments, are peculiarly liable to a variety of complaints. Not only are they apt to become *nervous*, and be subject to various mental and moral peculiarities, but digestion, and other functions, may also become seriously impaired.

The explanation of this is simple. In such cases the nervous current is nearly exclusively directed in certain channels, or to certain organs, till they become wearied, while others are left deficient, till they become impaired for want of sufficient use.

The proper remedy, in such cases, is *change*, new scenery, new occupation, new *thought* and *emotion.* Something to stimulate the *brain*, and to send the nervous current more forcibly into the unused channels. In other words, we must act through *the mind!* And it is, in fact, principally in this way that *travelling*, or *change* of any kind, does benefit.

The change of air alone is often beneficial, beyond doubt; but in a vast number of instances it will do but little good if the patient is not *interested;* that is, if the *mind* is not brought into play. Very often, indeed, where no interest is excited, the patient is only wearied, and made worse.

Fresh *thoughts*, and *emotions* are, therefore, the most powerful medical agents we possess, in a vast number of cases; and it is indispensible to ascertain the state of *mind*, and *feeling*, of a patient before administering medicine. If the patient suffers from continued cares and anxieties, from apprehension, ungratified longing, or any emotion too long continued, both mind and body are certain to become deranged; and so continue till the cause is removed.

Mere *dulness* even, from want of suitable occupation and pursuits, will cause serious disease, both mental and bodily, and much of the prevailing ill health, among certain classes, is due to this cause alone.

Many women are chafed, and worried, by stupid conventional restraints, which either force them to be idle, or to busy themselves only with what they despise. These persons often fret themselves to death.

Others, whose minds are of small calibre, and whose education has been of the common, frivolous kind, fall into a spiritless, listless state, simply because they are *incapable* of taking an interest in anything. They *know* nothing, and have never had the *desire* to know awakened in them.

Such persons are perpetually wretched themselves, and a constant cause of misery and discomfort to all around them. They always need entertaining, but can never be entertained; and they are always regular *patients*, from whom all the different practitioners take fees in their turn.

No good can *ever* be done, in such cases, unless there be *brain* enough, in a healthy state, to produce active *thought* and *exertion*, and something can be done to bring it into play! It is *inert mind* here that makes the invalid, and *active mind* only can effect a cure.

Many such women have been cured by becoming *mothers*, and thus having natural feelings and cares aroused. Others have been saved by a sudden reverse of fortune, compelling thought and exertion of a new order. But if there be not healthy brain enough to produce sufficient *nerve power*, or *mind*, there is nothing to operate upon, and the patient cannot be benefited.

An idiot is much more fortunate, because *he* has not mind enough to worry with, while these women have just sufficient to fidget with, and to feel discontent, but not enough to cause exertion.

The frivolous votaries of *fashion*, from being continually subject to periods of feverish excitement, alternating with others of listless idleness, while violating all the laws of physical health, are subject to a peculiar class of complaints. Such women suffer from a continual *neurosis*, and exhibit a *peculiar idiosyncracy*, which points them out to the experienced physician at once. Their condition is shown, by certain well marked signs, as clearly as that of a person suffering from any other well-known diseased condition.

The physician knows at once what is the matter with them, and he knows what special derangements to look for. He knows also, full well, that he can *do no good*, unless the victim is capable of, and disposed to, a complete change of life. Such patients are troublesome, and therefore they must *pay well*, and they are *always on hand!*

During the American war, I was once troubled with a patient, a man, who was on the point of committing *suicide*, from simple listlessness, and want of something in which to take an interest.

He was not without natural capacity, and had a good *physique*, but had never been brought up to *do* anything; and so, having neither occupation, nor hobby, and, *unfortunately*, a sufficient income to live on in idleness, he was literally *bored to death!*.

He had, *in imagination*, every complaint under the sun; and of course nothing I could do for him, or say to him, did him the slightest good. One day he told me seriously, that he certainly should *blow his brains out!*

Being thoroughly tired of the man, and knowing that it was only through the *mind* he could be cured, if at all, I said to him, quite coolly, that it seemed *the only thing to be done!* "But," said I further, "why trouble to shoot *yourself?* Your country now needs men to fight her battles, and you might just as well go and let one of the enemy shoot you; your death then would be of some service perhaps, if it was only in saving a better man!"

Well! that touched him a little, and he went at once and enlisted; and I saw him march off, a few days after, for the field of battle.

Other cases drove him completely out of my head, when some two years after, a bronzed, hearty-looking fellow, with his arm in a sling, walked into my office, and in a loud, cheerful voice called out, "Halloa, Doctor; how do you do? Do you know me?"

At first I did *not* know him, he was so changed; but it really was my old patient, who had been so set on suicide. He was evidently completely changed; and I felt curious to hear his history since we had last met, and he related it.

"When I left you, doctor," said he, "my only wish was to get into a fight as soon as possible, and have the thing over. Just at that time, you remember, matters were pretty well hurried, we were short of men, and therefore but little time was spent in drill. Myself and a few others being incorporated with an old regiment, pretty well thinned, we were soon at work. In three weeks after you last saw me, we were drawn up in front of the enemy, and I found myself where I had so long wanted to be.

"After firing for awhile we were ordered to charge, and at it we went. As yet I was unhurt, and had felt but little excitement from the shooting. The idea came across my mind that nothing would happen to *me*, and that I should have all the trouble and bother for nothing; but just then one of the enemy dashed at me with his bayonet."

"And you stood still, to let him drive it through you," said I.

"*Not a bit of it*," said he. "Directly I saw the cold steel, driving straight at my breast, I jumped aside, and brought down the butt of my own gun on his head! He fell like a log; but at the same instant another fellow gave me a sharp prod, right through the thigh. Oh! how it hurt, especially when he pulled it out again! Didn't I feel *mad*, though?

"I never remember having my dander up so before; and the way *he* went down, too, was a caution. My blood was up now, and you better believe I laid about me to some purpose. I felt a darned sight more like *killing* than being *killed*, and my comrades told me afterwards that I shouted and fought like a madman!

"That wound laid me up for some time; but no thoughts of suicide ever came across my mind after that affair, *nor have they since*. In fact," said he, "I have found *something to do*, and am a new man altogether. At present my arm is broken; but when well, I am going back again *to see the war through*, unless used up first. Afterwards, if spared, it is my intention to make one in some settlement out west, where there will be plenty to do, with a fair chance of being scalped."

The man was perfectly cured. All he needed was something to rouse him, to bring *mind* and *feeling* into vivid action; and he *found it*. He might have killed himself; but when it came to letting himself be quietly *hurt*, and perhaps *killed*, by *another*, it was a different thing. As he said himself: *Not a bit of it!* that was another affair altogether.

Intense mental excitement will overcome hunger, thirst, fatigue, and even torture. In all probability many unfortunate victims of cruelty, in bygone ages, have in this way been enabled to sustain the awful trials to which they were subject.

A sudden and powerful emotion, or mental shock, has been known to *sober a drunken man*, at once; and, on the other hand, men have taken enormous quantities of liquor, and even opium, with impunity, while under strong emotional influence, or mental excitement.

A sudden impression on the *mind* has *often* changed a person's whole bodily and mental condition, sometimes for the better, and sometimes for the worse. In many instances bad news, frights, joy, and rage, have suddenly caused fits, paralysis, insanity, and even lameness, blindness, and deafness. At other times those suffering from these afflictions have been just as suddenly cured, by the same causes.

The beneficial effects of *laughter*, and a *joyous mind*, upon digestion, and the peristaltic motion, are well known. I once knew a confirmed dyspeptic, in New York, completely cured by going almost daily to see the celebrated *Fox*, in his comic pantomimes!

"The very first time I went," said he to me, "I came away *hungry*, and enjoyed a good meal, which was followed by the only natural action of the bowels I had had a long time! And now, whenever I suffer from constipation, a dose of *Fox* always relieves me. I consider him the best physician in the city!"

This effect of laughter, in stimulating the action of the bowels, the kidneys, and the skin, has often been observed, and it is easily explained. *Joyous laughter* is a state of exhilaration, in which the *brain* is *charged* to its fullest capacity almost, and the *mind* literally *overflows;* there is nervous fluid enough for all purposes, and to spare.

But contrast this with *care*, anxiety, or dissatisfaction—then you have the *very reverse!*

The Philosophy of Hobbies.

In the preservation of health, or the cure of disease, through the influence of the *mind*, especial notice should be taken of the benefit to be derived from *Hobbies;* the importance of which can scarcely be exaggerated.

No matter how much a man is overworked mentally, or how he may be harassed and worried, if he can only betake himself often enough, with a relish, to some hobby pursuit, he is all safe. No matter what it is, but it is better something to do *with the hands*, something to *make*, over which he can *whistle*, or *sing!* One of England's greatest statesmen recuperates himself at carpentering, and works at it with the greatest zest. With his shirt-sleeves turned up, and a paper cap on his head, humming some merry tune, while he plies his saw and plane, he fully recovers the tone of his mind, and prepares himself for new efforts.

Some of these men are *jewellers*, and make little articles of bijouterie to give to their friends. Some make clocks, or machinery, while others are gardeners or sportsmen. Every man should have something of the kind—some hobby to ride—which will take him away from his usual business, or avocation, and make him forget his cares and his worries. But it must be something in which he takes *a real interest*, and into which he can throw himself heart and soul, for the time being. If he can do this, he *unbends the bow*, the wearied faculties recover their power; and the troubles that had seemed too heavy to bear he soon makes light of.

As I said before, it is not much matter what a man does; but something for the *hands* to be busy with is best, even if it be carving cherry stones, or making toys for the children.

If a person's usual business is sedentary, an active, even hard-working hobby may be best; but it must always be *ridden with pleasure*, and must *thoroughly engage the attention*, so that nothing else can be thought of.

English business men, in this respect, act much more rationally than Americans, as a general rule. They occupy themselves *less time* with business, and *leave it* more completely when they *do* leave it. Most of them have their hobbies, or they retire to their houses, or their clubs, forget business entirely, and enjoy themselves.

The American business man, on the contrary, as a general rule, scarcely ever has a hobby, outside his business. He remains at his business perpetually; never leaves it if he can help it, and never ceases thinking about it. He has little quiet home enjoyment, because his mind is never calm enough for it; and if he takes any amusement it must be something exciting, and probably aided by exciting drink.

The consequences of such a life are, a feverish state of the nervous system, a feeble and imperfect action of all the organic functions, constant dyspepsia, and early death; often preceded by *insanity*, and effected by suicide.

Any one familiar with the condition of business men, in the great cities of America, will say that this picture is not exaggerated, so far as the great mass of them are concerned. There are some pleasing exceptions, it is true, but they are very few; and they are generally regarded, by their fast-living compatriots, as *slow*, or perhaps even a little cracked.

The thorough-going, driving, business man, simply uses his *mind* to burn up his *body*, and he often works for this end with such energy, that he wears out both long before their natural time. The Englishman of leisure, on the average, *lasts much longer*, and *enjoys himself more*, than the American man of business, simply because he has *less of one thing*, and relieves the strain on his mind by *change.* This is a matter on which I can speak from considerable experience; and I must here tell all the feverish, nervous, dyspeptic, *impotent* victims of *fagging*, that *medical* treatment is of no earthly use to them. They must first treat the *mind* rationally, give it *rest* and *change*, and create for themselves an *interest* in something outside of the eternal business. How many of these men I have seen, feeble in body, sick, but excitable, rushing round, sustaining themselves by whiskey and tobacco, and tottering on the very verge of *insanity.* They come to me for *tonics*,—to be strengthened,—and are anxious to take any amount of *elixirs* and *renovators*, or to do anything except *resting!* this they cannot do. As I said to these gentlemen before, so I say now,—it is through the *mind* you have been made as you are, and you can be *cured* only through the *mind.*

I knew one gentleman, a money-broker, in New York, who was quite a clever fancy joiner. He made most beautiful little caskets and boxes, in his leisure time, and he *made leisure* also for it. He had a partner just the contrary; a man who had no idea about anything but stocks and commissions. In the first great business troubles, consequent on war, they became seriously involved, and were in daily danger of bankruptcy, but managed to struggle through. The partner, however, literally worried himself insane, and was for six months in an asylum. He recovered, and came back to his work, but a mere wreck of what he had been. Immediately after his return, he spoke with my friend about his past trouble, and asked him how he had escaped.

"S——," said he, "I can't understand it; you worked harder than I did, I believe, and had much more at stake; and yet you used to come every morning to the office quite fresh and ready for any amount of labor, while I was fit for nothing. And now, here you are just as, jolly as if there had been no trouble at all. I don't believe you even lost a night's sleep through all the crisis, while I often did not sleep for three or four nights together. What's the secret, S——? What do you *take* or do?"

"Well," said my friend, "you must come home with me to-day, after business is over, and I will tell you."

He went with him away off into the country, to a plain, comfortable residence, with a good garden, chickens, three dogs, a serviceable pony, a neat, tidy, cheerful wife—well-dressed—but not *too fashionable*, and four hearty, laughing, romping children. They were received with a chorus of childish welcomes, and dog-barkings, which made the place ring again. The lady gave a hearty welcome, and promised them an early dinner, for which their ride had made them fully ready.

"And now," said my friend, "for the *secret! Here is part of it!* There is plenty here to engage a man's attention,—if he will only interest himself in it,—and make him *forget Wall street!* The only *stock* I bother myself with here is my stock of chickens, and my only *commissions* are those which my wife gets me to fill for her in the city. When I get here, on an afternoon, I *shut right down* on the office, and refuse to even think about business in any way. But this is not all. I have something special—a private recipe of my own, which I will now show you."

He then took him into a large, pleasant room, fitted up as a *carpenter's shop*, with a proper bench, and all kinds of tools nicely arranged on the walls.

A number of beautiful little boxes and other articles were about, in various stages of progress, and some nicely finished.

"This," said he, "is my grand recipe! There are the tools with which I kill blue devils, and drive away care. Nothing makes me so happy as to come here, turn up my shirt-sleeves, put on an apron, and go to work. You will scarcely believe it; but, while so engaged, I can sing like a blackbird and whistle like a ploughboy. It will all seem very absurd perhaps, and you will think it a strange way for a *business* man to pass his time. But, I tell you what it is, old fellow, *nothing but this saved me, during the crisis, from following you to the asylum!* During the worst of it I still took my old course, left business behind me when I left Wall street, and came here to make boxes by the dozen, feed chickens, and have runs with the dogs and the children. While engaged here, I could thoroughly forget our difficulties, could sleep well after, and go fresh to the office next morning, ready for another hard day. This is what carried me through, and what makes me so jolly as you call it now."

"And now, just tell me how *you* spent the time out of the office, while we were being so hard driven."

"Me? Oh! that is soon told. I used to go home, take a bottle of whiskey, some strong cigars, and sit down to *calculate*, and go all over the day's business again. Sometimes I used to go to Delmonico's, meet other brokers, and do a little business, or discuss matters. It was no use going to bed, *for I could not sleep!* Often I have sat down at three or four o'clock in the morning, dozed a little in the chair, got up again, took a drink, and then went at the calculations again, till it was time to go to the office. You know what a state I used to come in, and you know how it ended. If you had been the same, the whole concern would have gone to the devil, and us with it."

"Exactly," said my friend. "Well, here is the whole secret. My *hobby* saved me, and you *had no hobby!* A business man must have *a change*; something to draw him away from his business in his leisure hours, and allow him to recuperate."

"Ah, S—— !" said he, "I see it all plainly enough now; but here is my misfortune. I was never allowed any hobby when young—in fact, never saw one—and am now too old for it. My father, as you know, killed himself by business; and I don't see that I can do anything else, but I'll try. One thing I am determined upon; I shall get away from Thirty-second street into the country, if only for the sake of my boy. *He* shall have a hobby, if I had none; and I am sick and tired of this eternal party-giving fuss, and operatic howling. It's all very well now and then, but as a constant thing, its an awful wearying bore. I shall delight Harry to-morrow, by telling him he is going into the country to have a dog, rabbits, pigeons, carpenter's shop, anything he likes, if he will only make a hobby of it, and I'll try to help him."

Such an experience as this tells the whole tale. One man wore out his *brain*, and with it his *whole body* also. The other used his brain in such a way as to keep it in health, and thus give him constant *mental capability* and *bodily health* at the same time.

A gentleman from America, connected with one of the publishing houses, had an invitation to visit a celebrated literary man at his own home, in the suburbs of London, and went expecting to find him, as he expressed it, *hard at it!* And so he did; but not in the way he had imagined. On his arrival, and giving his card, the servant said: "Oh, yes sir; Mr. —— is expecting you, and said that when you came to please join him in the garden;" at the same time opening the garden-gate, and pointing down one of the paths. The gentleman followed the indication given and soon found his literary friend *hard at it*, indeed! With his coat off, his shirt-sleeves turned up, and a straw hat on his head, he was digging away, with a vigor that showed his muscles could be active as well as his brain! It was a surprise, and also a *lesson*—"for," said he, "I found out by that visit how such men retain their health and vigor. Gardening was his *hobby*, and the pride with which he pointed out his well-trained fruit trees, and his vegetables, showed what a thorough interest he took in them. Instead of being a *pale, sickly student*, the man was hearty and strong, and fully capable of *work*, both with body and mind.

A celebrated poet takes his relaxation with an axe, chopping wood, and often—as he expresses it—strikes out an *idea* with every *chip!*

Some men, for hobbies, take up with scientific pursuits, such as botany, mineralogy, or chemistry; and, in England, many such men have become really eminent, in that which they pursued merely for amusement.

If a man can *take a thorough interest* in a *beetle*, or a *stone*, or any other natural object, he is safe from nervous disease, or insanity, from over-application to business.

This subject of hobbies has been dwelt upon at some length, because of its *real importance.* Hobbies are, in fact, of the greatest value, in the treatment of nervous and mental disease, and may be truly called called the best of *mental tonics.*

Women, unfortunately, have fewer hobbies of a really healthy kind than men. Many things which they would like to do, they must not do, for fear of *Mrs. Grundy.* And even when they are allowed to act, it is with so many restraints, and impediments, as to make what they do of little value.

Most of their amusements are indoors, sedentary, and too much like their usual pursuits. They are, therefore, not *exhilarating*, and bring no new faculties into play. This is one reason why nervous disorders are more difficult to cure, in women, than in men. Their imperfect education has given them no intelligent interest, in any natural objects, or scientific investigations; and the frivolities with which they do busy themselves, either as duties or amusements, soon weary them, from their very insipidity.

If a woman cannot pleasantly occupy herself, in duties suitable to her nature, and is incapable of taking rational interest in other matters, interesting to the whole race, she is sure to be nervous and unhappy. Such women are fidgety, full of whims, and always sick. They can seldom be benefited, because, from the imperfect development of their *brains*, there is not *mind* enough to bring into play. Medicine is of no use, and nothing can be done but to let them fidget their lives away as quietly as possible.

English ladies, as a rule are more active, and occupy themselves more out of doors than American ladies. They garden more and walk more, and many of them are enthusiastic *naturalists.* This makes them, as a rule, stronger, more healthy, and longer lived; they also conserve their youthful appearance much longer.

The *climate* is, of course, more unfavorable to American ladies, and makes out-door pursuits, for much of the year, too unpleasant. But *custom* is a worse enemy, to most of them, than climate. Absurd notions of *gentility* and *respectability* prevent them from doing much which they could do; and, generally, they prefer to be sickly, feeble, and nervous, and so please Mrs. Grundy, rather than be strong and healthy at the risk of offending her.

But women, everywhere, sadly need pursuits out of the line of their usual duties. They need *hobbies*, in fact; and it is for want of them that female nervous disorders are so generally incurable. Educate them better, develop their brains in a more healthy manner, and they will be less liable to nervous disorders. By having more *mind* to act upon, they can also be treated more beneficially when treatment is necessary.

Philosophy of Rest.

Rest is another matter of great importance, in the treatment of nervous derangements. Many people have a wrong idea as to what *rest* is. They fancy that complete rest is the same thing as complete *idleness*, or doing *nothing;* which is often one of the most *tiresome* things a man can have to endure. This is why many men, who *retire*, as they call it, from business, and indulge in perfect idleness, find it so terribly wearisome that they rush back to business again, as a relief.

True rest can be found, in most cases, only in *change of occupation!* not in idleness. And the change must be to something different, *entirely different*, to that which has caused the weariness, or fatigue.

A man thoroughly tired with *bodily work* rests by being still, and can enjoy quiet reading, talking, or even simply musing. But the man who is wearied with study, with *mental work*, wants to use his muscles, to walk, run, or be active in some way. Bodily exertion is *rest* to him.

This is the philosophy of the *hobby* again. Riding one is the best *rest*, because it is a *change*, and brings a fresh set of faculties into play.

A good deal of injustice is done, in legislation, and by the pressure of social custom, from people thinking of *rest* only from their own point of view, or from their own experience. Thus, business men, who have been worried and harassed all the week, and hard-working men, who are thoroughly tired with six days' labor, like to spend the Sunday in perfect quiet, and doing nothing. This is *rest* to them, and they enjoy it. But they often forget that there are others, following dull sedentary occupations, perhaps under most unhealthy and depressing conditions, to whom a day of forced idleness, and perfect quiet, is *no rest at all!* On the contrary, such a day as a thorough Puritan Sunday may be, to such people, more wearisome to get through than all the previous six.

These people want, on *their* day of rest, to run about, to go off on their country trips, to enjoy the society of their friends in pleasant gardens, and to visit museums, and places of amusement, as they do in Europe. It is simple tyranny to compel them to pass their day of rest in a way that gives them no rest.

I have often heard poor workmen, closely confined all the week to sedentary occupations, complain bitterly about this. "Call it a day of *rest*," said one once to me; "why I am tired to death of it, long before it is over, and would often prefer to be at the shop."

This is a matter that really concerns the public health, and it should be considered merely in reference to that.

All should be allowed to *rest* in the way they need to, under proper regulations; and surely all could do so without interfering with one another. I have often noticed on a Sunday, in Germany, all the churches open, and also the concert-rooms, gardens, gymnasiums, and theatres. Each one went to which he preferred, and some went to all of them. In other words, each person *rested*, and took his relaxation in the way that suited him best. There was no confusion, no disturbance, but real hearty, healthy enjoyment all round.

Country rambling, especially when there is some taste for botany, or other branch of natural history, is one of the very best kinds of *rest*, and *enjoyment*, to a vast number of people, and every encouragement and facility should be given to it, by cheap steamboats, and railroad trains.

I remember an old farmer once telling me, in the greatest astonishment, of the doings of a party of poor tailors one Sunday, on his farm. They had strolled away from the town, delighted to have a chance to stretch their legs, and breathe fresh air, and run and jump about. In the course of their perambulations they came to a place where the old farmer had hauled a lot of stones, and begun to build them up into a stone wall, round his field. Well, it struck the poor fellows that it must be *great fun*, to *lift and haul stones*, and build them up into a wall; and at it they went, each one trying to build more and better than the other! "Would you believe it, sir," said the old farmer, "they toiled away there for hours, and were laughing, shouting, and singing all the time like crazy fellows ?"

The farmer never thought that the tailors were *resting*, but they were. After six days' sitting cross-legged on a board, in a stifling atmosphere ; four or five hours' active exertion, in the bright sun, and pure air, was *real rest* and thorough *enjoyment !*

But the farmer, who had had six days at the stone wall, took *his rest* on Sunday by smoking his pipe, and dozing in his arm-chair, or at church.

Now in such cases it is a *gross wrong*, and a *great evil*, to force all to observe *one rule* in regard to rest. People have different requirements in this respect, according to their natures and their occupations, and all have the same rights in the matter.

CHAPTER XXVIII.

REMARKS ON THE NUTRITION OF THE BODY, AND ON THE SOURCE OF THE SECRETIONS.

It is well known by all who have even a slight knowledge of physiology, that the whole organization is perpetually changing; every part constantly wastes away, and is, during health, as constantly renewed. Certain vessels called the *absorbents* take up the old matter and convey it away, while from other sources new matter takes its place. No part, except portions of the *teeth*, escape this constant change, so that during an ordinary life the whole body will have been, as it were, made over again many times.

The Blood not the only Source of New Material.

It was formerly thought that all the parts of the body, and all the secretions, normal or abnormal, were formed directly from the *blood.* This fluid was said to contain all the elements, of every kind, needed to repair the waste, or support the existence, of every organ, and to form all the secretions. Disease was thought to arise almost solely from *imperfect, or impure blood*, by which the various parts were either imperfectly nourished or poisoned. Hence arose all that class of medicines used for *purifying the blood*, and for making it richer in quality, or greater in quantity.

The blood, it was thought, produced everything; not only all the solids and fluids which form the body itself, but also all its *secretions* as well. The urine, the saliva, the bile, the pancreatic juice, the fat, the perspiration, and in fact everything else, was supposed to be directly derived only from the blood.

Latterly, however, many physiologists, from a more careful study of the human economy, have disputed this, and with good reason.

In fact, the more the matter is considered, the more impossible it seems, that the great variety of secretions formed in the body can all come from the blood. There are so many of them, and their collective amount is so great, that the blood could neither form them all, nor maintain them. Besides, many of them contain matters not found in the blood, and occasionally they are formed in such immense quantities, suddenly, that the blood, if they came from it, would be entirely changed in a short time. No such entire change, however, ever does take place in the blood, which is *very rarely* much different one time from another.

Take the instance of a sudden and profuse perspiration, or copious and continued flow of urine, and it will be seen how impossible it is for them to be derived directly from the blood. Such an immense amount of mere *water* is often thus discharged, by the skin, or kidneys, that, if it came from the blood, that fluid would be left too thick to flow; whereas it is scarcely changed at all, in fluidity, by such discharges, however copious they may be. But it is not only water that is removed by the urine and perspiration, since these fluids contain various kinds of *salts*, and much *organic matter!* So much, in fact, of both, that if it all came from the blood the *composition* of that fluid would be entirely changed, by the loss. Such, however, is never the case, for the composition of the blood is almost identical, at all times, even after the most abundant and varied secretions have been formed.

The amount of uncombined, oily, and watery *fluids*, and of *gases*, contained in the body, is enormous, far too great, in fact, to come from the blood. Between all the muscular fibres, as well as between the muscles themselves—between all the joints, and filling all the spaces not occupied by the organs themselves, we find these fluids and gases. It is by them that the viscera are kept asunder, and enabled to move freely about without pressing on each other. They constitute, in fact, the cushions, rollers, and springs, which cause all the various parts to work smoothly, and without friction, or jar.

The blood is not taxed to produce these uncombined fluids and gases, nor to form *fat*, which is simply stored up material, which nature decomposes, when needed, and recomposes into various substances.

The Secretions not all derived directly from the Blood.

It seems most probable that the blood forms the substance of the secreting *organs* themselves, as it does of the body generally, but not the secretions which these organs produce.

Thus *fat* is formed, by a peculiar membrane called the *adipose tissue*, from the uncombined fluids and gases of the body; but the membrane itself, which does the work, is formed from the blood. And such is the case, probably with many, if not all, of the other secretions, and their organs.

But then comes the question, from whence is the material of these secretions derived, if not from the blood? Whence comes all the *water*, for instance, in perspiration and urine, and whence comes all the oily and other fluids used in lubricating the body? To answer these questions we must explain the nature of these substances, and the chemical changes involved in their production.

All these secretions, both fatty, oily, and watery, as well as most of the solids of the body, are composed of the same elements, *nitrogen*, *oxygen*, *hydrogen and carbon;* and are all readily changed from one into the other. The greater part are formed of the three gases oxygen, hydrogen and carbon only, and many of them only of hydrogen and carbon; these are chiefly oily, or fatty substances. The watery fluids are composed of hydrogen and oxygen only.

Nitrogen, though peculiarly an animal element, exists in smaller quantity in the body, and is, apparently, not so essential to the composition of the secretions.

The three most essential elements are the gases, oxygen, hydrogen, and carbon, which exist in the body under various conditions, and are available in almost any required amount for the formation of the secretions, without the blood being taxed for that purpose.

They can permeate the whole of the body in all directions. In every cavity and vessel they fill all the space not otherwise occupied; but as no part is impervious to them, they pass through all the membranes and tissues, and meet and mix together everywhere.

The particular manner in which they combine, in any part, depends upon the structure of the organ in which they meet. Thus the adipose tissue, or fat-forming membrane, takes the hydrogen, carbon, and sometimes oxygen, in such proportions as will form *fat*, while another organ, in the *joints*, takes the same elements, *in other proportions*, and forms *oil* from them. The perspiratory glands, on the contrary, select principally hydrogen and oxygen, and form a watery fluid from them.

These three elements, oxygen, hydrogen and carbon, are the elements of *air* and *water*, and of all *vegetables*. There is, therefore, at all times, and in all circumstances, an abundance of them in and around our bodies, independent of the food we take.

They no doubt enter through the skin from the external atmosphere; we take them in with every breath, and with every drop of water—which is only oxygen and hydrogen combined—and they are abundantly liberated by the decomposition of the vegetable and animal substances we eat.

In short, the body is, in all parts, filled with these gaseous elements, as a sponge is filled with water, and from them every secretion can be formed, without anything being taken from the blood.

This, however, is not all, for there is good reason to suppose that from these three gases, combined with other substances, also in the gaseous form, some of the most important parts of the body are produced, and *not from the blood!*

My own opinion is that the more subtle portions of the brain, and of the nervous substance generally, are formed in this way, and only the grosser portion from the blood.

Modern organic chemistry has done much for medicine, by showing how different substances act and react upon each other; and how, by proper combination, we can mutually decompose them into the gases we want.

Those who have not made such matters subjects of special attention, can scarcely imagine how subtle gaseous elements are, in their nature, and what minute portions of them can influence the matter they come in contact with. The very same gases, in slightly different proportions, form substances totally different.

Thus *starch*, *sugar*, and mere *woody fibre*, are composed of the same elements, oxygen, hydrogen and carbon, and are easily converted one into the other. Nitric acid (aquafortis) is composed of oxygen and nitrogen, the same elements as the air we breathe, only in different proportions.

There is absolutely nothing in pure atmospheric air, but what is in pure aquafortis; and by taking away a little oxygen, or adding a little nitrogen, the one is changed into the other. In the same way a little addition of any of these three gases may completely change the composition of the substance of the brain, spinal marrow, or nerves; and any such change in *substance* changes entirely their *action*, and as *their* action changes so does that of all the organs on which they act.

Thus we see that a small portion of a gas, such as we constantly breathe, drink, and eat, may reach the nervous centre, and through that affect the whole body.

If we take away the bones, which merely serve us as a framework to support the soft parts, the great bulk of the body is composed only of the three gases oxygen, hydrogen, and carbon, and the *nervous* substance is almost entirely so. We therefore see what an important part these three elements play.

It is remarkable also that some of the most powerful medical agents, and poisons, are composed of nothing but the same three ever-present gaseous elements. Some of these are so powerful, that a small portion of a single grain will cause *instant death!* And yet there is nothing in them but what is naturally a part of the body itself.

In short, the matter of which our bodies are made, the food that nourishes it, the medicines that cure it when diseased, and the poisons that kill it, are all composed of the same few gases, merely differently mixed, and each may be readily changed into the other. Thus food may become either medicine or poison; and drugs may either act as remedial agents, in curing disease of the body, or as poisons in destroying it.

It should also be here remarked, that any portion of the substance of our bodies is not, necessarily, always either solid, fluid, or gaseous; but may change from the one state to the other. In fact, these changes are constantly occurring, and often take place in the most rapid manner. The two gases, oxygen and hydrogen, meeting, in the proper proportions, in any part of the body, may, in a moment, combine and form water; or carbon and hydrogen may meet and form one of the oily fluids, which exist in all parts of the organization.

Very little further change may form these fluids into solids, and these again may as readily decompose back again into fluids and gases. And it is these changes in chemical combination, it must be remembered, that cause all mental, moral, and bodily changes; the whole being depends upon them.

In its composition, and in the manner in which its elements are combined, the brain, and nervous substance generally, is different from any other part of the body. The bulk of it is a soft, semi-fluid mass, apparently loosely held together, and therefore readily susceptible of change both in form and chemical composition. It also contains a large amount of uncombined *gases*, of various kinds, which no doubt assist materially in causing these changes, and thus have an important influence over its action.

My own conviction is, that these gases, permeating the substance of the great nervous centres, and filling the spaces between the convolutions of the brain, are the most important agents we have to deal with, when we study the functions and diseases of this important organ. I believe that it is really from these gases that the nervous system derives much of its peculiar nutriment, perhaps as much as from the blood. I also think that those substances which act most energetically upon the brain, in any way, do so *only when they are in the gaseous state*, and that those which cannot be made to assume the gaseous state, in the body, can have no direct effect upon the brain at all. Alcohol, for instance, decomposes in the body very rapidly, or becomes gaseous, and mounts at once to the brain. The peculiar alkaloids of tea, and coffee, do the same; and so in short do all those substances which act as stimulants, or narcotics. All those drugs, on the contrary, which do not decompose when taken, and become gaseous, have no direct effect at all on the brain and nerves.

This is highly important to bear in mind, because upon this fact is based the whole theory of what is called *Neuropathy*, or the treatment and cure of disease by acting directly through, and upon, the brain and nerves.

The brain is the organ which elaborates *thought*, and from its action result all of what we call mental and moral manifestations. This is the peculiar and special function of the brain; and, as before remarked, there can no more be thought, or *mind*, without a brain, than seeing without an eye, or digestion without a stomach.

Chemical Change the True Cause of Life—both Bodily and Mental.

It has hitherto been supposed, unfortunately, that the various functions carried on in a living body, such as digestion, nutrition, feeling, thinking, and so forth, were due to a peculiar force, called the *vital power*, distinct from the ordinary natural forces that operate on what is called dead matter. This notion, which has led both physiologists and physicians astray, is now being abandoned by the most advanced investigators. It is beginning to be perceived that every function of the living body—or, in other words—every *vital process*, is due only to *chemical changes* in the substance of the body, exactly like those which take place in what is called dead or inorganic matter.

Digestion, nutrition, muscular action, thought, feeling, and all the other wondrous phenomena we call *life*, are simply the results of chemical transformations, exactly like those that the chemist effects in his laboratory. In fact, the living body is a laboratory, in which the various complicated chemical changes take place, resulting in what is called organic action, or *life*.

The term, *vital power*, was invented merely as a cover for our ignorance; and, like other similar inventions, it satisfied the mind till the real truth appeared. It has, however, been hurtful, by leading men astray, and making them satisfied with attributing all vital phenomena to the mysterious action of this unknown power, instead of trying to understand them as simple natural processes. Every new discovery decreases the need of referring to this imaginary vital power, and points inevitably to the time when it will no longer be appealed to.

In the treatment for the cure of disease, this vital power has always stood in the way; especially in nervous and mental diseases. Men have been so afraid of a bugbear called *materialism*, that they dare not even think of life—especially *sensational*, and *mental* life—as being in any way connected with, or dependent upon, ordinary natural agencies. And yet, this is what we *must* come to, if those things are ever to be understood, and rationally considered. We must not allow ourselves to be frightened at mere *names*, nor at the prospect of having to abandon old theories. Veneration should not stand in the way or investigation, nor belief blind us to facts, however opposed they may be to that belief.

Health—What Is It?

What we call health, both of body and mind, is merely a certain condition of the material substance of the body. Change that condition, in a certain way, and we have disease. Both states result from the action and re-action of the matter of the body, and not from any mysterious power, or vital force, belonging only to living beings. And this is true, both of the *body* and the *mind*. To put this important point more plainly and forcibly, it may be well to compare the living body with an electric telegraph, the same as has been done in other chapters. When the telegraph does not work well, we know that something is wrong, either with the battery or the apparatus, and we do not expect it to work well again till everything is put right. It is not thought for a moment that the imperfect working, or *disease* of the telegraph, can possibly be caused, or cured, in any other way than through the apparatus itself. It is just so in regard to all the organs and functions of the human body. As regards their state, whether of health or disease, a man is just as much a mere combination of chemical and mechanical forces, acting conjointly, as is the electric telegraph. And this is as true of feeling, and thinking, as it is of digestion or locomotion. If you change a man's *brain*, by adding to it, or taking away from it, certain of the elements which enter into its composition, you change that man morally and mentally.

The way in which a man shall *think*, the way in which he shall *feel*, and the way in which he shall *will*, at any particular moment, or on any given occasion, depends on the composition and condition of his brain at that moment; or, in other words, a little more, or a little less phosphorus, or of one of the gases—oxygen, hydrogen, or carbon—in the substance of his brain, decides for the moment his character as a mental and moral being.

All the various forms of nervousness, hypochondria, mania, and insanity result in this way from chemical changes in the substance of the brain; and, if we could only know just what change *had* occurred, and could rectify it, the diseased condition would be remedied at once. Unfortunately, the subject has been too recently looked at in this light, and has been too little studied, for much to be known *practically* about the matter; but every day is adding to our stock of facts, and giving us the results of new experiences, so that the future is full of promise. And if we only get rid of the idea that *moral* means only are proper, or efficacious, in many mental disorders, we shall soon arrive at better modes of treatment. It will some day be seen that hypochondria, eccentricity of character, perverted propensities, and much of what we call vice and crime, must be cured by the bodily *physician*, and not by the mere *preacher* or *moralist*. If a man has a morbid propensity to drink, or to licentiousness, it is useless to think of curing him by reason or persuasion alone. We might just as well expect to cure him of dyspepsia by the same means, when his stomach is diseased.

But, still mental, moral, and sensational influences, *do* operate both upon mind and body, and forcibly too—as many of the illustrations already given have shown—but it is only through the medium of the chemical changes which they cause.

The physician, or physiologist, cannot consider life, mind, or feeling, as something distinct from the body, or as having an independent existence. He can know nothing of life, or of mental, or moral being, separate from the bodily one. With him, life, mind, and feeling, intellect, or moral impulse, result from the action of certain organs, the same as do digestion, or locomotion, and he can study them only through the medium of those organs.

CHAPTER XXIX.

COMPOSITION OF THE HUMAN BODY AND THE CHANGES IT UNDERGOES.

People not familiar with these subjects, scientifically, are apt to suppose that the human body is made, at least in a great measure, of something very different from the ordinary dead matter around them. They think also that, as a general rule, solids remain solids ; fluids, fluids ; and gases, gases, always. But it is well known that there is nothing in the human body but what is found in other bodies, and in all the common objects around us. The substance of all its different parts also, like matter everywhere, is continually changing ;—the solids becoming fluids, and the fluids gases, and back again incessantly. In fact, these changes are necessary to its vital existence, and it is upon them that all action depends, as already shown.

The parts most energetically active, and that perform the most subtle and essential functions, are so formed as to be extremely liable to change ; while the parts of secondary importance are more stable in the composition, and change less easily and rapidly. Thus the *bones* change very slowly, and the muscles more rapidly.

The *nervous substance*, and especially the *brain*, changes the readiest. The firmest portion, as before remarked, is semi-fluid ; and it is permeated by fluids and gases, all of which are ready, under slight influences, to enter into new combinations, and thus change the character of the brain and mind. Every such change, no matter how slight, exerts an influence over the whole system ; because the action of every part, as before explained, depends upon the influence which it receives from the nervous centres, and the character of that influence depends upon the constitution of the nervous substance.

Bearing this in mind, it will be no longer a mystery how a man can be instantly made sick, or killed, by a smell, or by breathing a poisonous vapor. He simply takes into his system a gas, which has the power to decompose—instantly—the fluids, or gases, of the brain; and thus so changes the very substance of that organ, that it can no longer secrete, and transmit, the proper nervous influence. In this way, typhus, and yellow fever, and many other diseases, are conveyed from one to another. But it is not only material agents that affect the nervous substance, and entirely change it in a moment. Changes of temperature will do it; though more slowly; and so will electricity, much more rapidly. Many people are much affected by the electrical condition of the atmosphere, or of their own bodies; and, in many cases, electricity can take the place of the nervous current, and be the best curative agent we can use.

But, besides all these influences, there are others not usually taken account of, which are capable of changing the composition of the nervous substance, and paralyzing all brain-action in an instant, equally with the most deadly poisons.

The mental and emotional influences are as real as physical ones, and often quite as powerful. Long-continued grief, or apprehension, will destroy health and life as surely as slow poison, and a sudden fright, or fit of rage, may kill in an instant, as surely as a drop of prussic acid.

These mental and emotional influences act just like electric shocks, and cause real chemical changes in the substance of the brain. Just as an electric spark makes the two gases, oxygen and hydrogen, unite in a moment, and form water, so can such a shock as sudden fright, or rage, cause the gases and fluids of the brain to decompose, and enter into new combinations. And it is quite as possible that a poisonous combination may take place, as any other, which explains why such violent passions are aften followed by insanity, paralysis, or death.

In some persons the substance of the brain, and nerves, is less firm than in others, and more disposed to change; such persons are very liable to contract certain diseases, and to suffer from violent emotions, or peculiar mental conditions. Other persons, on the contrary, are but little affected by such things, and always--as the proverb goes—*take things easy!* It is simply because their brains are differently constituted, and can resist influences to which others cannot help giving way. Many bad habits—the abuse of ardent spirits, for instance—often so change the composition of the brain, that the person becomes irritable, or dull, or even imbecile; and, it must be remembered, that, if we only know what is proper to be done, it is as possible to *improve* the brain, by proper medication, as it is to injure it by such habits.

This is an important fact, and one which will be new to most people. Nevertheless, it is certain that the brain can be nourished, and improved, as surely as the muscles can be; and it must be remembered that, when we improve the brain, and the nervous substance generally, we improve the whole system, since the perfect action of every part depends upon its receiving proper nervous influence.

Nourishment and Improvement of the Brain.

The fact that perfect action, of every part, depends upon perfect action in the nervous organs, and that we can nourish and improve the nervous organs, or act upon them medically, the same as we can other parts, is one of the main points in Neuropathic practice.

A vast number of diseases, especially chronic ones, and those usually called nervous, result simply from a feeble condition of the brain and spinal marrow. There is simply not nervous power enough secreted to keep all the organs going; and either the whole system is debilitated, or some particular organs act feebly. Now, in such cases, if we can strengthen and improve the nervous system, we improve all the rest; and if we cannot do this, we can do no good at all.

If, for instance, a man has been thinking too much, or has been harassed by care, till his nervous system is enfeebled, he will either be *run down*, as we commonly say, that is, generally weak, or some particular function will be imperfectly performed. Most usually such a man becomes dyspeptic; and he is commonly given *tonics*, to improve his appetite and digestion, from the idea that the stomach is diseased or weak. But the fault is in the feeble state of the brain and nerves; and till these are strengthened and improved, no tonics in the world can do his stomach any good. Give such a man no strengthening medicines, as they are called, but send him away from his mental work, or his cause of care; let him travel, and mix with agreeable company, under new influences, and he will soon recover, if the nervous exhaustion has not gone too far; or let him ride some pleasant *hobby*, as already advised.

It is only in extreme cases, where the brain is too much enfeebled, and its composition radically changed, that medicines are needed, and then they should be neuropathic ones, such as readily assume the gaseous state, and which are calculated to nourish and improve the *nervous substance;* the ordinary tonics and alteratives, in such cases, often make matters much worse.

Feeble organic action, of any kind, is seldom a local disease; that is, it does not depend upon anything wrong in *the organ itself*, but it results merely from deranged nervous influence, as before explained. The organ gets either too much, or too little, nervous power, and therefore acts imperfectly; there is something wrong with the nervous centre, or with the nervous cord; and till that is put right, no local treatment can do any real good. The proper course, therefore, is to find out what is wrong in the nervous system, and correct that.

But all such corrections can be effected only by neuropathic treatment, and neuropathic remedies, which act directly upon the nervous system itself.

Here, then, is the whole theory of what is called neuropathy! It acts through the medium of the nervous system only, on which the action of every part depends; the remedial agents are all such as act directly on the nervous centres, and are either mental or moral, electrical, or medicinal; the medicines being such as are capable of becoming gaseous, and in that form being absorbed and assimilated with the nervous substance.

The particular agents to be used, in any case, must, of course, be determined by judgment, and experience, though there are some which are applicable to nearly all cases of simple, enfeebled nervous action, or a weak and impoverished state of the brain.

These principles apply especially to all derangements of the proper functions of the brain itself, to all mental disorders, moral perversions, and nervous irritability. These all result from something being wrong in the brain itself, in its composition, or structure.

Man's thoughts and emotions result from the action of his *brain*, the same as his bodily strength results from the action of his muscles; and he can no more be strong, or healthy, mentally and morally, with a feeble brain, than he can be bodily strong with weak muscles.

This fact, that the mental and moral character results from certain physical conditions, equally with the bodily character, is a fact that should never be lost sight of. The mental and moral man is entirely dependent upon the bodily man.

A man inhales a small quantity of oxygen, or some other gas, which mounts to his brain, unites with the gases there, changes the combinations, and instantly the whole action of the brain changes, and the man becomes mentally and morally different.

The gases engendered in the body act in the same way. A man with a clear, powerful mind may sit down to a debauch, in eating or drinking, and rise from it dull and stupid, with his mental power totally obscured. His digestive organs cannot use, in a proper manner, the material he has taken, and it decomposes, forming baneful gases, which mount to the brain, and temporarily poison it.

If this be continued too long, the character of the brain becomes different, and the man is totally changed, mentally and morally, because he necessarily thinks, and feels in a different way. He is not, strictly speaking, the same man. In many extreme cases the substance of the brain completely changes, and becomes almost fluid. This is the disease called *softening of the brain.*

When a man has softened brain he can no more think clearly, or vigorously, than he can work vigorously with softened muscles. And if this softening becomes permanent it causes a state of permanent idiocy. The organs necessary for the support of his bodily life may, however, still continue to act, providing the spinal marrow is not diseased also. And this explains why bodily health often remains after the mind is completely gone.

In all cases where the mind becomes feeble, or unnaturally active, or in which the feelings are perverted, and also in simple *nervousness*, of any kind, there is something wrong with the *substance of the brain!* There is either something combined with its elements that should not be, or they are deficient in something necessary to their healthy action.

In such cases the most excellent results follow from neuropathic remedies. The brain becomes firm again, and consequently the mind regains its power, the feelings become natural, and the morbid nervous condition is changed to a state of well-balanced calmness.

Sometimes these results can be obtained by a change in the electric conditions, and sometimes by mere mental, or emotional influences; but in most confirmed cases we must use proper medical agents capable of becoming gaseous.

A great number of valuable remedies of this kind have been discovered recently. Modern chemistry is also continually adding to their number, and by separating the really active matters from the useless, as in the case of the vegetable alkaloids, enables us to use minute quantities, and with certainty as to their action. It is time that the old practice of *dosing*, with immense quantities of powerful drugs, to cause a *powerful action*, was done with; it has probably killed more than disease itself.

CHAPTER XXX.

MEDICINE, MEDICATION — ITS NATURE AND OBJECTS, ETC.

Medicines in General.

In all cases of disease, nature herself continually strives to bring back a state of health, and the object of medical treatment is, to assist this natural effort. If the medicine acts one way, while nature is acting another way, it not only does no good, but possibly much harm. And this has really been the case with much of the past medication. Nature would be trying to bring matters right by thowing out an eruption, by a diarrhœa, or a profuse perspiration, and the doctor would immediately step in, with his medicines, to stop all these operations, which he mistook for the disease itself. The consequence was that nature's efforts were all counteracted, and she had the effects of the medicines to fight against, in addition to the disease. No doubt many thus died, from being doctored, who would have lived had they been let alone.

When the medication assists, or regulates, the proper natural effort, it may do much good; and this, therefore, is the important point to aim at.

Different Kinds of Medicines.

Anything which acts as an assistant, in the restoration of health, is a medicine, whether it be a material substance or merely a nervous or electrical influence.

Medicines, therefore, are of different kinds, and act in different ways, according to their nature, and to the circumstances in which they are given.

Chemical Medicines.

In some cases medicines are given to effect direct chemical changes, as when we give alkalies in sour stomach, or acids when there is too much alkali in the blood. But much of the chemical medication is a great mistake, founded on ignorance of the actual chemical state of the bodily fluids, and of the changes which the medicines undergo after they are taken.

Thus, very often when nitric acid is given, as an acid, it really acts as an *alkali*, or totally opposite. The change occurs in this way: The nitric acid is composed of *nitrogen* and *oxygen*, and in the stomach these may separate, the nitrogen combining with a portion of the hydrogen, which is always present there, and forming *ammonia*, while the oxygen combines with another portion to form water. The effect is the same, therefore, as if a solution of ammonia, or *sal volatile*, had been given.

Vegetable acids often decompose still more readily, and the gases that compose them enter into new combinations. Many of these acids are composed, in a large measure, of *carbon*, which being liberated, may act much like charcoal. These vegetable acids may, therefore, be the very best things to counteract *acidity*, and are, in fact, often used for that purpose; one acid neutralizing another.

It is but seldom that medicines can be given, with any certainty, to cause direct chemical changes in the living body, and much and serious evil is being done constantly in the attempt.

Nutritive Medicines.

In other cases medicines are given to supply some element, in which the body is deficient. Thus, in some impoverished states of the blood, we find it is deficient in *iron;* and if that metal be then given, in a proper manner, it soon causes an improvement. In other cases lime is needed, or phosphorus, and the proper administration of these substances is then beneficial.

In this case the medication is a species of *nutrition;* and, if we know what really is needed, and can give it in a proper form—that is, in a form that the organs can make use of—we can effect much good.

Sometimes it is not very obvious what element the body does need, though it is obvious something is deficient; and this is one fruitful source of mistake and wrong treatment. Very frequently, also, the element is given in a wrong form, and the system can derive no benefit from it. Many of the metallic compounds, given as nutritive medicines, are thrown out of the body in the same state they were taken. Others are decomposed, combine anew, and act totally different from what they were intended to do. It is only in certain states, or chemical conditions, that such matters can be absorbed, and carried into the circulation, a fact which is often lost sight of.

Neuropathic, or Nerve Medicines.

The greater part of the medicines taken are intended to act neither chemically, nor as nutritives, but simply as regulators of the organic functions. And this regulation they effect by acting on the nervous centres, either directly or indirectly, in such a manner as to increase or decrease the force of the nervous current, according as may be needed.

Thus, such medicines as diuretics, and purgatives, for instance, irritate the kidneys, or intestines; and this irritation, being conveyed to the nervous centre, excites a reflex nervous action, which causes those organs to act more energetically. In all cases where any organ is excited, by medicines, to increased action, it is only in this way. The medicine does not *directly* cause the increased action, but it irritates the *sensor nerves* of the organ; and these, by conveying the impression to the nervous centre, cause a reflex action, and the transmission of a more powerful nervous current to the seat of irritation.

Most people suppose that it is the medicine itself which acts directly on the part, but this is a mistake. It is the nervous influence only that acts, and the medicine merely sets it indirectly in motion. If the nerves connecting the stomach with the nervous centres were cut through, no emetic, no matter how powerful, could excite vomiting. But with these nerves perfect, a mere thought, or emotion, will do it, as has been before shown.

Medicines can also be given to act directly on the nervous centres themselves, to either increase or decrease their organic action, according as they are torpid or over active. Such stimulants as alcohol, tea, and coffee, and all the various narcotics, are remedies of this kind. These constitute, in fact, the most important class of medicines, the proper use of which is comprised in the practice of *neuropathy*.

Excepting when used chemically, therefore, or as nutritives, all kinds of medicines act through the nerves; only in ordinary medication they do so *indirectly*, by reflex action; and in the neuropathic practice they may act directly as well, by operating at once on the substance of the nervous system, which they are enabled to do owing to their gaseous form.

CHAPTER XXXI.

THE NERVOUS INFLUENCE IN MEDICATION.

Neuropathy.

The important fact that all diseased, as well as all healthy action is due entirely to nervous influence, though well known, as a general rule, has not, till lately, been practically acted upon in medicine. In consequence of this, much of the medical practice has hitherto been, and is now even, not only useless, but positively hurtful—so much so, in fact, that many an eminent practitioner, at the end of his life, has expressed doubts whether he had done most good or most harm. Some of them have even experimented, unknown to their patients, by giving mere inert substances, such as bread pills and colored water, and have found their *cures* just as frequent as when they used real medicines, while the harm done was certainly much less.

The ruling idea in medication, hitherto, seems to have been that the human system, when diseased, must be *well shaken up*, or strongly acted upon. Hence, the most powerful remedies were thought the best, and they were generally used to the full extent the system would bear. The amount of purging, vomiting, sweating, bleeding, salivation and other violent actions, to which the human body has been subjected, is frightful to contemplate. The disease itself has often been a mild affair compared with the treatment.

And all this has been without any rational justification or foundation. We now know that most of the results, if not all, sought to be obtained by these murderous means, can be obtained more certainly by other means, as mild and harmless as they were violent and hurtful, as will be shown further on.

If the nerve force is sufficiently powerful, and if each organ receives its due share, all the functions of the body go on in a healthy manner; but if any organ does not receive enough, it cannot act well, and becomes, in consequence, feeble or diseased.

Unequal distribution of the nerve force causes unequal action in the different organs, some getting too much, and some too little. From this arises excitement, irritation, or inflammation, in some parts, and torpidity, or feeble action, in others. In perfect health each organ gets exactly its proper share, and there is enough for all.

This explains why men injure themselves by over use, or abuse, of any of their organs. If the student exhausts too much of his nervous power in thinking, there will not be enough for other purposes, and some organ will act inefficiently. Most usually he becomes dyspeptic, simply because the stomach cannot get nervous force enough to enable it to digest. The libertine, on the contrary, uses up too much nervous power in sexual indulgence, and becomes, in consequence, feeble in body, and imbecile in mind.

Since all organic action therefore, whether healthy or unhealthy, is caused solely by the stimulus of the nervous current, it is evident that, in one sense, *all diseases*, except such as arise from direct violence, can be tracked back to *deranged nervous action*, and their cure can be effected only by making this action healthy again. Or, to use a mechanical illustration: If one portion of the machinery works too fast, we must lessen the amount of steam it receives, and if another goes too slowly we must increase the amount, till all receive exactly the right amount. Just so we must act with disease; the organic action must be increased or decreased, in the diseased parts, as needed, by regulating the supply of the nervous current. All diseases therefore, organic or functional, must be treated through the nerves.

It is however convenient, and proper, to divide all diseases into two classes, which for convenience may be here called the bodily, or organic, and the nervous or functional.

The different nature of these two classes of diseases may be partially illustrated, by comparing the human body again with an electric telegraph. In this there may be wires or other parts, broken, and machinery deranged, so that it will not work, such accidents corresponding to the ordinary organic diseases in the human body. There may, however, be no parts broken, nor any out of order, and yet it may work irregularly, or not at all, from want of the *electric current*, owing to some fault in the chemical battery. Such derangements are analagous to functional or nervous discases, which result from some fault in the brain or nerves.

Now when the machinery or apparatus is broken, or deranged, the machinist is sent for, and he puts all right again with his tools and soldering irons. But when the battery is in fault, and there is simply no electric current, the chemist must step in, with his acids and other elements, to cause the necessary reactions.

The machinist's work will not correct the fault in the battery, nor will the chemist's proceedings mend the broken machinery. The two processes are entirely different things, and calculated to effect totally different purposes.

This is precisely analogous to what is needed in treating the two different kinds of disease. The purgatives, emetics, and irritants that are used in the bodily or organic diseases, are altogether inappropriate, and unsuited to the merely nervous or functional diseases. In most of them it would be as absurd to expect any good result from such treatment, as it would to expect an electric current from piling the machinist's tools in the battery pot. Strictly speaking, therefore, *nervous diseases* are those arising from derangement of the nervous apparatus itself, and affecting its functions only. But in one sense all diseases are nervous, and can be acted upon only through nervous influence.

Mental, Emotional, and Electric Medication.

But there is another class of medical agents, not usually considered as such, but which are, in many cases, more proper to use, and more effective than any drugs whatever. These are mental and *emotional* influences, and electrical conditions. That the mind and feelings do exert a real positive influence over the body, has already been shown in previous chapters, and it has also been stated that the extent of that influence is but little appreciated.

Electricity also, in many ways, can supersede drugs, and is a true neuropathic agent. If not indentical with the nervous power itself, it can often take its place, and either cause true organic action, or chemical change, in the substance of the body, the same as violent emotion or powerful drugs, a fact which will be further illustrated subsequently.

In ordinary medication drugs are given for the express purpose of causing an artificial local disturbance, of some kind, which, being transmitted to the brain, through the nerves of sensation, causes that organ to send a reflex nervous current to the disturbed part. That is, the drug causes a reflex action from the nervous centre, and, so long as there is a plain indication to be fulfilled, it may be a proper plan of proceeding, providing the drug can effect the desired reaction. Emetics, purgatives, and diuretics are good illustrations of this principle, because their action is prompt and unmistakable. But a large number of diseases are so obscure, as to their real nature and origin, that we know not what indications require to be fulfilled to cure them. When the stomach, bowels, or kidneys are simply inactive, it is easy enough to decide what is needed to be done. But when a person is sick without any of these obvious derangments, especially in chronic cases, there are no obvious indications to be fulfilled, and drugs are given merely experimentally. In such cases there are almost as many different modes of practice as there are physicians, which, as some one wittily remarks, makes medicine a most accommodating science ; for if you don't like your doctor, or his treatment, you can easily find another, who will tell you he is an ignoramus, and who will treat you on an exactly opposite system. And the very fact that all the different, and utterly opposite, modes of practice, on the whole, equally succeed or fail, as the case may be, proves that none of them are founded upon actual knowledge, but simply on routine or experiment.

A celebrated physician once put the case thus :

"A sick man," said he, "is like a man struggling with an enemy in a dark room. The doctor comes in with a club (*his medicine*), and begins to strike all around him in the dark. If he hits the enemy (that is the disease)—all right ; but if he hits the man, why he makes matters worse for him ; *and he is just as likely to hit one as the other*—in the dark."

In all disease there is some deranged or irregular nervous action, which requires to be put right, and this can be done only through the nervous centres. But the old plan of depending only on reflex nervous action, excited by drugs, is too uncertain, too violent, and too dangerous.

It is, in fact, an open question, whether drugs have not caused more disease than they have ever cured ; or, in other words, whether the doctor has not *hit the patient* oftener than he has hit the *disease?*

Now, if the nervous centres can be acted upon *directly*, and if the nervous power, emanating from them, can be properly equalized and distributed, without the ordinary powerful drugs, then they can be dispensed with. And this is precisely what Neuropathy professes to do.

The great bulk of all the medicine used is given emprically ! That is either from mere *custom*, or at a *venture*. No one knows exactly what it is intended to do, nor the special way in which it is expected to act. The bulk of it, however, is meant to act either as a *stimulant*, or *sedative* ; that is, either to *increase* some organic action, or to *decrease* it ; or, in other words, to *make a change*.

An indefinite idea of thus making *a change*, with the *chance* of its being for the *better*, is the ruling idea in nine-tenths of our medication. It is also a rational idea, although the nature of the change sought, and the true way to obtain it, is seldom understood.

Since every organ acts only from *nervous influence*, it is evident that if we wish to either increase its action or decrease it, we must do so by increasing or decreasing the amount of nervous influence it receives. All *change*, therefore, or alteration, must be effected through the nerves ; and only those medicines are really effective which act upon the great nervous centres. Further, bearing in mind what has been before stated, that the nervous substance is nourished, excited, or calmed, mainly by matters in a *gaseous form*, it is evident why only those medicines are effective which can become gaseous when taken into the body.

The great point, therefore, in medication, is to know what medicines will decompose into gases, when taken, and how those gases will act, whether chemically or as simple restoratives, or as stimulants, or sedatives, to the nervous substance.

When medicines are taken in a gross solid form, and are not changed, they act only upon the bodily substance they come in contact with ; in many instances only chemically, or as mere irritants. To produce a legitimate medical effect they must become *fluid*, or be dissolved, so as to be absorbed into the fluids of the body. When most effective, they pass from the fluids even into the gaseous state, as before explained ; and in disease of the nervous system this is especially necessary.

Therefore, the more perfectly *soluble* a medicine is made, the more readily it is taken up and disseminated ; which explains why a small dose, properly prepared, may be much more efficacious than a large dose given in a crude form.

Many medical reformers have recognized this fact, and acted upon it to the benefit of their patients.

The continued trituration, and extreme dilution, of *homœopathic* medicines are intended to make them more soluble, and better adapted to be absorbed.

Still, for those medicines intended specially for the nervous system, mere *fluidity* is not enough ; they must be *gaseous!* or at least they must be capable of becoming so, when taken into the body.

Neuropathic medicines are all capable of becoming *gaseous*, and in that form reach the brain and spinal marrow, where they combine with other gaseous elements there existing.

Every combination of this kind changes, more or less, the composition, or structure, of the nerve substance, and consequently changes its action. No medicine can act, neuropathically, that cannot, when taken, assume the gaseous form ; but all the most active remedies readily and naturally assume that form.

The chapter, previously given, on the gases of the body, and on the chemical transformations that continually occur among them, will make this important point readily understood, and they should be read in connection with this.

In regard to remedies of this kind, it must also be borne in mind that, in order to act on the nervous centres, it is not necessary they should be taken in the ordinary way, by the stomach. They may be *breathed*, or *smelt*, and in either case are absorbed at once, as gases. They may even be taken into the system by the pores of the skin, and be fully effective.

A familiar instance of this is seen in the case of *chloroform*. This needs only to be breathed; and it mounts at once, in the state of gas, to the brain, and makes it torpid, so that all feeling is lost.

The ordinary effects of alcohol also farther illustrate the same fact. It is not the fluid substance alcohol that mounts to the brain, but the stimulating gases, which are let loose by its decomposition in the stomach.

The gas called *sulphuretted hydrogen*, a compound of sulphur and hydrogen, is one of the most active chemical agents, and causes immediate and great changes in all the chemical combinations it comes in contact with.

A dog can be killed by being made to breathe an atmosphere containing only one-*eight-hundredth part* of this gas. In fact, it need not be breathed at all, nor even smelt, for it can be absorbed *through the skin*, in any part of the body, and will cause death. And yet this same gas is the *curative agent*, in many of the mos tcelebrated mineral waters, and is constantly engendered in the body by the natural healthy action of its organs.

The wonderful power of such an agent results from its property of effecting sudden chemical change, among the substances with which it mixes. Whether those changes shall be beneficial, or injurious, depends on the state of the parts it comes in contact with, and upon the nature of the new combinations it gives rise to.

Sulphuretted hydrogen is largely given off from foul sewers, and neglected water-closets, and is often the source of serious disease.

In many cases of feeble health, the substance of the brain is in a soft, lax condition, just ready to break up, or change, if certain agents come in contact with it.

Suppose a man in this state encounters the odor from a foul sewer; he need only take one whiff, the gas mounts to his brain, and he feels faint, or shivers, is taken sick and dies. The gaseous elements in his nervous substance, acted upon by this powerful chemical agent, change their combinations in a moment, and the brain is decomposed, or destroyed, as surely as if broken up by force.

And yet this same agent, given at the right time, and in the right way, may just as easily effect changes of the most beneficial character, or even *save* life.

The mere smell of prussic acid, even when largely diluted with air, causes headache and fainting, and in its pure state, even instant death. There are numerous other agents known equally powerful, all acting in a gaseous form, and in the minutest quantities. Some act when taken into the stomach; some when breathed; some when smelt; and others only need to touch the skin, from which they are instantly absorbed.

CHAPTER XXXII.

WONDERFUL POWER OF SOME AGENTS AND RAPIDITY OF THEIR ACTION.

To those not familiar with chemical transformations, it is astonishing what minute quantities, of some matters, are needed to effect the most wonderful changes, and with what rapidity they act. The smallest atom of some particular substance will, in many cases, change a large mass of matter from a solid to a fluid, or to a gas, in an instant, and often with the greatest violence. Exactly analogous changes occur in the body, from the absorption of various powerful poisons, or remedies.

Many fluid substances are decomposed in an instant, into gases, with explosion. Nitro-Glycerine, for instance, is a fluid thicker than water, and apparently more stable in its composition; but, add a single drop of certain chemical matters to any amount of it, and—in an instant—it explodes with fearful power, and nothing is left but a number of gases.

Now these gases, while combined in the form of the fluid, nitro-glycerine, are held together very loosely, as it were, and are easily caused to separate and enter into new combinations, instantly, and with fearful violence.

There are many similar substances, known to chemists, which have the appearance of oils, or simple fluids, but which are so easily decomposed, and with such an exhibition of force, that it is dangerous to experiment with them, except in the smallest quantities. Chloride of nitrogen, for instance, is one of these. It is an oily-looking fluid, so liable to change, and with such violence, that a *single drop* of it is very dangerous, and few chemists dare to make even enough to look at. So loosely are its component gases, chlorine and nitrogen, held together, that a mere *touch* of any oily body, will explode, or separate them, with tremendous violence; and then neither has any explosive power whatever by itself.

It may be necessary to remind the unscientific reader that, in all these cases, nothing is *destroyed*, and nothing new produced; the elements which compose these substances merely separate, and pass suddenly, and violently, from the fluid, into the expanded gaseous form.

As a general rule, fluids are more liable to this sudden and violent change than solids, but still there are some solids almost as dangerous. It is the sudden conversion, for instance, of some of the solid elements of gunpowder into gases, that causes its violent explosion when fired. But the chemist can form solid substances which are so liable to explode that it is difficult to keep them. The mere jar of shutting a door, or of moving a chair, or the slightest touch will set them off.

All these substances, whether fluid or solid, are composed of elements that have a great tendency to assume the gaseous form, suddenly and violently, owing to their being but slightly held together. The same elements, it must be remembered, can form either solids, fluids, or gases, of the most opposite characters and properties, according to the proportions and ways in which they are combined.

But, striking and wonderful as are the changes just mentioned, in fluids and solids, those which take places in gaseous compounds are still more so. The addition, or subtraction, of a minute portion of some particular gas to or from one of these compounds, a degree more or less of heat, or an electric spark, may separate it in an instant; and its various elements then enter at once into new combinations, producing the most astounding and unexpected results.

Thus, we may have a mixture of two gases, oxygen and hydrogen, in a glass vessel, and nothing is visible—the glass appearing perfectly empty—but, pass an electric spark through them, and, in an instant, they combine and form *water!* The same water can again, by electricity, be decomposed into the same gases from which it was formed.

From their nature, gases mix, or separate, more readily than either solids or fluids; and, as they are everywhere present, and pass through almost every substance, their combinations and recombinations are perpetually taking place. They are, in fact, the great causes of transmutation and change.

Peculiar Gases of the Body.

The human body, as before explained, is everywhere permeated, saturated, with gases. They are all the time being taken into the body by the food and drink, by the breath, and through the skin, and the changes which occur in the body itself also keep forming them, incessantly.

Many of the gases thus formed in the body, by the decomposition of its substance, are of the most poisonous character, and would cause death if they were not decomposed or neutralized. In a state of health, however, one gas counteracts another, and thus even the most hurtful are made harmless, or even useful. Immense quantities of the deadly *sulphuretted hydrogen* are formed in the intestines, and disseminated from thence all over the body, but ordinarily no harm results from it. In fact, it is no doubt necessary in many ways, to effect changes in other combinations.

In a state of debility and weakness all this may be changed, and man may be literally *poisoned* with the gases engendered by his own body. In numerous instances, to a great extent, this is beyond doubt the case.

It is quite common to observe, in unhealthy persons, most unpleasant odors from the body, sometimes of a very peculiar character. All these are poisonous gases, and nature is trying to get rid of them. It is well known that most *lunatics* have a peculiar smell, so marked in fact, that an experienced person can generally distinguish a lunatic at once, by the odor. An acute and practised nose can detect many diseases in the same way, and even particular kinds of mental derangements.

These unusual odors show that the gases, in the body, are undergoing decomposition, and that they do not recombine in the normal way. This, of course, indicates that the chemical constitution of the body is different from what it should be, and that constitutes a state of disease.

The various nervous conditions peculiar to women, especially hysteria, erotomania, and many others, are often very distinctly marked by the odors of the body, a fact which they frequently notice themselves.

In short, the action and reaction of the gases, both within and without the body, is of the highest importance, though not generally acknowledged or understood, even by many medical men.

It should also be remarked, as a further explanation of how rapidly change can take place in the body, that the fluids and gases are not confined entirely to the particular cavities, sacs, or tubes in which we find them. Both fluids and gases pass readily through the walls of any of these receptacles, and meet and mix with one another in all parts of the body.

The whole substance of the body is *porous*, so that a fluid, or gas, may pass from the inside to the outside, or be absorbed from the outside to the interior. And when this is known, and it is further borne in mind how readily chemical combinations change, it will be no longer a mystery how a man may be poisoned by breathing, or smelling, some particular gas, or by its coming in contact with his skin only.

It must be borne in mind, in regard to chemical changes, that the new body produced may be formed *entirely* of the elements of the old one! No fresh matter may be needed, but only a different arrangement, or combination, of that which formed the old body. Thus we might have a mixture of the three gases, oxygen, hydrogen, and nitrogen, and there would be no more to be *seen* than in an equal bulk of common air, nor need it be in any way more active. But an electric spark, or the mere presence of some other element, may in an instant cause a wonderful transformation.

A portion of the oxygen may unite with a certain proportion of the nitrogen, and form *nitric acid*, while another portion of the nitrogen, uniting with the hydrogen, may form *ammonia!* Thus there would be produced from this invisible gaseous compound, a most deadly, corrosive *acid*, and a pungent *alkaline gas*.

Then, again, these two might unite and form *nitrate of ammonia*, a crystaline *solid*.

The process might also be reversed, and from this solid nitrate of ammonia we might again get the acid, the alkali, and, finally, the inert gaseous mixture.

All these wondrous changes, from one substance to another, be it remembered, require only a different arrangement, or combination, of three simple elements. And this change from one form to another, the work of a single instant, may result from mere contact only with some other body, or even from its mere *presence!* For it is a fact that substances in a certain state of motion, or change, themselves, may excite in other substances the very same motion, or change, by being merely in their neighborhood. Chemists see instances of this constantly, both in fluids and gases.

In fact, all compound bodies, except dense solids, are liable to these sudden breakings up and recombinations, from the smallest apparent causes.

Similar Changes occur in the Human Body.

But it is not only in artificial chemical compounds that this takes place, or in nature at large, but also *in the human body!* The gaseous and fluid substances that compose such a large part of its bulk, are every moment decomposing, and reforming into other snbstances, perhaps totally different. All such changes of course affect the *health*, or condition of being, and they may be either hurtful or beneficial. *Life* itself, in fact, in all its aspects, is but the expression of these changes, and it is by chemical transformation that we *live!*

Every portion of food or drink that we take, every breath that we draw, or odor that we smell, all act as modifying agents in this way.

In short, the various component substances of our bodies, and those surrounding us, are perpetually acting and reacting on each other, and every change thus produced makes more or less change in us, both bodily and mental.

To effect changes of this kind, *in* the living body as well as *out*, we often require only a minute portion, or even the *presence* merely, of some disturbing element, or a slight exhibition of electric force. But a *thought* only, or *emotion*, may act in the same way, and bring about most momentous chemical changes.

When medicines are administered, in disease, it is, of course, with the object of effecting some needed transformations; and if the medical agent be of the right kind, and in the right form, it may do so, and thus bring back a state of health. But, as will be seen from the explanations given, it is not mere *quantity*, or *exceptional activity*, that may make such an agent useful, but its power of inducing change, or effecting chemical transformations. And very often this power may reside in a minute portion, of a very simple substance, that has no especial activity of its own on the system at all.

The very smallest quantities of matter that we can deal with, in the ordinary way, by measuring, or weighing, even with the most delicate apparatus, are large and ponderous, compared with the extreme minuteness of division effected by chemical means. We can *measure* to ten or twenty thousandths of an inch, or even much less, and *weigh* to as many thousandths of a grain, but when this infinitesimal part of a grain is obtained, we can, by chemical means, divide it millions of times more. In fact the division can be carried so far that figures can scarcely state the extent. And yet even in this attenuated state, when the amount of any particular substance, in any given body, is so extremely minute that it seems totally lost, it may still exert the most surprising effects. One of these millionths of the millionth of a grain, or less, may originate changes and transformations in large masses of matter, which will split their component parts asunder, and recombine them, in new and totally different combinations.

And yet, surprising as all this may seem, spectrum analysis makes us acquainted with quantities of matter still smaller. So minute in fact, that by no chemical tests whatever can we know of their presence. And yet the spectrum shows infallibly that they are there, and we know that, inconceivably minute though they be, they still may cause changes, in vast masses of matter with which they come in contact, of the most stupendous character.

All this shows that the power of a chemical agent, or of a medicine, is not to be estimated by its own immediate effect, but by the changes and transformations, the actions and reactions, to which it gives rise, among the matters with which it comes in contact.

All Substances act, Chemically, either in the Fluid or Gaseous States only.

No substance can act chemically, unless it be *fluid*, or *gaseous*, or capable of becoming so when in the presence of other substances. The more perfectly fluid, or gaseous, it is, the quicker, and more perfect is its chemical action. It is the same with medicines. If they remain solid they are useless, and their activity is in direct proportion with their power of becoming fluid or gaseous.

Perfect solubility therefore, is one of the most essential qualities of a medicine, because without that it cannot be so minutely divided as to be readily absorbed, and assimilated. A substance may be *ground* and *pulverised* to the utmost possible extent, but it still remains solid ; and each particle, no matter how small, is just the same as the whole mass was at first. It is only when *dissolved* that it can be said to be thoroughly subdivided.

Perfect solution, and proper dilution, put the particles of the medicine in such a state that they can be absorbed, and reach the parts where they are wanted. Before they can get to some parts in fact, as before stated, they must even becomes *gaseous*, because only gases can reach those parts. But changes of this kind, from solids to fluids, and from fluids to gases, take place very readily, under proper influences, and are occurring all the time, both externally and within the body.

All bodies can exist in either of these three states, solid, fluid, or gaseous, and they pass insensibly from one state to the other. There is, in fact, no real separation between solids, and fluids, and gases, and they are therefore only relative terms, the solid becoming gradually softer, then semi-fluid, and finally fluid, but we cannot say where solidity ends and fluidity begins. In the same way, there is no actual separation between fluids and gases. The fluid becomes gradually lighter, and more volatile, till finally it passes into the state of vapor, or gas, but we cannot indicate the exact point where one state ends and the other begins.

From the solid state up to the gaseous state, therefore, there is only a continuous change, and not separate states, or conditions, each distinct from the other. The change consists in a giving way, or weakening, of the power, whatever it may be, that holds the particles of the substance together;

—the agent that usually effects this change is *heat*. The action is well shown in the familiar case of *water!* This body, at any degree of heat below 32° Fahrenheit, is a *solid*, which we call *ice!* But let it be heated above 32° and it becomes *fluid*, or water. Heat it still further, up to 212°, and it rises into *vapor*, or steam, which is water in the *gaseous* form. All bodies change in the same way, only they require different degrees of heat, some being always solid, some always fluid, and others again always gaseous, at the average temperature of the atmosphere. But there is a certain degree of heat in which *every body* can exist in *either of the three states*. The more a body is heated, as a general rule, the more it expands, or the further apart its particles separate. Fluids expand more than solids, and gases still more than fluids, but in all of them, any change in temperature changes their bulk. Even the changes of temperature in the body, arising from organic action, and from the varying conditions of health, expand and contract every part. The increased heat engendered by exercise, by a fever, or by a warm bath, changes solids into fluids, and fluids into gases, just the same as the heat of the sun effects such changes on the earth. A sudden *perspiration* from exercise, is a good illustration of this. The fluid perspiration does not exist as such, ready formed, and prepared at any time to gush out, but it results from the actual *liquefaction* of some of the *solids*, by the increased *heat*, engendered by the exercise, or by chemical or electrical changes. Some of the fluid even passes into the state of vapor, or gas, as may be readily seen by holding a cold glass over the heated body, when the vapor will condense upon it in drops. A sudden chill, or cold, reverses this process, converting the gases into fluids, and the fluids into solids, thus causing congestions, and obstructions of various kinds in the different circulating vessels. Hence the popular treatment for a *cold*,—causing a *perspiration*,—which again liquifies the solids and removes the obstruction. Nature herself does the same thing by *inflammation*, and *fever*, which always terminate in some discharge or liquefaction.

Chemical Changes cause Changes of Temperature, and of Electrical Condition.

Chemical combination and change always gives rise to change of temperature, sometimes to an extreme degree. Some substances may be mixed together that produce intense cold, and others again, though cold when mixed, produce, by their union, sudden and intense *heat*. And in this way our food and drink, the air we breathe, and the medicines we take, may, by mere chemical action on the substances they come in contact with, cause great changes in the temperature of the body. And the increased heat, or cold, thus caused acts in its turn, and induces other changes. Every chemical change also causes a change in the *electrical* conditions of the body, as well as in its temperature; and these electrical changes, in their turn, react and cause other changes; so that action and reaction, decomposition and recomposition, are perpetually taking place.

The influence of a medicine, therefore, is not limited to its immediate effect, for it may be only the starting point, for an infinite series of changes, many of which may not have been anticipated or desired.

Homœopathy.

Many medical reformers have perceived the fact, though but partially, that all medicines must be capable of the most perfect fluidity, or extremely minute division, before they can be properly absorbed and appropriated. Among others, Hahnemann appears to have caught the idea, and his system is really founded upon it. The numerous and systematie triturations which he prescribes for drugs, and their extreme dilution, are for the purpose of making them more proper for absorption, and appropriation. So far, in fact, homœopathy has the same foundation as neuropathy. But in Hahnemann's day chemical physiology was not so well understood as now, especially not in regard to the gaseous elements, which are in reality, so far as disease and its treatment is concerned, the most important among the bodily constituents.

Just as the fluids are more mobile than the solids, and therefore easier transformed, so are the gases yet more mobile than the fluids, and still more readily decomposed, and recomposed. This is why neuropathic treatment is so prompt and effective, because it operates, by means of medicines capable of becoming gaseous, upon the gaseous elements of the body. And, as already explained, the nervous substance itself is, in a great measure fluid and gaseous, so that by this treatment we operate directly upon the seat and origin of nervous power itself.

Homœopathy was, in fact, the commencement of a real reform in the mode of using medical agents. And the principles laid down in this book are an extension of that reform. Neuropathy, in short, is perfected homœopathy, or rational allopathy, according to which way it may be considered.

PART V.

ORGANIC DISEASES OF THE NERVOUS SYSTEM.

CHAPTER XXXIII.

Inflammation and Congestion of the Brain.

From the delicate structure of the brain, from its great activity, and from the unyielding nature of its bony enclosure, it is peculiarly liable to suffer from pressure; and the consequences are also likely to be more serious than in other parts of the body, for the same reasons. A small piece of bone, either forced in upon the brain, or growing within the skull, may cause convulsions, fainting, and even death; and so may a little clot, or tumor, or a small quantity of blood, from a ruptured blood-vessel.

In other parts of the body such accidents, though causing temporary distress, may not result seriously, because the offending bodies can either be thrown off by inflammatory action, or the parts gradually accommodate themselves to their presence.

But in the brain it is different, because inflammation there is a very dangerous thing, even if by its action the irritating body could be got rid of; and there is no room in the skull for anything besides the brain itself, and the parts necessary for its support and nutrition.

A morbid condition of the brain may arise in four different ways. *First*, from the blood which nourishes it being of bad quality; *secondly*, from the blood circulating too rapidly or too feebly; *thirdly*, from pressure, arising either mechanically or from effused blood, or fluid; and, *fourthly*, from disease, changing the structure of the brain matter.

These conditions affect the brain organically, and directly; but it may also be functionally deranged from many remote causes, only partially known, and also from sympathy with morbid conditions of other parts of the body.

Congestion from Bad Quality of Blood.

Impure, or imperfect, blood affects the whole body, more or less; but its bad effects are more marked in the brain than elsewhere. Other parts of the body may withstand starvation, or poisoning, to a great extent, and recover, but the brain suffers from them immediately, and recovers with more difficulty.

When the blood is thin, or poor, the brain is imperfectly nutrified, and suffers in the same way that it does from deficient *quantity* of blood, as will be explained further on. It is not bad in *quality* in such cases, but there is not enough nutritious matter in it to support the brain.

The quality of the blood becomes bad mainly from imperfect action of the lungs, kidneys, or liver.

These organs, when in vigorous action, remove from the system certain hurtful matters, which become real poisons if they remain. Thus the lungs remove carbonic acid in the expelled breath, the liver removes the elements of bile, and the kidneys remove urea, and various salts. The healthy normal action of these organs is sufficient to remove all these hurtful matters; but if their action is suspended, or becomes sluggish, of course more or less of these matters will be left behind, forming a poisonous element in the blood.

Such matters in the blood act exactly the same as poisonous drugs, and if in too great quantity, may cause disease, or even death. Usually the immediate symptoms they give rise to are headache, sleeplessness, or drowsiness, delirium, or fainting; and if they are not removed, more serious and permanent derangements ensue, with finally confirmed organic disease.

The brain feels the presence of these poisonous matters in the blood immediately, and the mind suffers in consequence. It is a matter of common remark how dull, melancholy, and miserable, a man becomes when his liver is *out of order*.

His whole nature is changed, so that, from being perhaps the most merry and best-tempered of men, he becomes the most sad and irritable. The man is simply *poisoned!* He has not taken poison *into* the system, but the inaction of his liver has prevented poison from going out of it, which amounts to the same thing.

All the secretions which are separated from the blood by such organs as the liver, kidneys, and lungs, are simply the refuse and hurtful matter which the system cannot use, and which are therefore got rid of in this way. If they are not separated from the blood, but circulate with it, they act as poisons, just the same as if they had been taken into the stomach, or injected into the blood vessels.

Bad temper is often only the result of a torpid liver; and a dull, wandering mind is frequently caused by inactive kidneys. The brain cannot act properly, and evolve good *mind*, unless it receives plenty of *pure*, healthy blood, and no amount of *mental* influence, or effort, can ever do much good to the mind that is deranged, or weakened from the blood being poisoned.

No one would expect a man to be in his right senses, or to act rationally, who had taken too much opium, or aconite, or even alcohol; and he whose blood contains too much bile, or urea, or carbonic acid, from inactive lungs, liver, or kidneys, is just in the same condition.

In all cases where the brain is suspected of suffering from the bad quality of the blood—and there are plenty such—the nature of the secretions should be attended to, so as to discover what organs are in fault, and restore them to healthy action.

Many a wandering mind has thus been steadied; many a gloomy or violent disposition corrected, and many cases of insanity cured, by simply restoring the lungs, liver, or kidneys, to proper action, and thus bringing the blood again to a healthy state.

The modern physician depends upon health of the *body* for restoring health of mind, and not upon mere scolding or preaching. In other words, he tries to get healthy action of the *brain*, without which there can be no healthy mind.

Impure blood not only causes temporary, irregular, and imperfect action of the brain, but may even cause in it serious and fatal disease, if allowed to circulate in it too long. Softening of the brain, or fatty degeneration, or dropsy, may no doubt be thus caused, as well as other derangements.

Bilious poisoning of the blood, from disordered liver, usually makes itself apparent by obvious indications, in the skin and eyes, and by the imperfect action of the bowels.

When the poison comes from inactive kidneys it can be detected by examining the urine; and when the lungs are in fault it is usually shown by blueness of the lips.

In all forms of nervous disease, and in all cases of imperfect mental action, arising in those previously sound in mind, the action of the liver, skin, kidneys, and lungs, should be carefully studied, because it is possible the trouble may arise from them alone.

If they do not act with sufficient energy, the blood is poisoned by the matter which they should have removed, and this poisoned blood, circulating in the brain, is certain to cause diseased mind, or morbid nervous conditions.

Congestion of the Brain arising from Want of Blood.

It has already been shown that a full supply of healthy blood must constantly circulate in the brain to maintain it in healthy action. Cut off this supply, and the brain and mind become torpid at once. Ordinarily, when the brain is deprived of its due supply of blood, we have *syncope*, or *fainting*, which always arises from this cause, except in actual disease of the brain. When the supply is not cut completely off, but only limited, we have languor, dulness, and indisposition for thought or action, with a feeling of faintness.

Anything which suspends the circulation of the blood will cause *fainting!* Most usually this arises from inaction of the heart, especially when there is too little blood in the body, or when it is too thin, and poor in quality.

Sometimes fainting is preceded by a feeling of languor, singing in the ears, and coldness of the extremities, with uneasiness of mind; but, in many cases, it comes on quite suddenly, without any warning. The immediate symptoms are paleness of the lips and skin, apparent stoppage of the pulse, and breathing, cold perspiration on the forehead, and loss of power, so that the patient falls down.

A fainting fit may be over in a few minutes, or it may last for hours; but, in all cases, recovery from it occurs only when the blood begins to circulate again in the brain. Usually the pulse, and breathing, may be detected, though faintly; but, in long-continued syncope, both frequently seem totally suspended. This, however, is not the case, as there is always *some* circulation, and breathing, though it may be so slight as to escape detection.

Any causes which impoverish the blood, or decrease its amount, may cause faintness, and finally fainting. Poor food, bad digestion, loss of blood, or excessive discharges from the kidneys or bowels, are very frequent causes. The abuse of purgative and diuretic medicines, often leads to fainting, because a too great discharge, from either kidneys or bowels, is equivalent to a loss of blood. In the old purging days, patients were often made to *faint at stool*, from the violent action of the medicine they had taken; and this was thought rather desirable than otherwise,—and they were fortunate also if they escaped *bleeding* as well!

But, in addition to these physical causes, the heart may be affected by emotional, or mental conditions, so that its action may become imperfect, or even totally suspended. Thus, some persons will faint from terror, some from joy, and some from surprise. Seeing blood, or any disgusting object, will always bring on fainting with some people; while others are similarly affected by the sight of any one suffering, or in danger.

In such cases, the fainting is caused by stoppage of the heart's action, and consequent non-circulation of blood in the brain ; the emotion acts upon the heart, through the nerves, and paralyzes it, much the same as if the nerves connecting that organ with the ganglionic centres were cut through.

The heart may be affected in this way, so as to cause great languor, or even fainting, through either of the senses. Thus, some are affected by particular sights, some by smells, some by sounds, and some by touching or tasting certain things.

In short, anything which suspends the action of the heart stops the flow of blood to the brain, and so may cause fainting.

Sometimes the fainting is very prolonged, and is then called a *trance!* Such cases often resemble death so closely, that persons have been buried while in trance, and afterwards recovered. Generally, true death can be known by the appearance of the eyeball, which sinks and looks rumpled when a person is dead. In no case, however, should burial take place till there are obvious signs of decomposition, which leaves no doubt. One of the first and surest signs of death, is the appearance of a green color on the abdomen, which is never seen during life.

In trance there is of course *some* breathing, and some circulation of the blood, though slight ; and, with close attention, one or both may be detected. There is also a different *feel* of the body, and a different condition of the muscles.

Trance may be either complete or partial. Some are totally *dead*, mentally, for the time, while others retain consciousness, more or less, and know what is taking place around them. When this is the case, there must be circulation of blood enough, in the cerebrum, to cause mental operations ; though, for some reason, the other nervous centres fail to receive a due supply.

Fainting is often mistaken for apoplexy, but it may always be distinguished by attending to the pulse. It is, of course, only *complete* syncope, or fainting, which could be so mistaken ; and, in complete syncope, the pulse cannot be felt, while in apoplexy it can be, and the breathing is also generally perceptible.

Fainting, in all cases, results from deficient circulation of blood in the brain,—no matter from what cause ;—so also does languor, debility of mind, and some forms of headache. Serious disease of the brain, and insanity, may also happen from the brain being thus *starved* too often, or for too long a period. Many cases of softening of the brain, and insanity, have been caused by *bleeding.*

During a fainting fit there is not much to be done, and care must be taken not to do to much. In the first place, the patient should be laid flat down on the floor, with the head on a level with the body ; and, if cold water be at hand, the face and neck should be gently sprinkled with it. In the absence of cold water, fan the patient, and, at the same time, chafe the hands, and lift the arms now and then above the head, and then bring them down again. In bad cases, it is good sometimes to dash cold water in the face with some force ; but, as a rule, it is best to avoid wetting the patient unnecessarily. At the same time that this is done, the clothing should be everywhere loosened, so that no impediment be left to the circulation. If a knife be handy, never wait to undo corset-laces ; cut them at once, and all other laces that can be readily got at. Corsets cause more fainting than perhaps anything else, and lay the foundation for many cases of brain and heart disease.

Smelling-salts, held to the nose, are good helps ; but they should not be given too persistently, nor too strong, or they may arrest the process of breathing. Especially should care be taken with any *liquids*, like hartshorn, or cologne, which are apt to be spilled into the mouth, and very easily cause suffocation.

Keep every one away but those who are really needed, so that the air and space around may be clear.

The object in view in keeping the head low, is to make it easier for the feeble heart to drive the blood to it ; and cold water on the face excites the terminations of the sensory nerves, causing reflex action along the motor nerves, which influence the muscles of the heart and lungs.

As soon as the patient can swallow, a little stimulant may be given. A teaspoonful of sal-volatile is very good, in a wine-glassful of water, or a little weak brandy and water, hot. The compound spirits of lavender are also excellent ; or, in short, any stimulant that comes handiest. Care should be taken, however, not to use stimulants too strong, nor to continue them too long. As soon as the heart begins to act well, they are no longer needed.

It is often useful to roll the body gently from side to side, and raise the arms up and, down, just as is done with a drowned person, to bring the lungs into play, and thus rouse the circulation. As soon as the fit is over, the patient should remain quiet for some time ; and, if a female, be left with her own sex, because the fit is usually followed by a tendency to activity of the kidneys, which should not be restrained.

Those who are subject to such fits, and who have sufficient strength of mind, may often work them off by active exertion, mental and bodily, when they feel the premonitory symptoms. In this way, there is no question, patients can do much for themselves, just as they may also encourage and exaggerate the fits by needless giving way to the tendency to them.

As this disease, when established, results from debility, everything possible should be done to strengthen the system, in order to prevent, or finally cure it. Everthing exhausting should be avoided—both physical, mental, and emotional—and every means should be taken to improve the tone of the vital organs. Good food, fresh air, judicious exercise, and regular hours, with absence of all worry and excitement, are the most essential things. The skin should also be kept in brisk action, by bathing, and friction, and strict attention paid to the excretory functions, especially in young females. Strong tea, or coffee, are often exciting causes of fainting, and should always be avoided.

Active, even boisterous amusement, if not too prolonged, is an excellent preservative against this trouble, and should be encouraged. Gloom, dulness, fear, and anxiety, dispose to it. In our young girls, it is often brought on from insufficient fresh air and exercise, too little food, too much book-study, and *corsets!* Take half the school-books away, remove the corsets, and let them romp and play, and feed them well, and most of them would get over the tendency to faint.

Apoplexy.

Apoplexy, or *stroke*, as it is sometimes called, is manifested by a sudden loss of all mental and muscular power, and sensation. The patient falls, as in an ordinary swoon, or fainting fit, and, indeed, the two diseases are often confounded. There is, however, an important difference, by which they may always be distinguished; and it should be well understood, because the treatment useful in the one disease is hurtful in the other. In ordinary fainting, as before explained, the blood leaves the head, owing to some defect in the circulation, and the brain is paralyzed, simply because it is deprived of its full supply of that vital fluid. The face is pale, and the extremities cold, while the breath, and pulse, can scarcely, if at all, be distinguished.

In apoplexy, on the contrary, the circulation, and breathing, are not suspended, nor even perhaps diminished. In fact, in some cases, both are accelerated. A feeble, irregular pulse, is always a bad sign, as it shows the brain much affected. Ordinarily, the breathing is slower than usual, but at other times it is heavy, or labored, and accompanied by a peculiar *snoring* sound, and *puffing* out of the lips. This is called *stertorous* breathing, and, once heard, it can never be forgotten—it is observed only in severe cases.

The face is usually flushed, while the blood-vessels in the neck, and on the temples, are seen to be swollen, and the eyes appear congested.

Sometimes the attack is instantaneous; the patient falling as if dead, with little or no preparatory warning. More usually, however, he complains of pain in the head, and becomes insensible gradually. Perhaps in all cases there is some preparatory warning, but it may be slight and unnoticed. The most usual indications of an approaching attack of apoplexy are, pain in the head, or feeling of fulness, drowsiness, and perhaps loss of hearing, or sight.

In severe cases there is complete loss of consciousness, and motion, and it is utterly impossible to rouse the patient; but in slighter cases some degree of consciousness and sensation may still be left, so that he can be stimulated to make slight efforts at voluntary motion.

One side of the body may be completely without sensation, or motion, and the other only partially so, or it may even be convulsed. The power of speech is lost, but the patient usually retains the power of swallowing, at least for some time, except in fatal cases, in which that power is lost from the first, or very soon after the attack.

Sometimes an attack of apoplexy lasts but a short time, and gradually passes off. At other times it lasts for weeks, and yet the patient may recover from it; but in bad cases it may be fatal in a few hours, or even minutes.

In most cases an apoplectic fit leaves behind it paralysis, or loss of power, in some of the muscles, which is rarely recovered from. The paralysis frequently affects only the half of the body, leaving the other half in its ordinary state. When the paralysis is all on one side, the body being divided *down* the middle, it is called perpendicular paralysis, or *hemiplegia;* but when it is only in the lower half, the body being divided *across* the middle, it is called horizontal paralysis, or *paraplegia.*

Paraplegia results from pressure upon, or disease of, some part of the spinal cord, hemiplegia only being connected with the brain.

Apoplexy always has a tendency to return, and those who have once had an attack may expect to die from it. There may be many slight attacks before the final one, extending over a length of time, but usually the second, or at most the third one is fatal. It is rare in youth, more frequent in adults, and most frequent in old age; in fact a large proportion of deaths over sixty are from this cause.

The predisposing structural causes of apoplexy are, probably, defects in the conformation of the brain, or of its blood-vessels. which may be fatally exaggerated by intemperance in eating, or drinking, or by over-exertion, or violent and long-continued emotion. A short neck, large head, and general full habit, is popularly thought to predispose to apoplexy, but with no good reason. In fact, these external peculiarities are of small account, compared with internal conditions, and have less influence than *habit*. A long-necked, small-headed man, of spare habit, who is intemperate, may run more risk of apoplexy than the most full-blooded, bull-necked man who is temperate.

In using the term *temperance* I mean it to apply to all things which influence a man's health, and not to eating and drinking alone.

Amative pleasures, in excess, very much dispose to apoplexy, and so does indulgence in passion, or excessive mental work. In fact, this is the main cause of death from apoplexy among our business men, and journalists.

The immediate cause of apoplexy is *compression of the brain*, which may result in two ways, namely, from blood escaping from a ruptured vessel, when it is called *sanguineous* apoplexy; or from a fluid secreted from the vessels, when it is called *serous* apoplexy.

When the blood escapes in consequence of an injury, as in a blow, or fall, it is called *extravasation*. In such a case the vessel is ruptured by violence; but in ordinary sanguineous apoplexy it gives way from disease, or over-distension.

The serum, or fluid which causes serous apoplexy, is the same which causes, in children, hydrocephalus, or water on the brain. It may result either from chronic disease, or from inflammation, following a fracture, or other injury of the skull.

The symptoms are much the same, let the apoplexy arise how it may; and we have no means of knowing, during life, whether it is sanguineous or serous, or whether it arises from disease in the membranes, or in the substance of the brain. The most frequent cause is effusion of blood from a ruptured vessel, and this may take place either on the surface of the brain, or in its substance.

The blood forms a *clot*, the pressure of which, on the brain matter, causes the apoplexy. A very small clot is sufficient, especially in some portions of the brain, to cause instant *death!* In other parts, however, a much larger clot may do less mischief, and may be recovered from.

In examining brains after death, old clots are sometimes met with, half absorbed, showing that recovery is possible in favorable circumstances.

In other cases where death has taken place, with all the usual symptoms of apoplexy, no clot, nor any other cause of the disease could be discovered.

In these cases, it is probable, the circulation was suspended in the brain from some sudden, spasmodic constriction of the blood-vessels.

The treatment to be adopted, in case of an apoplectic fit, may be described generally as the opposite to that for fainting, because in fainting we want to drive blood *to* the head, and in apoplexy we want to draw it *away!* The head should, therefore, be kept raised, and cold, by lotions or ice, while the lower parts of the body are made as hot as possible, and irritated by mustard plasters, or hard rubbing with course towels, or a flesh brush.

If the patient can swallow, stimulants should be given, in small quantities at a time, till the pulse begins to rise, and then they must be stopped. The object of the stimulation is not to excite, but to keep up the circulation, and prevent sinking.

For it must be borne in mind that, though there is too *much* blood in the head, yet there is too little in the other parts of the body, and the object is to *equalize* the circulation.

Care must be taken, from the first, to remove all obstructions to breathing, and the circulation, such as neckerchief, and collar, and to keep the patient still.

This is pretty much all that can be done, at first, and the result must be waited for.

It is customary, as soon as the patient rallies a little, or even if he does not rally at all, to bleed from the arm. But many excellent physicians totally condemn the practice; and I think with reason. It is a question if a single life was ever saved by bleeding, in apoplexy, while it has unquestionably done much mischief.

The fact must be borne in mind, as before stated, that there is not too much blood in the *body*, in apoplexy, but only too much of it in one place,—the head. It is not evenly distributed, and what is wanted is to cause an equal distribution.

And this shows the reason for the treatment adopted; for the cold to the head drives the blood away from there, while the heat to the lower limbs draws it to them, and thus the brain becomes relieved.

Now, when we bleed, it does not follow that the blood is especially abstracted from the head at all, but rather from the whole body equally, leaving the unequal distribution still the same.

The great evil of bleeding, however, is in the after effect.

Suppose the patient recovers from the fit; then, as soon as the brain is relieved, it requires its full supply of blood, as before, and cannot get it; the consequence of which is that it is starved, and the patient becomes languid and feeble, with a tendency to faint.

The final result of this is disease of the brain, giving a disposition to further attacks of apoplexy, or to *insanity!*

Bleeding has confirmed the tendency to apoplexy, in many of those it seemed to relieve, and it has made numbers *maniacs* for life, who might have perfectly recovered without it.

In all cases the patient has a better chance of preserving life, and reason, without bleeding, than with it.

After the first urgent symptoms are over, there is not much more to be done ; the patient must be kept very still, with the head and neck cool, and the extremities and surface of the body generally warm. Nourishing but unstimulating food should be given, in small quantities at a time, and stimulants moderately, if the circulation seems languid.

If the bowels are constipated, as they frequently are, there should be no hurry in forcing them, and especially there should be no resort to active purgation ; there are the same objections to purging as to bleeding, and it often causes similar mischief. Castor oil, or an injection, may be used if there seem any distress, or if the bowels remain too long constipated. If the bladder should be paralysed, as it sometimes is, care must be taken to draw off the urine with a catheter.

The most important thing is, for persons to recognize when they are *threatened* with apoplexy, and how to ward it off, for but little can be done for it when it comes. The fact is, that a large proportion of our business, and professional men, *cultivate a tendency to apoplexy*, as assiduously and steadily as if it were a thing they desired. This may seem a strauge statement, but it is nevertheless true, as will be evident on observing carefully their habits. It is true they do *not* wish apoplexy, but they could scarcely go better ways to work to get it than they do, if they *did* wish it; as a little explanation will show. Anything which causes a too active circulation of blood in the brain, too frequently, may lay the foundation of apoplexy, and other diseases. Whenever a man habitually uses his brain unduly, and neglects proper exercise of his body, he keeps constantly a larger supply of blood in the brain than there should be. The result of this, at first, is headache, languor, failure of mental power, and drowsiness.—After a while memory, or the power of attention fails, and sleeplessness sets in, with an utter weariness and disgust of all kinds of mental labor. Very often this terminates in softening of the brain, insanity, suicide, or death. In other cases, the constant distension of the blood-vessels, from incessant mental occupation, so weakens their coats that at last one gives way, a little blood escapes, forms a clot, and there is a case of apoplexy.

Very often, when a man finds his mind flagging, he spurs it up with *wine*, and this hastens on the evil day, for every effort the brain is *forced* to make, when it is really in need of rest, necessitates the circulation in it of still more blood, and consequently a still more dangerous distension of the blood-vessels.

Now observe the habits of our business and professional men, and see if it is not true that they cultivate a tendency to apoplexy. The whole day long, from the time they rise till the time they lie down, the mind is in a constant state of excitement and worry; or, in other words, the brain is kept gorged with blood, and its vessels distended to their utmost capacity. Not only is there the actual mental work, but the disturbing emotions of hope, fear, joy, and despair, continually digging away at the brain and keeping it in a state of unrest; very likely also tobacco, and liquor are brought in to help; and, with all this, the rest of the body is totally neglected. The skin, kidneys, bowels and stomach become deranged, and the lungs, perhaps, breathe the whole time an impure air, so that but little blood is made, and that impure, but the brain has to take it nearly all.

A man leading such a life—and thousands do so—is fortunate indeed if he escape brain disease in some form, and especially apoplexy. It is not at all an unusual event, in Wall-street, New York, for a sudden turn in stocks to tumble some operator down in a fit. The poor man has had the blood-vessels in his brain distended all day, up to the utmost they could stand, and then comes some news which makes his heart give an extra throb, a fresh blood wave rushes to the head, the vessels burst, and down he falls!

The same result is arrived at, in a slower way, by those who steadily overwork the brain in a less excitable way. It is only a question of time. Newspaper editors, and writers, are constant victims to apoplexy, and other forms of brain disease, from constant overwork of the brain, and want of rest. *Any man who begins to hear, or feel, the arteries beat and throb behind his ears, or who finds his eyes grow dim, and his hearing dull, while he is writing or reading, may be sure that he is on the road to apoplexy!* If he does not then *stop*, he will probably soon see things by *halves*, or *double*, and on stooping, or rising suddenly, will lose his balance from *dizziness*, and perhaps be quite unable to see and hear. If he cannot then *stop*, let his mind rest, and cultivate his body, he had better make his *will*, and wait for the blow.

No kind of medication is of any possible use in such cases. The only thing is to give the *mind*, *at once*, *absolute* *rest*, with pleasurable occupation, and resort to every means for developing the muscular system, and improving the tone of the vital organs.

Intemperance in eating and drinking, and over-indulgence in any violent emotions, strongly dispose to apoplexy, especially if combined with neglect of proper exercise. The sedentary man, who works only with his mind, keeps his brain *hot*, and his body *cold*, which are the conditions best calculated to cause apoplexy, especially if he tries to stimulate himself with exciting food and drink, or is spurred on by powerful emotion. Hundreds of men live constantly in this way, on the very verge of apoplexy, just ready for some unlooked for, or dreaded event, or bit of news, to topple them over. Then there is often great lamentation, and wonder, and it is spoken of as a mysterious dispensation of providence.

Extravasation of Blood in the Head.

A severe blow on the head, whether it cause fracture of the skull, or only *concussion*, may lead to extravasation of blood from some of the vessels, and all the symptoms of apoplexy. In simple concussion, or even in fracture of the skull, if no portion of the bone be driven in, the patient usually recovers, if kept quiet. When a part of the bone presses on the brain, however, it must be raised, so as to relive the pressure. If the injury be at the base of the brain there is danger of some of the large blood vessels being ruptured, and more serious mischief is to be apprehended. Usually this is indicated by bleeding from the ears.

In all such cases search should be made at once to see if the skull be fractured, and if there be any part of it driven in, so as to cause pressure. This of course is a surgeon's business, but instant help may often be needed when a surgeon is not at hand. It is therefore very desirable that *some* knowledge of such matters should be more general than it is.

The only thing to be done in a case of concussion of the brain, or simple fracture of the skull, is to keep the patient perfectly still, with the head cool and the extremities warm. As he begins to recover, if the pulse be low, stimulants should be cautiously given, and nutriment in an easily digested fluid form. Bleeding is often resorted to, but I cannot advise it, in any case.

The great danger, from any accident to the head, is in inflammation, followed by the secretion of *pus*, or matter. This makes pressure on the brain. just the same as a clot of blood would do, and leads to apoplexy just the same. Very often a patient recovers from an accident, and seems quite well, but dies afterwards from an apoplectic fit. In such a case there has probably been inflammation, perhaps quite mild, followed by secretion of pus, or serum, which has killed by pressure. Sometimes after an accident a tumor will form, or a growth of bone, within the skull, either of which may lead to fatal results.

Many children have been injured by *boxing the ears*, a practice indulged in only by the cruel and ignorant. The concussion from a box on the ears, though it may only cause a *dizziness* at the time, may lead to chronic or acute inflammation, followed by a secretion of pus, or serum, resulting in water on the brain, idiocy, or death.

Inflammation of the Brain and its Membranes.

There may be inflammation of the brain itself, called *phrenitis*, or of its membranes, called *meningitis*. And the inflammation may be either *acute*, or *chronic*.

The distinction between phrenitis and meningitis is not of much practical importance, for the symptoms, causes, and consequences are pretty much the same in both, and one is apt to lead to the other. The following remarks therefore apply to either.

Acute inflammation of the brain, commonly called *brain fever*, usually commences very suddenly. The first symptoms are apt to be over-excitement of the mind, and of the senses. The patient seems as if intoxicated, and the senses become painfully acute, so that the least sound alarms, and the light, even when subdued, is complained of as being too bright. In short, there is real delirium, accompanied very generally by severe pain in the head. The eyes look wild and bloodshot, and the pupils are contracted; the tongue is dry and hard; the breathing quick and labored, and the pulse full and hard.

There are also all the usual indications of fever: hot, dry skin; scanty, dark urine, and occasional shivers; twitchings of the muscles may also be observed, and in bad cases even convulsions.

These symptoms may exist from twelve to sixty hours, and, if not controlled, usually end in collapse. This is shown by a gradual subsidence of the pain and excitement, and the occurrence of stupor and fainting, with hiccough, which soon terminates in death.

Brain fever resembles typhus, but may be distinguished from it by being more sudden and rapid. It is also somewhat like *delirium tremens*; but on comparing the symptoms, to be hereafter described, they may be readily distinguished.

In Phrenitis, there is, of course, a sudden and rapid increase in the circulation of the blood in the head, which causes the excitement of the senses, and delirium. The extra flow of blood in fact excites the brain just as alcohol, or any other stimulant would do, only more dangerously.

The object in view, in treating brain fever is, therefore, to get this overflow of blood from the head as soon as possible. The usual plan is to bleed at once, even to fainting, and follow that up by severe purging.

The same objection however applies to bleeding here as in apoplexy. There is none too much blood *in the whole body*, but merely in the brain, and our efforts should be directed to getting it away from there to some other part.

The proportion is not altered by bleeding, while the vital powers are weakened, and collapse is hastened. Every drop of blood taken away is wanted afterwards, if the patient lives; and very often, after recovery from the fever, softening of the brain sets in as a consequence of the loss of blood.

But little more can be done than what was directed in apoplexy. Keep the patient as still as possible, in a quiet, darkened room, with the head cool, and the extremities warm. Cut off the hair, so as to apply cooling lotions or bandages to the head easily and effectively, and use hot fomentations to the abdomen, with mustard baths, or poultices, to the feet and legs.

Blisters are commonly applied to the feet, legs, abdomen, and back of the neck, or even to the shaved head; but the milder means above advised will be found quite as effective.

Sometimes, by such means, the inflammation is subdued, the excitement subsides, and the patient gradually becomes rational and free from pain. Most usually, however, the disease runs its course, and is followed by the natural collapse, in which stage other treatment becomes necessary.

Generally severe purging is made to follow the bleeding; but it is just as unnecessary and objectionable, since it leads to premature collapse, and to subsequent debility.

As soon as the patient is able to take nourishment, it should be given, in a fluid form, and even a little stimulant, as soon as ever the fever begins to abate.

In the stage of collapse, nourishment and stimulants must be given more freely; and if the patient cannot sleep, opium must be used, or chloral hydrate.

When this stage is reached, the patient needs not only all the blood he has, but *new blood*, as rapidly as it can be made. If he has been bled, now is the time when the evil of the practice shows itself.

The only hope in this stage is in *nourishment*, *quiet*, and *sleep!* Recovery is always slow, and the brain is often seriously affected for a long time after. In a great number of cases, indeed, the patient never fully recovers, neither bodily nor mentally, especially after bleeding and purging.

Chronic Inflammation of the Brain.

When there is chronic inflammation of the brain it is always confined only to some particular part.

The whole brain seems never to be inflamed in a chronic form, but always acutely. The membranes, however, both of the brain and spinal cord, may be affected by chronic inflammation over the greater part, if not the whole of their extent.

Chronic Inflammation of the Membranes usually shows itself first in slight delirium, which gradually increases till there is great excitement, as in acute inflammation. After a while this subsides, and the patient falls into a state of mental dulness and final idiocy. Generally there is also considerable pain in the head, with slight fever, but not much derangement of the special senses, if any.

The symptoms, however, are often very obscure, and may easily be mistaken for those of mania.

Chronic Inflammation of the Brain usually begins with pain in the head, accompanied by dimness of the vision, and giddiness. Cramps in the limbs are also often felt, always with a kind of numb tingling, as if they had been asleep. There is also very generally a peculiar unsteadiness in walking, as if the patient could not properly balance himself, and the legs are *dragged*, instead of being properly lifted up. This is a characteristic symptom; and very often the first thing the patient notices is that he is apt to *catch his toe*, while walking, without however suspecting the cause.

There is not usually any fever, but the general health is apt to suffer.

The most marked signs of the disease are in the *mind.* The patient becomes restless, or fidgety, and cannot apply himself long to one thing, and seldom remembers clearly what he has been doing. Very soon, if the disease be not checked, fainting fits set in, or convulsions, or partial paralysis. Sometimes paralysis is, for a long period, the only marked indication, and it may even pass off, but is nearly sure to return. Generally the paralysis is observed in the muscles of the legs only, causing the unsteady gait, and dragging of the feet, and showing that the *spine* is affected, as well as the brain.

Chronic phrenitis, if not checked, terminates in *wasting* *away* of the brain, or in its becoming *softened* or *hardened*, and sometimes puffed out, or *overgrown*.

Softening of the brain may be caused by the pressure of *pus*, the result of inflammation, or by blood being effused in its substance. When caused by pus it is called *white* softening, and when by blood *red* softening.

Hardening of the brain is caused by a deposit of lymph in its substance, like what causes swellings in other parts of the body.

Hypertrophy, or diseased overgrowth of the brain, is caused in a similar manner to hardening, only the material does not solidify, but makes a puffy growth.

All these diseases lead to idiocy and death; but it is astonishing how long the brain will continue to act, in some cases, even when its substance seems quite changed, or almost destroyed. It must be remembered also that one side only may be affected, and the other remain comparatively sound.

The brain is also liable to tuberculous deposits, like the lungs in consumption, and to cancer, and other malignant growths, all of which cause inflammation.

Beyond perfect quiet of mind, change of scene and occupation, and attention to the bodily health, but little can be done in chronic inflammation of the brain, because the mischief is done when any of the marked symptoms are noticed.

The great point is, for men to recognize the conditions which lead to the disease, and change their habits in time.

If a man be habitually intemperate, gives way to violent emotions, neglects his bodily health, and overworks his mind, he is surely predisposing himself to inflammation of the brain and apoplexy.

The time to stop, and make a change, is when he first finds his mind get feeble and confused, and his head hot and painful, with dizzy spells, and feebleness in his limbs. If he *will*, or *must* keep on, after these warnings, there is danger in the future, and no *medical* treatment can be of the least service to him.

Congestion of the Brain.

Determination of blood to the head, or active congestion of the brain, arises from derangement in its circulation. The fault may be in the action of the heart, driving the blood with too much force and frequency, or it may be in the blood-vessels of the brain itself.

The symptoms are, usually, flushed face, sense of fulness in the eyes, with dimness of vision, violent beating of the arteries in the neck and temples, and headache. All the symptoms are made worse by stooping, or looking up, or by any unusual exertion. In bad cases there may be giddiness, total loss of sight for a time, and great pain in the back of the head. Sometimes the patient is restless, and excitable, and at other times dull and drowsy, with no inclination for mental effort!

This condition may endure for a long time, sometimes better and sometimes worse, and the tendency to it may, with care, even pass away. There is, however, always a liability to a return, and it is a dangerous condition to become confirmed, as it often terminates in acute or chronic inflammation. In fact, simple congestion, or rush of blood to the head, is often only the forerunner, or primary simple stage, of more serious disorders.

Whenever a man has a tendency to determination of blood to the head, he should observe, whenever an attack comes on, what he has been doing, so that he may find out what disposes to it, and thus be able to ward it off. Nearly always it will be found there has been some imprudence in eating or drinking, over-indulgence in some strong emotion, or too much, or too long-continued mental work; and, of course, all such things should be carefully avoided in future. Quiet of mind, control of the passions, moderate bodily exertion, and the non-use of stimulants of any kind, are the main things to be attended to.

In a severe attack, the head should be kept cool, while the patient lies still, with the head raised, and with all impediments carefully removed from the neck. If the feet are cold, they should be put in hot water, or have mustard poultices applied to them. It is well also to rub and chafe the whole body, so as to draw the circulation to the surface. If the bowels have been a long time costive, it is also serviceable, in bad attacks, to give a mild purgative.

Delirium Tremens.

Drunkards' delirium is a state of congestion of the brain, caused, apparently, by long-continued over-excitement. In this disease, the vessels are kept engorged with blood so constantly, from the action of the stimulants, that their coats become weakened, and cannot contract with force enough to assist the circulation. The consequence is that the brain is always over-full, and in a state of fever, as it were. The blood itself is also both poor and impure in quality, because digestion is imperfect, and there is no proper nutrition.

Very often there is no delirium tremens till the stimulants are left off, and then it is apparently caused by the mere cessation of the usual excitement. In fact, this is generally the case; although sometimes an attack will come on in the very midst of a debauch.

Delirium tremens may result from the abuse of alcoholic liquors, opium, or other narcotics, or even from long-continued mental excitement. There is no doubt but that there is always, in this disease, an overplus of blood in the brain, and it is probably always impure, or much impoverished. There is no good ground, however, to suppose, as some have done, that the vapor of the alcohol itself finds its way into the brain, alone causes the delirium, directly.

Some physicians contend that delirium tremens is essentially a *nervous disease*, and that it depends only incidentally on the congestion, which may be the case, but it is very certain that the congestion is always present.

The symptoms of delirium tremens are well-marked, and very painful to witness. At first, there is a remarkable lowness of spirits, which is shown in the countenance, and is accompanied by sighing, and a feeling of oppression at the heart. Sleep is difficult to get, except by the usual stimulus, and then it is heavy, and disturbed by bad dreams, so that it gives no refreshment. There is generally no appetite, the tongue is furred and flabby, and the pulse is slow and irregular. There is also a tendency to shaking in the hands, and a constant restlessness, or disposition to change the position of the body.

As the disease progresses, great excitement sets in, even to delirium, with an almost total absence of sleep, except in short snatches, broken by starts and tremors, probably from bad dreams. The mind is almost constantly in a confused state, though there may be occasional intervals in which the patient rouses himself, and becomes partly rational, for a short time, and then he wanders off again. There is all the time a state of *worry*, and apparent anxiety to be doing something, but with no power to do anything. A state of feverishness next supervenes; the skin and head become hot, and the feet and hands cold. A clammy perspiration breaks out on the face, which has a peculiar smell, something like that of insane people. This denotes an advanced stage of the disease, and those who have once smelt the peculiar odor can recognize delirium tremens by it at once.

After this, the mind wanders worse and worse, and becomes filled with strange fancies and visions, mostly of a terrifying character. In fact, *fear* and dread seem the great characteristics of this disease. Horrid forms, particularly those of *snakes*, seem to follow the poor victim everywhere, and he shrieks with terror in his vain efforts to get away fromthem.

Finally the stage of excitement wears itself out, and exhaustion sets in, much like that of typhus fever. The skin, bowels, kidneys, and all the other secreting organs cease to act, and the vital powers sink rapidly, till death ensues, unless proper measures are promptly taken.

The treatment of this disease, however, is pretty well understood; and it can be generally cured, unless the patient be too much run down, or the attacks come too frequently.

Although delirium tremens resembles typhus fever, in some respects, still it may readily be distinguished from it, especially at first, because there is no increase of the pulse, and nothing feverish or inflammatory. The second stage requires a little more attention to distinguish the two; but, if the habits of the patient are known, a correct judgment can usually be arrived at. The fear also, and dread of being pursued by horrid things, is almost peculiar to delirium tremens.

Some forms of mania resemble this disease, to some extent, but none of them present that peculiar rambling of the ideas, nor that dreadful fear so peculiar to delirium tremens.

In treating this disease, it must be borne in mind that the worst symptoms follow, in all cases, the sudden stoppage of the stimulant, whatever that may have been, which leaves the system in a state of uncontrollable excitement. The first thing to be done is to calm and soothe, and above all, induce *sleeep.* The bowels and kidneys must also be made to act at once; and, for this purpose, the compound cathartic pill, when it can be got, is excellent But, if that, or the compound rhubarb pill, cannot be got, Epsom salts will do, or castor oil, or any good, quick purgative. Two or three teaspoonfuls of sweet nitre also will help the action of the kidneys. They may be given in a half tumbler of water, and repeated every two hours, till the urine flows freely.

The great thing after these remedies have been administered, and while awaiting their action, is to induce *sleep!* For this purpose, twenty or thirty drops of laudanum may be given every four hours, till the patient goes to sleep. It is well to give the laudanum with ten drops of ammonia to each dose, or thirty drops of sal volatile.

Keeping the head cool with cold lotions, or wet bandages, assists very much in inducing sleep; and, in bad cases, the hair should be cut off short. When the patient awakes, a little beef tea should be given, and some weak, hot brandy and water, just enough to slightly stimulate. If he remains tolerably calm, he may be left awake from six to ten hours or so, and then the laudanum should be given again, to induce another sleep; but if he becomes very restless, it may be repeated in four or five hours—always giving the beef tea and stimulant when he wakes, and paying attention to acting on the kidneys and bowels.

After a few good sleeps, the dose of laudanum may be gradually reduced, and also the stimulant, and the amount of nutriment increased; but the bowels and kidneys *must* be made to act.

In many cases, the *chloral hydrate* acts better than laudanum, and should be used in preference. Twenty to forty grains may be given at a dose, in a half tumbler of water.

In a few days solid food may be given, and some good tonic—such as quinine, or the compound tincture of gentian. The brandy, or other stimulus, may be needed for a little while, but the dose must be gradually lessened. It may be totally left off as soon as the appetite is restored, and the bowels and kidneys act freely.

In the violent stages of the disease, the patient must be watched, and guarded, or he may injure himself or others. Restraint is sometimes necessary.

Hydrocephalus.

Water on the brain is a disease of childhood, and is principally found in those of a scrofulous habit. The nature of it has already been explained, when describing the membranes of the brain. *Acute* hydrocephalus is always a result of inflammation of the brain, and the first symptoms are precisely those described when treating upon that disease. There is always derangement of the digestive organs, and kidneys, and also of the nervous system. The patient becomes dull, languid, and drowsy; complains of pain in the head, and soreness in various parts of the body. Sleep is fitful and disturbed, and there is a tendency to moan, or to call out, "Oh! my head, my head!"—and, in most cases, a peculiar, short, sharp cry is heard, called the watery-head cry. In some few cases there seems to be no pain, and no complaint is made; the child being simply dull and drowsy.

As the disease progresses the walk becomes more unsteady, there is a tendency to clench the fists, with thumb inside the fingers, and to throw back the head. The drowsiness may now disappear, and be succeeded by an unusual wakefulness. The child seems to find it difficult to support the head, sighs very often, has a peculiar dejected look, and seems to be in constant suffering

There is also apt to be a good deal of fever in the advanced stage, the head is very hot, and frequently the brain seems to swell out, at the openings of the skull bones, so that it may be felt with the finger. The child screams with pain, and all the time carries its hand to its head, as if to point out the seat of its suffering.

This condition of active inflammation may last for several days, or even weeks, and finally passes away. Then commences, from the serous membrane, the effusion of fluid, which presses upon the brain, causing drowsiness, insensibility, twitching of the muscles, or convulsions, with squinting of the eyes, and finally paralysis, with delirium. The swelling out of the brain becomes more evident; the moaning, and other signs of pain, more constant, with grinding of the teeth, and rolling of the head from side to side, till finally a severe convulsion puts an end to the suffering.

These are the more prominent symptoms, observed in most cases, but they are often much varied, and sometimes totally different.

The duration of the disease is also very uncertain, being sometimes only a few days, and sometimes several weeks.

In infants it usually runs its course in ten days, or two weeks; but in children from five to eight years of age it more frequently endures from four to six weeks.

The immediate cause of death is pressure on the brain, from the fluids effused from the serous membrane. No known treatment is of any use, unless perhaps in the very earliest stages, to check the inflammation. It is doubtful, however, if at any time much, or any good is done, for the disease is probably caused by a deposit of tuberculous matter in the brain, like that which causes consumption in the lungs; and when the mischief has gone far enough to be noticed, it has gone too far to be cured.

Chronic hydrocephalus, or dropsy of the brain, consists in an undue effusion of fluid into the *ventricles* of the brain, as before explained. The quantity sometimes is very great, several gallons having been found in some cases, causing the head to be enormously distended.

The dropsy may exist before birth, causing a difficulty in delivery, or it may come on at any period after; but there are no means of knowing when it is threatening, for the first sure sign is the actual enlargement of the head.

The pressure of the water forces the bones of the skull apart, and stretches the integuments in all directions, so that the top of the head overhangs, especially before and behind. This overhanging of the immense top, and the small face beneath, has a peculiar effect, and gives the poor child a strange, weird appearance.

The nervous system is always disturbed, so that the patient is fretful and uncertain.

The eyesight is usually affected, even to blindness in many cases, and very often hearing, smell, and taste are lost, from pressure on the ganglions of the special senses.

Epileptic fits are common, or convulsions, and there is a peculiar unsteadiness in the walk, as if the patient were constantly trying to balance.

Various other symptoms are also observed; but it is not necessary to notice them all, because the disease can never be mistaken.

A few cases have been known in which the head gained an enormous size, and yet with no suffering, or loss of intellect, or of any of the special senses.

Children born with water on the brain seldom live long, and when the disease appears during the first year, the child seldom lives over three years. In some few cases the brain seems to get accustomed to the usual conditions, and the patient grows up with a watery head. A few have been known to reach twenty, thirty, and even forty years of age. Nine times out of ten, however, or rather ninety-nine times out of a hundred, an early death puts an end to the patient and the disease. In some still rarer cases the fluid has become absorbed, and the head has resumed its normal state.

A scrofulous habit appears to be the great predisposing cause of hydrocephalus, and the immediate exciting causes are probably deranged nutrition, inaction of the kidneys, bowels, and skin, and excitement, or stimulation of the brain.

Many children have probably died of this disease from the thoughtless efforts of their parents to make *prodigies* of them!

Scrofulous children are often very bright, and the vain parents encourage any peculiar faculty they may have, for the purpose of showing them off. The consequence of this is that the brain, which might have become healthy if left unstimulated, becomes precociously forced, and the seeds of disease are rapidly developed.

Restraining children in their natural impulse to romp, to be noisy and restless, and perpetually changing their occupation, does them an immense amount of mischief.

The ambition to have extra *good* children—that is, *unnatural* ones—often does as much mischief as the ambition to have them geniuses. It is always an unhealthy sign to find children precociously thoughtful, and quiet, or concerned about *serious things*. To talk to children about death, and a future state, and to try to create in them agitating hopes, and fears, about what they cannot understand, is sure to do them injury. If they take such things seriously it is a sure sign of an unhealthy brain, and inflammation, with its concomitants, dropsy, and death, may be looked for.

In many cases the size of the head is but little increased, and yet the disease goes rapidly through all its stages and ends fatally. In fact, sometimes there is no increase of the head at all, and yet the same result ensues.

It must be remembered that a small amount of pressure, in some places, may do more mischief than a large amount in others. Sometimes also death may ensue during the inflammatory or congestive stage, before any fluid has been secreted, and of course without any water being actually on the brain at all.

It may as well be said at once, in reference to chronic hydrocephalus, that there is no known treatment calculated to be of the smallest use, and the patient may as well be left alone, except as far as any means can be adopted to ease suffering.

Surgeons have tapped the brain, and drawn off the fluid, the general result being speedy death, with *very rarely* a recovery and cure. Compression has also been adopted to cause absorption of the fluid, but the result has not been satisfactory.

The great thing to attend to, in children predisposed to hydrocephalus, is the general heath, and bodily development, and to *keep them children*, in every sense of the term. I have seen numbers of poor little things, with pale, anxious faces, timid looks, and *old*, *wise* ways, at churches and Sunday schools, being catechised and drilled till their brains were either stupified or precociously developed, and who were being thus *prepared* for brain disease! When one of such dies it is called a mysterious dispensation of providence, and the poor little thing is said to have been *too good for this world!* It is certain that such ill-developed beings are never likely to be of much use in this world, nor is their existence likely to be one of much enjoyment to themselves, whether it be long or short.

Paralysis, or Palsy.

Paralysis, or Palsy, is not properly a disease itself, but a symptom, or consequence, of some other disease. Most frequently it is a result of inflammation, or of some organic derangement of the great nervous centres.

There are two kinds of paralysis, one affecting the nerves of *sensation*, and the other the nerves of *motion*; but both may sometimes coexist together.

Thus the *optic nerve* may be paralysed, causing a peculiar kind of blindness (*amaurosis*), in which the structure of the eye may still remain perfect. The *auditory nerve* may be similarly affected, causing nervous deafness; and so may the *olfactory*, and *gustatory* nerves, causing loss of *smell*, and *taste*. The nerves of touch, or common sensation, over the whole body, may also be paralyzed, so that there will be no feeling anywhere.

Paralysis of the nerves of motion may exist in some one part, or in half of the body, or sometimes in nearly the whole of it. When one *side* of the body is paralyzed it is called *hemiplegia*; and when the lower *half* of the body, from the loins downwards is affected, it is called *paraplegia*. When the nerves of motion in the face are affected it is called *facial* paralysis. Sometimes the motor nerves of the wrist only are paralyzed, especially in painters who work much with lead; and it is then called *wrist drop*.

Palsy is a kind of incomplete paralysis, in which there is motion; but it is involuntary and irregular. Sometimes, for instance, the head will constantly move from side to side without the patient being able to prevent it. This is called commonly *shaking palsy*.

Hemiplegia is most frequent on the *left* side, and it usually comes with, or follows, an attack of apoplexy. The power of motion, on the affected side, may be either lost totally, or partially, and sensation may be, or may not be lost at the same time.

The mind is generally affected to some extent, and especially the memory, which is scarcely ever so good after an attack as before. Usually the arm fails first, and for a long time it may only feel more or less *numb*; but gradually the whole of that side of the body becomes affected.

Recovery from hemiplegia, more or less perfect, occasionally takes place, and then the arm is the first part to regain its power, but it is seldom that the improvement is lasting.

Hemiplegia results from disease of the brain, or from injury to it, on the side opposite to the paralysis.

Paraplegia is a paralysis of both motion and sensation in the lower part of the body. When complete, there is a total loss of all muscular power, and of all sensation, so that the patient can neither move nor feel below a certain part of the spine. The bladder and large intestine are also paralyzed, so that the fæces and urine pass involuntarily.

Sometimes the paralysis is not complete, so that the limbs can be dragged about, and there is some sensation left, like a *tingling* in the muscles. There may also be some sensation in the bladder and rectum, enough to warn when they are about to act, though the patient may have no power to prevent that action.

Paraplegia generally results from softening of the *spinal* cord, following inflammation, or from some injury. It is therefore connected with the spinal cord altogether, while hemiplegia is connected with the brain.

Facial Paralysis affects the nerves of motion in the face only. Generally but one side is affected, and then the mouth is drawn over to the *sound* side, because the muscles act there, but not on the paralyzed side.

In this form of paralysis there is some disease of the roots of the facial nerves, or some pressure upon them.

Shaking Palsy usually attacks first the hands, arms, and neck, and then extends to the lower limbs. It has a constant tendency to encroach, and end in paralysis complete. In mild cases the palsy is suspended during sleep, but not in bad cases. Sometimes mastication and swallowing are effected by jerks, or spasmodic efforts, and the bowels and bladder generally act more or less involuntarily. Softening of the spinal cord is the most frequent cause, and it often follows the excessive use of alcoholic liquors, or tobacco.

The treatment of paralysis or palsy, may be summed up in few words. The first thing, of course, is to find out, if possible, the physiological cause of the disease, and remove it if we can. In the majority of cases it is, during life, mere guess work as to what particular part of the nervous centres, the brain, or spinal cord, is affected. And even if that be discovered, there is but little, of a special character, to be done. Attention to the general health, tonics, and the removal of all debilitating and exciting causes, constitute the sum total of our remedial resources. Since the paralysis depends upon pressure, in some part of the brain or spinal cord, from effused serum, or a clot of blood, no permanent relief can be looked for till that serum or clot be absorbed.

Good friction of the surface of the body, by rough towels and flesh brushes, is undoubtedly beneficial, because it stimulates the nerves, and they re-act on the nervous centres. Electricity is also often useful for the same reason, and both remedies should be steadily persisted in for a length of time.

The only special medicine of any use is *strychnine*, and this is so powerful that it should always be given, and watched, by some one experienced in its effects.

In paraplegia, ergot of rye seems to be of use in some few cases, and setons, and issues, over the spine, are commonly used to remove the inflammation, or to cause absorption of the clot, or serum. Such means, however, are very weakening if kept up too long, and perhaps the debility consequent on their use does more harm eventually, than their immediate action does good.

Recoveries *do* take place, from all forms of paralysis, but they are very few, and no one is justified in saying that they are owing to medical treatment. The steady use of friction, and electricity, are the most likely to do good, but they must be persisted in for months, or years, if necessary, because, it must be remembered, the process of absorption of the matter causing pressure, is very slow.

I once saw a man who had lain perfectly paralyzed for several years. The only voluntary motion of which he was capable, was a slight rolling of the eyes. He could swallow when food or drink was put to the back of his mouth, but otherwise was as motionless as a corpse, and so remained till he died. What he felt, or what was his state of consciousness, he had no means whatever of making known.

Headache.

Headache, like palsy, is rather a result, or symptom of some other disease, and in some of its forms it is the precursor, or first simple indication of congestion, or inflammation, of the brain, or of its membranes.

Medical writers describe many different kinds of headache, of which, perhaps, the following are the most distinct, and best known.

1. *Rheumatic Headache.* This is felt mostly in the back, or front of the head, where the muscles are most spread out, though it is often very bad in the temples, just above the front of the ear. The pain often intermits, and shifts from one point to another, occasionally locating itself along the muscles of the jaw.

As a general rule it is worst at nights, and is readily brought on by colds, or exposure to draughts, and is very liable to return, like rheumatism generally.

In this form of headache the muscles on the outside of the head are sore and tender, and are painful when rubbed, or pressed upon. In some cases they even swell, and become red and inflamed, like the limbs in inflammatory rheumatism.

The general symptoms are those of rheumatism, as we ordinarily see it. The stomach is usually deranged, and there are apt to be deposits in the urine. Usually rheumatism in the head is only a part of a general attack, affecting other portions of the body as well, but sometimes it attacks the head alone.

The treatment of this form of headache must be the same as for rheumatism generally, and the first thing is to get the bowels, stomach, liver, and kidneys working well. Then use tonics and anti-periodics, especially quinine. To ease the pain, if the patient cannot sleep, give five to ten grains of Dover's powders, or fifteen to thirty grains of chloral hydrate, or as many drops of laudanum. The head should be kept warm, with a flannel cap if necessary, and often rubbed gently with a good anodyne lotion, such as the following.

℞ Alchohol	half a pint.
Camphor	one ounce.
Liquor Ammonia, (Hartshorn)	one ounce.
Laudanum	one ounce.

Of course perfect relief is to be expected only when the rheumatism is cured.

Rheumatic headache can readily be distinguished from any other kind by its symptoms, as above described, and by the fact that it is felt most *outside* at first, and that the muscles are tender, and painful when pressed.

2. *Congestive Headache.* This form of headache is often only a mild chronic form of apoplexy, since it depends upon the same causes, and often terminates in acute inflammation.

The pain in this form of headache is felt, in a dull way, over and *in* the whole of the head, though it is perhaps worst at the front and back ; the face is usually flushed, the eyes red, and the countenance generally heavy and dull. There is no *soreness*, as in rheumatic headache, nor are the symptoms worse at nights.

Usually the liver is torpid, the bowels sluggish, and the urine scant and high-colored. In short, there are most of the symptoms we usually see when there is a tendency to inflammation of the brain, and apoplexy.

The treatment of this form of headache is also the same, essentially, as that for inflammation of the brain. The head should be made cool, the feet warm, and the stomach and bowels properly attended to as soon as possible. Relief is obtained only by drawing the overplus of blood away from the head to other parts of the body.

But, besides this form of congestive headache, it may also occur from weakness of the brain, caused by debilitating sickness, loss of blood, or by any enfeebling discharge. In such cases, the pulse is feeble and slow, the face pale and sallow, and the head feels as if there were no brains there to think with—in fact, it is starved. Very often, also, the feet swell, and, on making the slightest exertion, the heart palpitates, and the pain in the head becomes much worse. The most severe pain is generally felt when the cause of weakness is removed, and when an increased flow of blood takes place in the head. This arises from the circumstance that the brain has become weakened, and cannot stand the increased labor thrown upon it. As the system becomes more thoroughly nutrified, and the brain stronger, the pain ceases.

This indicates the required treatment. All weakening losses must be stopped, and the system built up, by tonics and good food, as soon as possible. Instead of there being too much blood, there is here too little, in all parts of the body, and a new supply must be created as soon as possible. Quinine and iron are both useful.

There is also a form of congestive headache, resulting from *irritability* of the brain and nerves! In this case, any little mental disturbance, or any unusual emotion, by exciting the brain, or increasing the action of the heart, induces a sudden rush of blood, and causes the pain. Any little excitement, or worry, in persons of this irritable temperament, causes palpitation of the heart, and *nervous headache*, instantly. The pain is often intense, and is peculiarly distressing, from the way in which it affects the mind and disposition.

Females are the most subject to nervous headache, partly from the greater natural irritability of their nervous systems, partly from their neglect of exercise, and, in part, from their tendency to give way to emotion.

A better physical development, and less development of the imagination, would correct this in most of them.

Overwork of the mind, in any one, and neglect of the bodily health and development, disposes to an irritable state of the nervous system, and consequently, to this form of headache. This is the case very generally with authors, business men, and mere novel-reading women.

All that can be done, both to prevent and cure this form of disease is, to strengthen the body, and avoid everything which can stimulate the mind or excite the emotions. Plenty of exercise in the open air, good food, cold water, complete mental relaxation, and no excitement.

The best of all precautions against irritability of the brain and nerves is, indulgence in some *hobby* of a handicraft nature; something which needs but little thought, and keeps the hands employed in *making!* The man who can thoroughly enjoy carpentering, locksmithing, metal-working, wood-carving, or any similar occupation, has a resource which will be more useful to him than all the medication he can purchase. And so with women; anything for them to do with the *hands*, if it be not too monotonous, and providing it *creates* something.

3. *Dyspeptic, or Sick Headache.*—This is properly called also *sympathetic* headache, because in it the head itself is not affected, but suffers, from sympathy, with some derangement of the stomach.

Any slight error in diet, eating a little too much, or going too long without food, will often bring on an attack, in those disposed to this trouble, while they may work mentally, even to excess, without having headache—if the stomach be all right.

The explanation previously given (of the nervous connection between the brain and stomach) will make it easily understood how this may be the case. In fact, the action of each organ upon the other is reciprocal, so that over-action of the brain may derange the stomach, or irritability of the stomach may affect the brain. The attack may be immediately due either to mere irritability of the stomach, to inaction of the liver, or to constipation of the bowels. The pain is usually felt most over one eye, or rather in the temple, and the eyeball itself is frequently quite tender, and very sensitive to light. The arteries in the temples are also usually distended, and throb very much, while the forehead is very hot.

There is generally more or less distressing uneasiness, or nausea in the stomach, especially in the morning, and not infrequently vomiting, especially on rising, or immediately after eating. Generally, however, an attack does not last over a day and night, or, at most, into part of the following day, when it passes off, leaving a feeling of faintness, and of tenderness in the eyes. Nearly always the immediate cause is waiting too long for food, eating something unsuitable, or undergoing some sudden emotion or mental excitement, especially on an empty stomach, or just after eating.

No set rules can be laid down as to diet in such cases, because what agrees with one may disagree with another. Careful observation will soon teach any one what should be avoided, in their own cases, better than any rules can. It may, however, be said, of persons disposed to sick headache, that they should never eat much at a time, and should never wait long for food. Frequent, light meals are best for them, of whatever experience shows suits them best. Very often an attack may be cut short by using some simple sedative, such as tea, or a little compound spirits of lavender, combined with some simple food—but coffee, liquor, or wine, should not be used; though a single glass of *champagne* is often serviceable.

In very severe attacks, ten, fifteen or twenty grains of chloral hydrate, or as many drops of laudanum may be taken, to induce sleep. On waking, the headache is generally gone. Of course, if the patient can sleep without such remedies, they should not be given.

When the sick headache arises from torpid liver, or inactive bowels, it is not usually so acute, and comes on more gradually, but may last longer. Some people are very liable to this particular form of disease; and, if they go over the usual time for a motion of the bowels, even for half an hour, or, if they wait for a meal, they are sure to have headache. Any little inaction of the liver leads to the same result, and they feel dull, and *headachy*, till exercise, or some other stimulus, has brought the liver into action, when they feel relieved at once.

It is very probable that the trouble arises, in a great measure, in such cases, from the blood which circulates in the brain being impure, as it always is in torpidity of the liver. The bilious matter, which the liver should remove from the blood, is left in it to a great extent, and is a real poison, as already explained.

Many persons bring on sick headache from too early rising, and from working, or walking, before breakfast, with the mistaken notion of getting an *appetite*. Many delicate females, subject to this disease, are much better for even having breakfast in bed, as soon as fully awake, the exertion even of dressing, with an empty stomach, being sufficient to give them sick headache the whole day after.

With the exception of what has been above recommended, it may be said that medication is useless to cure this disease. Nothing can be done but to try and keep the liver and bowels in good working order, and be careful in regard to diet. Purgatives, or emetics, are only of temporary service; and the same may be said of all *anti-bilious* medicines, to act on the liver. In fact such medicines, if used too much, only increase the evil, and make the patient worse.

The tendency to sick headache, it is some consolation to know, usually passes off by middle life, or earlier, and leaves nothing serious behind it.

Many persons bring on, or keep up this trouble, by irregularity in the time of eating, by not masticating their food properly, and by using too much slops! Many females especially bring it on in this way, and keep the stomach weak by continually drenching it with warm fluids.

4. *Periodic Headache.* This is felt almost solely in the forehead, and on that account is often called *brow ache!* It is also called *neuralgia in the head*, beccause in many respects it resembles ordinary neuralgia. The great peculiarity of this disease is that it comes and goes, and returns again, at regular intervals, like intermittent fever, the intervals varying in length in different cases. In some respects it resembles rheumatic headache, but may be distinguished from it by being periodic, and also because no *soreness* accompanies the pain.

Occasionally *one half* of the head only will be affected, while the other half is quite free. It is then called *hemicrania.* The causes of periodic headache are unknown, but in all probability it is dependent on some derangement in the nutritive or secretory organs, owing to which the blood becomes imperfect, or impure.

Generally all attempts to cure this disease are utterly in vain, although the time between the attacks may be often lengthened, so that the patient suffers from it less often. The first thing to be done is to regulate the liver and bowels, and make some thorough change in diet, and habits ; very often a change of air effects a cure at once.

5. Besides the above, which comprise the forms of headache most usually met with, there are also other varieties, less frequently met with, and of a less serious character. They are usually dependent upon some kind of local irritation.

Thus headache commonly accompanies a cold in the head, or chronic irritation of the mucous membrane of the nose, or frontal sinus. It also often accompanies worms ; and with many people, whose nervous systems are peculiarly sensitive, any change in the atmosphere will cause headache.

Neuralgia.

Neuralgia is one of the most distressing pains that human beings can suffer from. It is also one of the least understood, and the least benefited by medical aid. It consists in a very severe and distressing pain in some particular spot, in the course of one of the nerves, and is often unaccompanied by any signs of inflammation, or organic change. In some cases there is obvious congestion, or inflammation of the trunk of the nerve, and perhaps in all cases there is something of the kind, but as a general rule it cannot be discovered. In fact, the great peculiarity of neuralgia is that there is pain, and pain only, without apparent cause.

The pain of neuralgia is peculiarly acute and agonizing, and is often confined to a very small spot. It is also apt to be periodic, or to be excited by very slight causes. It is often described as being like cuts, or stabs, with a red hot knife, and many patients are made almost delirious by it.

The least touch, or draught of cold air is enough to bring on an attack, or to aggravate it almost beyond endurance. Very frequently, when the pain is in the face, the muscles will twitch and work spasmodically, in spite of all efforts to prevent them. In fact, this twitching is often the first indication of an attack coming on.

Some of the most painful attacks of neuralgia are experienced in the face, and they come on sharp and sudden, constituting what is often called *tic doloreux.*

No disease is more irregular or uncertain. There may be perfect freedom from it for months, or years even, and then it may return suddenly, and last for an indefinite time, on and off. The branches of the fifth pair of nerves on the face, are the most frequently attacked, but any of the nerves may be affected,

Sometimes no particular sensation is felt on touching the affected part, but at other times it is excruciatingly tender, although there may be no signs of inflammation.

The primary predisposing causes that lead to neuralgia are quite obscure, but many of the exciting causes are well-known. Exposure to cold is one of the most frequent, and so is over-fatigue, or excitement. In many cases, also, when it the eye is affected, long exposure to intense light will bring on an attack; and so will loud, or long-continued noise when the ear is affected. Great excitement of the olfactory nerve even, by smelling strong odors, or snuffing irritating substances, will sometimes cause neuralgia in some of the nerves connected with the nose. Too much mental work, anxiety, or powerful emotion, will, in many persons, be sufficient to excite neuralgia, while in others it may be brought on by torpid liver or kidneys, causing poisoning of the blood. But, after all, there are numerous cases, of the worst kind, in which no cause whatever, either immediate or remote, can be discovered.

The treatment of neuralgia is altogether empirical, or experimental, for no certain means of cure are known. As a general rule it is advisable to pay strict attention to the stomach, liver, bowels, and kidneys, and then if the disease results from blood poisoning, as it often does, relief may be obtained.

Sometimes fifteen or twenty drops of laudanum will give relief, or fifteen to twenty grains of chloral hydrate. In fact enough of this to cause sleep frequently cures.

Laudanum may also be applied externally, over the seat of pain, or a thick cloth wet with chloroform till the skin smarts. An excellent anodyne also is bi-sulphide of carbon. A bit of sponge should be put in a wide-mouthed bottle, and wet with the bi-sulphide, and then the open mouth of the bottle be pressed over the painful spot, so that the vapor may rise from the sponge on to the skin, this often relieves. The patent preparation called *chlorodyne* has also relieved in numerous instances.

In extreme cases the nerve is often cut through, or a small piece of it is even taken out, and when the offending part can be so removed, or disconnected from the brain, perfect relief is obtained. Too often, however, the precise part implicated is not hit upon, or the disease flits to some other part, and the operation does no good. It has even been known to make the patient worse.

Another operation, and which is much more frequently beneficial, is what is called *hypodermic injection.* That is, injection under the skin. A very small, fine-pointed syringe takes up a drop or two of some anodyne fluid, such as solution of morphine; the point of the syringe is then thrust into the skin, till it reaches the true skin underneath, and the fluid is injected. It of course comes into contact with the blood, and enters at once into the circulation, by which it reaches the nerve. Such an operation should be practised, at first, by a physician, and the injection may be varied in many ways. The patient can, however, soon be taught to do it for himself.

Sciatica.

This is a very painful neuralgia, affecting the sciatic nerve. It consists in a very acute pain, which darts down the back of the thigh, or along the outside of the leg down to the ankle. It is more persistent than neuralgia generally is, and is always made worse by pressure along the course of the nerve, where alone it is felt. This localizing of the pain, and the fact that moving the limb does not make it worse, distinguishes sciatica from rheumatism.

Examination has shown that in this disease the nerve, or its sheath, is really congested, or engorged with blood, and the pressure resulting from this congestion causes the pain.

In treating it, the seat of the congestion should be made out, as nearly as possible, and then means should be taken to relieve it. In some cases leeches over the inflamed spot are of great service, or cold lotions; but at other times these remedies are useless, and mustard poultices, or hot fomentations succeed better. There are no means that act in all cases alike.

To appease the pain the same means may be used as advised for neuralgia, including the hypodermic injection. It is, however, apt to be a very obstinate complaint, for which but little can be done. Chloral hydrate, to induce sleep, gives more relief than almost anything else.

Strict attention should be paid to the bowels, stomach, liver, and kidneys; and, if possible, the patient should have a change. When the pain is periodic quinine should be used.

Tetanus, or Lock-Jaw.

This disease is really one of the nervous system, although it shows itself in a rigid spasm of the muscles, especially of the jaw. Those who have read the explanations previously given, of the nervous system, will see at once that the muscles cannot act at all, except as they are excited by the nerves of motion. The violent spasms into which the muscles are thrown, therefore, in tetanus, must be caused by some abnormal stimulus from the nerves.

Occasionally lock-jaw comes on without any apparent cause, and it is then called *idiopathic tetanus*. In such cases the muscular excitation arises from a direct impulse from the nervous centre, but how that is originated we do not know.

Most frequently lock-jaw follows after some injury, which has irritated a nerve, as in the case of a jagged wound, or tear of the flesh from a nail, and it is then called *traumatic tetanus*. In this case the origin of the spasm is plain. The nerve of sensation is injured, and an impression is conveyed by it to the nervous centre, from which comes back, by reflex action, the impulse which sets the muscles at work.

An ordinary wound, in which no *nerve* is torn, or lacerated, may produce no such effect, even though it be extensive and serious, while a slight tear, or puncture, may induce lock-jaw at once. Exposure to cold will also bring it on in some people.

The symptoms are just the same in both forms of the disease, and they may set in very soon after the injury, or not till some time after. The first indications are a slight stiffness in some of the muscles, which gradually increases till some of them become rigid, or fixed. Very commonly this occurs in the muscles of the jaw, and is then properly called *lock-jaw*, because the jaw is as immovable as if closed with a padlock. It is also called *trismus*.

Sometimes the muscles of the back are affected, and the body is bent like a bow, with the stomach uppermost. This is called *opisthotonos*. When the muscles of the front of the body are affected the body is bent the other way, with the back projecting, which is called *emprosthotonos*. It may also be bent sideways, either way, and it is then called *pleurosthotonos*.

Either form of the disease, if it continues, is soon followed by a general spasm of the voluntary muscles, all over the body, causing excruciating pain, with great anxiety.

Breathing soon becomes difficult, the heart beats faster, and feverishness sets in. The spasms usually get easier for a short space, every ten or twenty minutes, and each succeeding spasm gets more and more severe.

If the patient sleeps the attacks do not occur; but usually sleep cannot be obtained.

Where the case is fatal, the spasms go on getting more and more violent and incessant, till finally the patient is worn out, and ceases to be able to breathe, on account of the muscles of the throat becoming stiffened.

Tetanus may cause death in a few hours, or it may last several weeks, or months, but in fatal cases seldom over ten days. It is always to be dreaded, and when it reaches a certain stage is seldom recovered from.

One of the first things to be done, in traumatic tetanus, is to examine the wound, and see if there be anything in, or about it, that may keep up the irritation. It should be cleansed, properly bandaged, and placed at rest. Then give a purgative, of any kind handiest; and, when that has acted, follow it by a good sedative. Opium, or chloral hydrate, as advised in neuralgia, and when the patient awakes apply cold water to the head and spine.

In giving the purgative it may be necessary to force open the mouth, unless an opening in the teeth allows of its being passed down to the throat. But care should be taken to open the jaws gradually, and not suddenly. The cold water is best applied by a common watering pot, over the head and spine, and the pulse should be felt all the time, so that it may be suspended immediately the action of the heart begins to fail.

Cannabis Indica, or the Indian hemp, is often very serviceable in lock-jaw, and two or three grains of the extract may be given every three or four hours. Chloroform will stop the spasms, but they come on again as the effects of the chloroform pass off.

There are some very active poisons, such as are used by the South American Indians to poison their arrows, which have been used, more or less successfully, in tetanus. In the ordinary state of the body these are very deadly; but in the spasms of tetanus they seem to exert a counteractive effect. Curari, or Woorali, is one of the most noted of these poisons.

Strychnine causes spasms like those of lock-jaw, but not so long continued. They also occur in hydrophobia; but this can be readily distinguished from tetanus, as will be shown further on.

Protracted exposure to either extreme heat or cold, or even violent exertion, may bring on tetanus, and so may irritation of the stomach, or bowels, as from worms, and violent emotion even disposes to it.

Tetanus usually comes on from four to seventeen days after an injury; and when from a wound it seldom occurs after the wound is healed.

If the spasms fully remit and weaken, there is hope; but when the disease becomes really acute it nearly always ends fatally. The most reliance perhaps is placed upon opium, in heavy doses; but I should prefer to try large doses of chloral hydrate first.

Injections have been used, in the rectum, of turpentine, or of twenty grains of tobacco, in a pint of boiling water. This should stand for an hour, and then be strained. It often relaxes the jaws, at least for a time.

The peculiar morbid state of the nervous system, in tetanus, is shown by the way in which the spasms are excited or increased. A draught of cold air, the rubbing of the clothes, a sudden, loud noise, or flash of light, will often increase them to a fearful extent.

Experience has shown that no remedy yet known has so much power, in controling, and curing, tetanus, as chloral hydrate. But its use must be continued for some time. For a person not accustomed to it, fifteen grains is a proper medium dose to begin with; but if this does not soothe, or induce sleep, twenty-five, thirty, or forty grains, or even more may be administered.

More powerful remedies, like the woorali, should be used only by the physician.

Hydrophobia.

Hydrophobia, or canine madness, is a disease of the nervous system, caused by blood poisoning, from the bite of a rabid animal, or of another human being. It seems to affect the dog, cat, fox, wolf, and jackal, and even the sheep and horse, according to some.

The disease may show itself soon after the bite, or not till some time after the wound is fully healed. Death sometimes occurs in twenty-four hours after the first attack, but usually about the second or third day; though it may not occur till the seventh or eighth.

As long a period as nine months may elapse, after the bite, before the attack; but the average period is from six to fourteen weeks. In these cases the poison lies latent; but very often the symptoms show themselves in a few days. The accounts we have of many years passing after the bite, before the disease appears, are to be distrusted.

The poison seems to be contained in the saliva, or mucus, of the animal's mouth, and is conveyed into the blood by the wound made with the teeth. If there be no breaking of the skin, or no absorption of the mucus into the blood, there is no infection of hydrophobia.

The idea, which some people entertain, that if a healthy dog bites a person, and becomes mad afterwards, that person will go mad also, is simply absurd.

Usually the first symptoms of the disease are pain and redness in the wound, from which the pain gradually extends about the body, with stiffness, or spasm, of the muscles, especially about the throat. The patient becomes irritable, anxious, and feverish, while a quantity of thick, frothy mucus pours from the mouth, and impedes the breathing. It is the gasping and choking caused by this mucus, and the spasmodic efforts made to clear the throat, which produce the peculiar noise that has been supposed to resemble the barking of a dog.

The most characteristic symptoms of the disease, when fully developed, and the most distressing to witness, is the spasm of the throat. This prevents the patient from swallowing, and leads to the most fearful terror and anguish at the idea of doing so. The patient probably longs to drink, but feels that it is impossible for him to do that, or to get rid of the horrible idea of choking. The sound, or sight, of water running, or pouring from one vessel to another, or even the motion of the air, or of any shining object before the eyes, will bring on the most fearful spasms. Any attempt to swallow produces still more alarming results, and the poor sufferer finally desists from the vain effort, with all his sufferings increased.

The nervous irritability is extreme; the least noise, or the smallest appearance of contradiction, or want of agreement, excites the most painful paroxysms of suspicion and terror. The eyes are fixed, wild, and staring; the eyebrows drawn together, and the whole features express, only too painfully, the anguish that is endured.

Sometimes there is delirium, but generally the mind is not seriously affected, though there seems to be no control. The patient appears to be aware of the unreasonableness of his irritability, but is powerless to prevent it.

The final termination of the disease is in suffocation, or convulsions.

As to a cure for hydrophobia, it may as well be stated at once that there is none known. Every likely and unlikely thing has been tried, but with no avail. Chloroform sometimes mitigates the spasms, and cold water to the head and spine has given relief, in a few cases, but without preventing a fatal termination. All that can be done is to prevent the patient from injuring himself, or others, in his struggles, and wait the inevitable result.

All the *mad-stones*, and quack remedies, are utterly useless, and have got their reputation simply from being used in cases where there was no hydrophobia.

The great thing to be done, when a person has been bitten, is to cut out the bitten part, if possible, or burn the wound, *at the earliest possible moment!* If caustic is at hand, apply that, or nitric acid, or a hot iron, or coal; but the application should be *thorough*, so as to burn to the very bottom of the wound. It is best also to suck it first, or apply a cup, and squeeze and wash it well. If this be done quick enough, before the poison is absorbed, the danger may be obviated; but *no time must be lost!*

The application of *mad-stones*, and other popular means, only lose time, and do no good whatever. The only chance of prevention is in *instant squeezing*, *washing*, *sucking*, *cutting out*, *and thorough burning*, to destroy or remove the poison before it enters the circulation.

Mr. Youatt, so celebrated for his knowledge of dogs, assures us that he has been bitten a number of times by rabid animals, and with no bad result. His practice was to apply nitrate of silver (lunar caustic) as quickly as possible. He used to put bits of the caustic *in the wound*—pushing them to the very bottom of it—and leaving them there to dissolve away. Of course, a severe wound would be formed, and much sloughing would take place, but no hydrophobia.

It is possible that the poison may often lie in the wound, or close by, for a long time without being absorbed; and, therefore, the burning, or cutting out, should always be practised, unless the symptoms of the disease have actually shown themselves.

The symptoms in the dog are similar, in the main, to those described in the human being; but there are many common errors on the subject. Most dogs will drink eagerly while mad; though they often have to do it by jerks and spasms. In fact, they are generally so eager to drink, that they upset the vessel which contains the water, and then are supposed to do it from their dislike to the fluid. They will also often take to the water, and swim in it, contrary to the popular idea. It is not the dread of water, in either man or animal, that causes the spasm when they see or hear it, but the feeling that they are unable to swallow, which induces convulsive spasms.

The symptoms of hydrophobia in the dog should be generally known; for, *by far the greater part* of those called mad are not so, and many persons really die from nervous derangement, brought on by *fear*, after being bitten by animals who never had the disease at all.

The first indication of madness in a dog, is a complete change in his disposition. A good-tempered one becomes cross; a bold one shy, or the reverse; and a fond one, sullen and morose. This change may be observed sometimes for several days, and then the dog becomes worse; biting at everything presented to him, or snapping at imaginary things. He wanders about in a restless, longing sort of way, as if he was looking for something, and cannot rest anywhere. If chained, he will knaw at his chain; or, if shut in, he will bite at the door, and try to force his way through it. All ordinary feeling seems to be lost, so that he feels nothing, and will bite, and hold on to a red-hot poker, without seeming to suffer. The way in which he howls and groans is peculiar, and very distressing to hear;—when once heard it can never be forgotten. This, however, is only in confinement; for, when at liberty, he runs about silently, and will seldom attack any one if not interfered with, or run against. He evidently becomes delirious at last, and fancies enemies all around him, at which he snaps and barks incessantly. This fierce excitement soon exhausts him, and he dies at last in convulsions. Contrary to what is thought, he will usually drink water all the time, but does it so eagerly, that he upsets the vessel in his haste.

And, here let me remark, that when a dog, supposed to be mad, has bitten any one, he should *not be killed*, but be shut up in some secure place, in the dark if possible, with water, and left alone. In the greater part of such cases, the animal will recover; thus proving that he did not have hydrophobia, and the bitten person may at once feel secure. But, if the animal is killed, he is at once thought to have been mad, beyond doubt, and the sufferer gives up all hope. The dog should never be killed if he can be safely shut up; because, if he dies, matters are no worse—and, if he lives, there is no danger.

Many dogs are worried and hunted till they become crazed with terror and fury, and are then called mad, and killed at once. Any one bitten by such an animal is thought to be certain to go mad also; and the very thought, and fear, of the thing, will actually induce many of the symptoms of hydrophobia, causing such nervous excitement that the patient may soon die from it. I have no doubt but that many have thus died, who, if the dog had been allowed to live, would have recovered, because they would have seen that there was no danger of hydrophobia.

I remember noting the details of one case particularly, in which a man was bitten by a poor hunted dog, said to be mad, who escaped from his pursuers into a wood and was lost. The man was in the greatest terror from the very first, and told all about him he should go mad, that he should bark like a dog, and bite, and go into fits at the sight of water. Sure enough all these symptoms commenced, and the man became quite delirious, raving about mad dogs, and occasionally falling into convulsions. Fortunately his physician gave him, by force, a heavy dose of opium, which threw him into a profound sleep that lasted ten hours, and he awoke more calm,—but was going off as bad as ever, as soon as fully awake, so another dose was given and he slept again. Before he awoke the poor dog returned home quite well, only weak and afraid, and evidently with no hydrophobia. As soon as the man awoke he was told this, and shown the dog, —immediately all the symptoms left him, and he became quite well, and so remained. If the dog had been killed, the man no doubt would have died, because he would have felt *sure* there was no hope for him.

All the worst symptoms of such a disease as hydrophobia may be brought on, in some persons, by fear, and a conviction that they have the disease, just as surely as when they are inoculated with it.

The fact is, hydrophobia is a very *rare disease!* Not one in fifty of the dogs called mad are really so, but merely furious, feverish, and excited, from fear and bad treatment. It has been found also that of those persons that are bitten by really rabid dogs, not one in ten take the disease. And this is not so strange when the matter is fully considered. The poison appears to exist in the saliva, or mucus; and, if this does not enter the wound, there is no infection—and many causes may prevent it from entering. If the dog bite through clothing, as it often does, it is quite possible that the saliva may all be wiped clean off his teeth before they enter the flesh. In the same way, one bite may remove all the poison, so that another bite, immediately after, may be harmless; and this may account for the fact that, of two persons bitten, one may become mad and the other not. A copious flow of blood may also wash out the poison, or it may be wiped out, by something rubbing the wound.

It must be remembered, therefore, that, though dog-bites should always be avoided, if possible, and *cauterized* at once, no matter how healthy the animal may seem, yet there should be no unnecessary alarm when they occur. Few of the dogs called mad really are so, and few of the bites cause hydrophobia, even from those undoubtedly mad. Cauterizing, or burning, will also remove all danger, even in the worst cases, if used early enough.

The rarity of hydrophobia is the reason why so many quack remedies get reputations for curing it. Perhaps not one in fifty of the bites they are used in would cause any injury, if left alone, but the remedy gets all the credit; and, in the cases which do turn out bad, it is supposed the remedy was not used soon enough.

The so-called *mad-stones*, are the most generally believed in. they are porous, and absorbent, and, being applied to the wound, stick there, like a new clay pipe sticks to the lips, and are supposed to draw out the poison. All they can do in that way, however, is not equal to squeezing and washing, or cupping, much less a thorough cauterizing or burning.

Some of these I have seen are common clay slate, some soapstone, and others are simply burnt bones. They can do no good, and may do harm by *losing time* when every moment is of value.

Many erroneous notions are held as to the original cause of hydrophobia, and it is commonly supposed to arise from the heat in summer, in the *dog days*. At this time therefore a senseless and indiscriminate slaughter takes place, and all dogs not killed are ordered to be muzzled. The fact is the heat has nothing to do with hydrophobia, and it is quite as prevalent in the coldest as in the hottest days.

The real and only cause of canine madness, so far as known, is *ungratified sexual desire on the part of the male!* The dog secretes a large amount of semen, and the necessity of its discharge, by connexion, is most urgent. When retained too long it causes erotic fever, which poisons the blood, and excites the brain, till the animal becomes rabid. Any one who has observed dogs after a female in heat will understand this. They are often *delirious*, though not rabid, and are perfectly indifferent to hunger, thirst, or pain;—nothing will turn them away from the object of their pursuit, and no threats, danger, nor blows, will deter them from gratifying their desires if they can. Now this kept up too long, or coming too often, without relief from gratification, causes madness.

Where the males and females, in anything like equal numbers, associate without restraint, dogs do not go mad. In Constantinople and other Eastern cities, dogs swarm, and breed wild in the streets, and yet madness is rare amongst them, though it is a hot country; the reason is that they have free sexual intercourse. If the dog knew how to masturbate, he no doubt would do so, and thus obtain relief, but his structure makes it impossible. The male monkey, having a hand, always masturbates when deprived of free intercourse with the female, and it is well-known how prevalent the practice is amongst men when suffering from the same deprivation. If the monkey could not practice this habit he would, in all probability, go mad like the dog, for he is extremely salacious, and probably also has considerable imagination, and memory to boot.

Even among men, the total deprivation of sexual indulgence, when the sexual organs are in perfect action, leads to most deplorable results. There is either perpetual pollution in some form or other, dwarfing and debilitating both body and mind, or there is disease of the nervous system, especially of the brain. Hypochondria, idiocy, and mania, often of a furious and murderous character, frequently result in this way.

Mankind are too much in the habit of speaking of this subject as a merely *moral* one, and of considering it either as a weakness or a vice, when the demands of nature are obeyed. It is, however, essentially a physical matter, and its moral associations are merely subsidiary and incidental. Sexual passion is the most imperative of all animal impulses, and its indulgence, to a certain extent, is a necessity of nature.

Softening of the Brain.

Softening of the brain, (*Ramollissement*,) is a more common disease than is supposed, and is a fruitful cause of *loss of mind*, and *death*. Many die from it without any one suspecting the cause.

Sometimes the brain becomes softened, or more fluid, as a result of inflammation, as explained in a previous article; and it may also do so from imperfect nutrition. If the blood be poor in quality, or poisonous, or if it be deficient in quantity, the whole body will suffer more or less, but particular parts will be apt to suffer more than others. The brain, especially when overworked, is very apt, under such circumstances, to become diseased, and finally partially decomposed, or softened. Long-continued excesses in sexual indulgence, or in drinking, also predispose to this terrible disease.

The softening observed is of various degrees, and presents various appearances. The brain may be either only a little more flabby than usual, or it may be partly pulpy, and sometimes it is almost fluid, so that the remains of the cellular tissue actually *float* in it.—Sometimes it is white like milk, sometimes amber colored, and at other times reddish, or even greenish, or yellowish. The softening may either affect the bulk of the brain, or mainly some particular part, and the softened matter may be infiltrated with pus, or blood. Generally the softened part of the brain has no odor, but occasionally it has a smell of sulphuretted hydrogen, or like rotten eggs.

Both the white and the gray matter are equally liable to this form of decay, and it may be confined to one hemisphere only, or may extend to both.

Generally, but not always, softening of the brain is first indicated by continued severe pain in the head, without any indication of inflammation, or rheumatism. The pain is not located, but seems to oppress the whole head, *inside*.

A more common symptom, however, is vertigo, and uncertain or double vision, accompanied with a decided weakening of the mental powers. Judgment, memory, and the power of keeping the mind fixed on anything, are gradually weakened, and finally lost, so that the patient sinks into complete imbecility.

Some of the first signs of this decay are observed in a slowness in answering questions, or in stating anything, as if the ideas were long in coming. The tongue also appears to be embarrassed, and many words are spoken imperfectly. Dejection of mind, indifference to everything, and confirmed hypochondriasis are also commonly observed, with constant drowsiness, twitching, or numbness of the limbs. There may also be a loss of proper feeling in the fingers, so that they cannot well lay hold of objects, unless very large. Squinting is often observed, or total blindness in one or both eyes, and also loss of hearing.

The moral nature also, in the first stages, is apt to be entirely changed, so that the patient acts in the most extraordinary and distressing manner, and is perfectly unaffected by any kind of remonstrance.

These symptoms may be more or less complete, according to the extent of the disease, and occasionally they remit, in the most singular manner, so that, for a time, the patient seems to be quite restored, but soon falls back into a worse stage than before.

During all this, the vital functions may proceed almost as usual, so that the general health may not be much affected for some time. In fact, we do not know what stage of degeneration the brain must reach before its functions are seriously affected. In many cases it has been found very much softened, and more or less disorganized, without the mental powers being destroyed, or even much weakened.

A point is reached at last, however, in which the breaking up has gone too far, and the mind comes to an end at once.

Perhaps a comparison may here be made with a galvanic battery. We may have the platina, for instance, in two different forms, either in a compact rolled sheet, or in the form of powder, and yet the effect is the same, and so it may be with the brain; it may still develop nervous power when partially fluid.

These remarks apply more especially to ordinary chronic softening; but when there is *inflammation* the symptoms are in many respects varied. The pain in the head is sharper, and there is often considerable excitement at first, with delirium, while the eyes, ears, and other senses are morbidly sensitive to whatever acts upon them. The limbs also become stiff, and sore, with cramps, and twitchings at times.

Sometimes there is more or less derangement of the bowels, stomach, and kidneys, but at other times none at all; and fever also may be either present or absent.

As the disease progresses, the use of one limb, or of half the body is lost, sometimes suddenly, but generally by degrees. The intellect may not be seriously impaired, even at a comparatively late stage of the disease; but the power of expression is enfeebled, so that the patient expresses himself slowly, with great effort, and tries to help out his words by motions.

Loss of consciousness, or fainting, more or less complete, finally commences, beginning with, or immediately after paralysis; but this may pass away temporarily, so that recollection returns, and the mind seems re-established, but only for a time. Finally, all mental power dies, the senses fail, and the sufferer sinks into a state of complete unconsciousness, from which he never arouses again.

The treatment for softening of the brain, in the first stages, is very simple. All mental *work* must be forbidden, no stimulants used, nor narcotics, and every means must be employed to tone up and strengthen the system generally. The only hope is in good nutrition, and perfect activity of all the secretions, with avoidance of excitement or strong emotions. Excessive sexual excitement, the abuse of liquor, and too much study or mental worry, are the chief exciting causes of softening of the brain, and they must be shunned by all who fear it, or have a tendency to it.

When the symptoms are once fairly noticed, showing that the disease is really established, nothing certain can be done, and the treatment must depend upon the situation and condition of the patient, according to the principles above laid down. At a later stage it is utterly useless to attempt to do anything, except watch the patient.

In this disease, as in apoplexy, and inflammation of the brain, the great thing is to attend to the first signs of derangement, and change the habits and mode of life. The man who *will* continue to overtask his mind, to indulge in continued sexual or other excitement, and to constantly use stimulants to excess, must expect apoplexy, or softening of the brain, and medicine cannot save him.

Hardening of the Brain.

Not only does the brain become softened and disintegrated, in the manner above described, but it may also undergo a destructive change of an opposite character, and become hardened, or indurated. The central portions seem more liable to this change, though it may also extend to the whole organ, making it sometimes almost like wax, and with a tendency to become *horny* when burnt, or treated with nitrous acid.

Occasionally certain parts of the brain are found as firm as leather, and much resembling it in appearance. In such cases the subject has either been more or less idiotic, or has imperfect command of some of the muscles of the body, according to which part of the brain was affected.

The causes of hardening of the brain are not known, but it is most probably a result of long-continued, slight inflammatory action. It has been found in persons who have died from *lead* poisoning, and is common in maniacs.

The general symptoms, and final results, of hardening of the brain do not vary much from those observed in many cases of softening. The gradual loss of memory, and all power of attention, and will, with paralysis, and palsy, being the most usual symptoms, with final idiocy, wasting away, and death.

In regard to treatment it may as well be said at once, that no known treatment is of the slightest use in such a disease, for when it is far enough gone to be observed, it is too far gone to be cured.

Tubercles and Tumors, and other Bodies, in the Brain.

Tuberculous matter, precisely the same as that found in the lungs in consumption, is sometimes deposited in the brain, causing softening, and other destructive changes, terminating in death. This may be called *consumption of the brain*. It is probably scrofulous.

There may also be found various kinds of *tumors* in the brain, which, by their pressure, cause loss of mental power, paralysis, palsy, apoplexy, and death. Nothing definite is known of their origin, nor can anything be done for them, except in very rare instances. Abscesses may also form in the brain, from injuries, or from inflammation; and, by the pressure which they exert, may cause a variety of serious and fatal symptoms. Some bold surgeons, in such cases, have plunged their knives into the very substance of the brain, let out the matter, and saved the patient.

Bullets and other foreign bodies have often been lodged in the brain, and remained there for years with no serious results, and even without inconvenience. In such cases, a membrane forms round the foreign body like a sac and keeps it steady in one place. It must also be understood that it never, in such cases, touches the medulla oblongata, nor any of the important ganglia of the sensorium. If these parts are missed, the brain itself may be cut, or handled, to a great extent, with no immediate apparent injury. A case once occurred in New York, where a man, while blasting rocks, had an iron bar some two feet long, and over half an inch in diameter, blown clean *through his head*, and yet he recovered, with no bad result following. The bar entered below his chin, went straight up, and came out at the top of his head. Of course it must have missed the medulla, and the sensorium, though it is wonderful how it could have done so.

The surgeon has often sliced off portions of the brain, and had his fingers in its substance, without injury, and without the patient suffering from pain, or even knowing what had been done. In explanation of this, it must be borne in mind that the function of the brain is to elaborate thought, and consciousness, and not to *feel*. It is probable that, in healthy persons, the brain may grow ; and that, after a portion has been lost, it may be reproduced—at least in certain parts, as Voit found it do in pigeons.

Diseases of the Spinal Marrow.

The spinal marrow may be the subject of injuries, inflammation, congestion, tumors, softening, hardening, and other forms of disintegration—like the brain. In such cases, however, the effects are confined to the vital organs, and to the muscular system ; the *mind* not being affected. Softening of the cord is a common cause of paraplegia, and so is dropsy, or watery effusion. A clot of blood, making pressure in the spinal cord, may cause paralysis in all the parts below, and so may a tumor, or any other morbid growth.

Injury to the spinal marrow, in any part, is almost sure to be followed by serious results, and it may be injured so far up that the whole body may be dead—that is, without feeling or motion—and the head only be left alive ; a living head on a paralyzed, or dead body.

THE END.

Dr. Hollick's Books and Lectures.

It is now some years since I gave my public Lectures on Sexual Physiology—the first strictly popular and scientific ones of the kind ever delivered in this country. These were attended by thousands, of both ladies and gentlemen, at whose request I wrote a series of books, embodying the Lectures, but more extended.

These books immediately obtained a large circulation, which has been steadily increasing, and is now larger than ever.

Like the Lectures, they are intended to give *useful information*, and to gratify, in a proper manner, that natural wish for knowledge of the procreative functions which all human beings must feel. But at the same time they are strictly moral and scientific, though popular; and those who seek them for the gratification of mere morbid curiosity, or from vicious motives, will be disappointed in them.

It is usually entirely overlooked that human beings, of both sexes, never can be *unthinking* about sexual matters, but always *do*, and always *must*, have their minds more or less occupied about them. The requirements of their nature compel this, and it is vain to expect it to be otherwise. The only question, therefore, is whether it is better for men and women to have *true* ideas on such matters, or *false* ones; for ideas of some kind they must have.

The question scarcely admits of argument, and may safely be left for common sense and experience to decide. It must not be forgotten also that, at the present day, knowledge is claimed by the people as a *right*, not requested as a *favor;* and that they are quite prepared to accept all the evils that may result from its possession, if they can enjoy its benefits.

The important thing is to give this knowledge in a *plain*, *practically useful*, and *unobjectional* form, so that all may receive and be benefited by it, and none offended. This has been with me a special study; and a long and extended experience, as a lecturer, practitioner, and author, has taught me that such knowledge *can* be so given.

If the subject be approached in a proper spirit and manner, it will be so *received*. I have lectured to private audiences of thousands, both of ladies and gentlemen, on Sexual Physiology, using anatomical models and paintings in illustration, and never heard the slightest objection from any one. On the contrary, I have had presented to me numerous votes of thanks and testimonials of approbation from all classes of the community.

My Lectures were the first complete and popular ones ever delivered on Sexual Physiology in this country, though they have been followed by many others ; and I should still continue them if my professional avocations allowed me time.

These books comprise all the subjects treated upon in the Lectures, but are much more extended and complete. They form, in fact, a complete library of reference, in which any man or woman can be sure to find, fully explained, any sexual matter in which they may be interested. Every one knows how constantly persons, of both sexes, urgently need information on such things, and know not where to get it. The discomfort, disease, and suffering which is caused by this ignorance is incalculable, and for the most part it has to be silently endured, because the sufferers shrink from publicity, and know not where to get the knowledge which alone can relieve them.

These books are adapted for both sexes and for all conditions, and have been written and revised with the greatest care. None like them ever were published before, nor are there any others like them in existence. There are such books adapted for *medical men* only, and there are others written only to pander to vulgar *curiosity*, or to minister to *vice ;* but these are altogether different.

☞ They are *popularly written, so that all can understand them ; they are perfectly moral and unobjectionable ; and yet are scientific enough for the use of students and medical men !*

Very few books—certainly none of this kind—ever had such a run of public favor before. One of them is now in the 300th edition, and another in the 200th, and the demand for them is steadily increasing. They are constantly kept revised, so as always to contain the latest information on all points, and are in this respect often ahead of many of the medical manuals.

One of the books—***"The Marriage Guide"***—is intended to give to married people, or those intending to marry, of both sexes, all that information about themselves and their mutual relations which they can need or desire to possess. *No couple should be married without reading a work of this kind first.*

"The Male Organs" is intended to give a man full information in regard to his own sexual system, its physiological action, its various diseases and derangements, and how its health and vigor may be preserved or restored.

The Diseases of Woman is intended to give the same information in regard to the female system, as "*The Male Organs*" does for the male system. The structure and functions of the female organs are fully explained, with the causes and cure of all their derangements.

The Matron's Manual of Midwifery is intended to explain, in a familiar way, easily understood, all the phenomena of pregnancy and childbirth, so that in case of emergency any woman would know what to do for herself or others.

The ***"Popular Treatise on Venereal Disease"*** is intended to explain all about these fearful scourges, and to show how they may be cured and prevented. It also shows how they taint the whole human race, and how their fatal effects descend to remote generations.

These books are all intended for *private self use.* Men and women can, by reading them, understand themselves, and know how to *cure* or *prevent* some of the most serious evils to which they are subject. If every one possessed, in time, the information these books contain, it would prevent untold misery both to young and old.

They are all well illustrated, both with *engravings* and *colored plates* of the parts described, and are full of *curious cases* and interesting information upon all topics (sexual) which may be of interest or importance both to young and old.

Besides giving my own experience, I have carefully studied all the most celebrated books on sexual science published in *England, France,* and *Germany,* down to the present day. The 300th edition of "*The Marriage Guide*" will especially be found full of new and interesting matter on the *causes of difference in sex,* artificial impregnation, etc., now for the first time made public.

The Tables of Contents appended to the advertisement of each book, will show the various matters treated upon, and give an idea of their interest and importance.

The books are all uniform in size, binding, and general appearance, and are all one price—ONE DOLLAR EACH. They form, in fact, a complete library of sexual information, full and complete, but *without a single word or statement to which the most fastidious could object.*

F. HOLLICK.

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No married person of either sex, should be without this book. It is utterly unlike any other ever published, and the matter it contains can be found nowhere else. It contains numerous *Engravings*, and *colored Plates*, designed especially for this work, and showing many of the new discoveries, as well as anatomical details and Pysiological processes.

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"We have just received a new work called '*The Marriage Guide*,' by DR. F. HOLLICK, the well-known Author of the Origin of Life, and we are constrained to admit that it is the most extraordinary book that ever came under our notice. Thoroughly scientific enough for deeply read scholars, or for practical experimenters, it is yet plain and popular enough for the most ordinary understanding. Nowhere else in the English language can there be found such a complete and practically useful compendium of Physiological information, strictly adapted for the use of married people, or of those intending to marry. All the new discoveries of *Pouchet, Bischoff*, and others, are fully given, as well as many others by the author himself, never before made known. The engravings are also excellent, as well as curious. In fact, taking it altogether, it is beyond all question *the* Book upon these matters, and will probably become as popular in future, and as universally referred to, as *Aristotle* has formerly been. One feature which peculiarly distinguishes this book from all others of the kind, is the peculiar tone of *morality* and *delicacy* which pervades it all through, and which makes it both proper and useful to be read by all persons of both sexes, who have attained the age of puberty. A very eminent clergyman authorizes us to say that he deems it a duty to introduce it privately among his flock, as the best means he knows of preventing and overcoming those hateful vices, unfortunately so destructive to soul and body, which are at the present time so fearfully prevalent."—*Review*.

"THE MALE GENERATIVE ORGANS."—This book, by DR. HOLLICK, the eminent popular Lecturer and successful practitioner, should be in the hands of every man who values his health, and the preservation or restoration of his powers. It is complete in every particular, and it is the only work in the English language where that fell destroyer of thousands, *urinary seminal loss*, is fully explained, and its cure and prevention pointed out. How many thousands yearly die, or become imbecile from this cause, who have never heard it mentioned.—*Medical Journal*.

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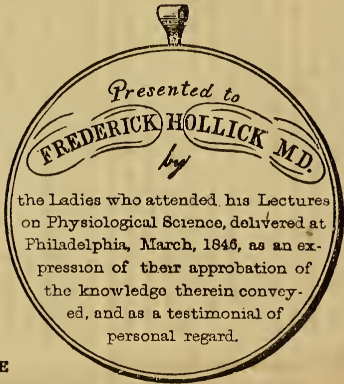

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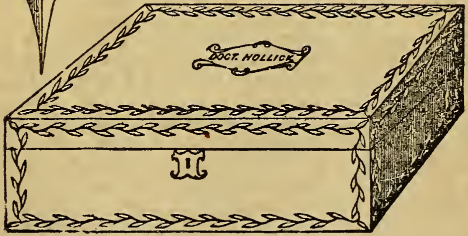
Dr. Hollick—Dear Sir: The members of your class, desiring the gratification of offering you some testimonial of their personal regard, and grateful appreciation of the benefits which you are conferring upon them and their sex generally, respectfully request your acceptance of the accompanying writing desk.

Were it necessary, we might repeat our assurances that your services to humanity will be, by us, long and gratefully remembered. The women of this generation have reason to rejoice that, by your efforts, a new and extensive field of information has been opened to them, whence they may derive treasures of knowledge, of immense importance to themselves and their posterity, hitherto concealed within professional enclosures.

Wishing you health and happiness, we beg leave to subscribe ourselves,

Truly your Friends,
Signed on behalf of the class by,
M. G.
O. W. B.

Phila. March 20, 1845.



NOTICES OF DR. HOLLICK'S LECTURES.

[COMMUNICATED.]

MESSRS. EDITORS.—The most scientific and useful lectures of the present day, which should claim the attention of every one, are now being delivered at Masonic Hall, by Dr. Hollick, on the subject of Paternal Physiology and Health. The writer of this heard his first course, delivered during the last week, and having been educated to the medical profession, is, perhaps, capable of judging of their usefulness. There is no doubt that the general feeling of the medical faculty, and of an enlightened community, towards itinerant lecturers, has been one of disapprobation and apprehension of quackery, but in the present instance there is certainly an exception.

Dr. Dunbar, (formerly Professor at the Washington College), who attended Dr. H.'s last lecture on Friday evening, was so pleased with the manner and matter of the lecture that he came out openly at the close of the lecture and stated, before the audience had dispersed, that he had come there at the request of a patient, prejudiced against the lecturer, but on hearing him he thought it his duty to say that the lecture was perfectly fair, scientific, calculated to do a vast amount of good, and that every man, young or old, should hear, and would be benefited thereby. His illustrations are complete and beautiful, and his explanations couched in such delicate language that the most fastidious can find no fault. Those of your numerous readers who may devote an hour to his remaining lectures will thank you for giving this publicity.—*Baltimore American*, *March* 2.

DR. HOLLICK'S LECTURES.—The distinction which Dr. Hollick has acquired as a most intelligent, judicious, and salutary lecturer on the interesting and important subjects of human physiology and health, renders any commendation from us quite unnecessary ; yet, in view of the fact that the course which he has lately delivered in this city, is, at the solicitation of many, to be repeated on this and the next two days at Masonic Hall, we would take occasion to assure all of their great value to every individual member of the human family. Many of the most prominent of the medical faculty in this city bear testimony to the excellence of these lectures, as calculated to be highly useful in imparting, in the most unexceptional manner, that knowledge of human physical structure and the laws of health, the want of which now occasions so much disaster and suffering.—*Baltimore Sun*, *March* 1.

Dr. Hollick and Physiology.—The second of a series of Lectures, by this gentleman, on human physiology, and the all important truths connected with our physical constitution, was attended by a full house, in National Hall, last evening. The time was well spent, and so appeared to think the audience. On the delivery of the first of these Lectures on Tuesday evening, the speaker in a comprehensive and well-digested exordium, placed himself and the subject right with the public. His manner, language and style, did the first; his sound logic, his argument, his candor and research, accomplished the second. Apart from the interesting and apposite details of the wonders of reproduction, the illustrations of the immutable wisdom of nature, which teem in the animal and vegetable worlds—which

> "Glows in each stem, and blossoms in each tree;
> Lives through all life, extends through all extent,
> Spreads undivided, operates unspent."

Apart from all this, Dr. Hollick's Lecture was excellent as a defence of truth, a vindication of the right of free and unshackled inquiry, and as a convincing refutation of that silly, but far too prevalent opinion that there are truths of which it is better to remain in a state of ignorance. Had nothing else been imparted in the forcible and well defined exordium of Dr. Hollick, than this judicious demolition of that fallacious, silly, but injurious twaddle which would forbid research to pass in advance of the old landmarks prescribed by custom, ignorance or a spurious morality—even that would well deserve the public patronage. Truths, well set forth, will make an impression, whether their investigation be fashionable or not. There is an affinity between the capacity to learn, and the truths to be learned, which always results, when a fitting opportunity is presented, in a free inquiry, and the gentleman who is bringing, in a judicious and elevated manner, a knowledge of those fundamental principles of our corporeal existence which are abused because unknown, will accomplish more good than half a dozen teachers of higher pretentions, and lower ability. It was gratifying to observe the decorum—the sense of respect for both speaker and subject, that was observed throughout the evening, which evidently shows that those who go there are actuated by higher motives than mere curiosity; by desires more ennobling than a passing gratification; in a word, it was clear that those who composed Dr. H's hearers, were men who know and dare to think, and who will profit by these most useful discourses.—*New York Herald*

"LETTERS FROM NEW YORK, NO. 11.

* * * * There have been several courses of Lectures on Anatomy, this winter, adapted to popular comprehension. I rejoice at this ; for it has long been a cherished wish with me that a general knowledge of the structure of our bodies, and the laws which govern it, should extend from the scientific few into the common education of the people. I know of nothing so well calculated to diminish vice and vulgarity as universal and rational information on these subjects. But the impure state of society has so preverted nature, and blinded common sense, that intelligent women, though eagerly studying the structure of the Earth, the attraction of the Planets, and the reproduction of Plants, seem ashamed to know anything of the structure of the human Body, and of those Physiological facts most intimately connected with their deepest and purest emotions, and the holiest experience of their lives. I am often tempted to say, as Sir C. Grandison did to the Prude—'Wottest thou not how much *in*-delicacy there is in thy delicacy?'

"The only Lectures I happened to attend were those of Dr. Hollick, which interested and edified me much. They were plain, familiar conversations, uttered and listened to with great modesty of language, and propriety of demeanor. The Manikin, or Artificial Anatomy, by which he illustrated his subject, is a most wonderful machine invented by a French Physician. It is made of *papier mache*, and represents the human body with admirable perfection, in the shape, coloring, and arrangement even to the minutest fibres. By the removal of wires it can be dissected completely, so as to show the locality and functions of the various Organs, the interior of the Heart, Lungs, &c.

"Until I examined this curious piece of mechanism, I had very faint and imperfect ideas of the miraculous machinery of the house we live in. I found it highly suggestive of many things to my mind." * * *

L. M. C.

[Extract from a Letter in the "Boston Courier" of Monday, June 2d by Mrs. L. M. Child.]