

BODY AND MIND :

AN INQUIRY INTO THEIR CONNECTION AND
MUTUAL INFLUENCE, SPECIALLY IN REFERENCE TO
MENTAL DISORDERS.

LECTURE I.

GENTLEMEN: The relations of mind and body in health and in disease I have chosen as the subject of these lectures, not with the hope of doing full justice to so complex and difficult an inquiry, but because it has for some time been my special work, and there was no other subject on which I should have felt myself equally justified in addressing you. No one can be more deeply sensible than I am how little exact our knowledge is of the bodily conditions of mental functions, and how much of that which we think we know is vague, uncertain, and fluctuating. But the time has come when the immediate business which lies before any one who would advance our knowledge of mind unquestionably is a close and searching scrutiny of the bodily conditions of its manifestations in health and disease. It is most necessary now to make use of the results of the study of mind in health to light and guide our researches into its morbid phenomena, and in like manner to bring the instructive instances presented by unsound mind to bear upon the interpretation of its healthy functions. The physiology and the pathology of mind are two branches of one science; and he

who studies the one must, if he would work wisely and well, study the other also. My aim will be to promote the reconciliation between them, and in doing so I shall embrace the occasion, whenever it offers itself, to indicate the principles which should guide our efforts for what must always be the highest object of medical science and art—the production and preservation of a sound mind in a sound body. Actually to accomplish much of this purpose will not lie in my power, but I may bring together fragmentary observations, point out the bearing of them on one another and on received opinions, thus unfold their meaning, and mark broadly the lines which future research must take.

Within the memory of men now living insanity was such a special study, and its treatment such a special art, that it stood quite aloof from general medicine in a mysterious and mischievous isolation; owing little or nothing to the results of progress in other branches of medicine, and contributing nothing to their progress. The reason of this it is not hard to discover. The habit of viewing mind as an intangible entity or incorporeal essence, which science inherited from theology, prevented men from subjecting its phenomena to the same method of investigation as other natural phenomena; its disorders were thought to be an incomprehensible affliction and, in accordance with the theological notion, due to the presence of an evil spirit in the sufferer, or to the enslavement of the soul by sin, or to any thing but their true cause—bodily disease. Consequently, the treatment of the insane was not in the hands of intelligent physicians, who aimed to apply the resources of medicine to the alleviation or cure of bodily illness, but was given up to coarse and ignorant jailers, whose savage cruelties will for all time to come be a great and ugly blot upon the enlightenment of the age which tolerated them.

Matters are happily changed now. On all hands it is admitted that the manifestations of mind take place through the nervous system; and that its derangements are the result

of nervous disease, amenable to the same method of investigation as other nervous diseases. Insanity has accordingly become a strictly medical study, and its treatment a branch of medical practice. Still, it is all too true that, notwithstanding we know much, and are day by day learning more, of the physiology of the nervous system, we are only on the threshold of the study of it as an instrument subserving mental function. We know little more positively than that it has such function; we know nothing whatever of the physics and of the chemistry of thought. The conception of mind as a mysterious entity, different essentially from, and vastly superior to, the body which it inhabits and uses as its earthly tenement, but from which its noblest aspirations are thought to be to get free, still works openly or in a latent way to obstruct the study of its functions by the methods of physical research. Without speculating at all concerning the nature of mind—which, let me distinctly declare at the outset, is a question which science cannot touch, and I do not dream of attempting to touch—I do not shrink from saying that we shall make no progress toward a mental science if we begin by depreciating the body: not by disdaining it, as metaphysicians, religious ascetics, and maniacs have done, but by laboring in an earnest and inquiring spirit to understand it, shall we make any step forward; and when we have fully comprehended its functions, when we know how to estimate fitly this highest, most complex, and wonderful achievement of organized skill, it will be quite time, if there be then the inclination, to look down upon it with contempt.

The truth is, that in inquiries concerning mind, as was once the case in speculations concerning other natural phenomena of forces, it has been the practice to begin where the inquiry should have ended. Just as the laws of physical actions were evoked out of the depths of human consciousness, and the relations of bodies to one another attributed to sympathies and antipathies, attractions and abhorrences, instead

of being acquired by patient observation and careful generalization, so has a fabric of mental philosophy been reared on the doubtful revelations of self-consciousness, in entire disregard of the more tedious and less attractive duty of observation of facts, and induction from them. Surely it is time we put seriously to ourselves the question whether the inductive method, which has proved its worth by its abundant fruitfulness wherever it has been faithfully applied, should not be as rigidly used in the investigation of mind as in the investigation of other natural phenomena. If so, we ought certainly to begin our inquiry with the observation of the simplest instances—with its physiological manifestations in animals, in children, in idiots, in savages, mounting by degrees to the highest and most recondite facts of consciousness, the interpretation or the misinterpretation of which constitutes what has hitherto claimed to be mental philosophy. The inductions which we get by observing the simple may be used with success to disentangle the phenomena of the complex; but the endeavor to apply the complex and obscure to the interpretation of the simple is sure to end in confusion and error. The higher mental faculties are formed by evolution from the more simple and elementary, just as the more special and complex structure proceeds from the more simple and general; and in the one case as in the other we must, if we would truly learn, follow the order of development. Not that it is within my present purpose to trace the plan of development of our mental faculties, but the facts and arguments which I shall bring forward will prove how vain and futile it is to strive to rear a sound fabric of mental science on any other foundation.

To begin the study of mind, then, with the observation of its humblest bodily manifestations is a strictly scientific method. When we come to inquire what these are, it is far from easy to fix the point at which mental function begins. Without doubt most of the actions of man, and many of those of the higher animals, do evince the operation of mind,

but whereabouts in the animal kingdom it first appears, and what part it has in the lower nerve-functions of man, are questions not easily answered. The more closely the matter is looked into, the more clearly it appears that we habitually embrace in our conception of mind different nervous functions, some of which proceed from different nerve-centres, and the more necessary it becomes to analyze these functions, to separate the more simple and elementary, and to discover in the concrete as much as possible of the meaning of the abstraction. Is the brain the exclusive organ of mind? If it be so, to what category of functions shall we refer the reflex acts of the spinal cord, which take place independently of the brain, and which often achieve as definite an end, and seem to display as intelligent an aim, as any conscious act of volition? It needs not to illustrate in detail the nature and extent of reflex action, which is familiar enough, but I may select a striking example in order to serve as a text for the reflections which I wish to bring forward. One simple fact, rightly understood and truly interpreted, will teach as much as a thousand facts of the same kind, but the thousand must have been previously observed in order to understand truly the one; for it is certainly true that, to apprehend the full meaning of common things, it is necessary to study a great many uncommon things. This, however, has been done in this instance by the distinguished physiologists whose labors have fixed on a tolerably firm basis the doctrine of reflex action; we may, therefore, take, as our starting-point, the accepted results of their labors.

It is well known that, if the hind-foot of a frog that has had its head cut off be pinched, it is withdrawn from the irritation. The stimulus to the afferent nerve reaches the gray matter of the spinal cord, and sets free a force which excites to action the corresponding motor nerves of the same side. When the foot is pinched more strongly, the force liberated by the stimulus passes across the cord to the motor nerves of the opposite side, and there is a simultaneous withdrawal

of both limbs; and, if the excitation be stronger still, there is a wider irradiation of the effects of the stimulus in the gray matter, and a movement of all four limbs follows, the frog jumping away. These movements of the decapitated frog, which it is plain effect the definite purpose of getting it out of the way of harm, we believe to be analogous to the violent coughing by which food that has gone the wrong way is expelled from the human larynx, or to the vomiting by which offending matter is ejected from the stomach. Independently of consciousness and of will, an organism plainly has the power—call it intelligent or call it what we will—of feeling and eschewing what is hurtful to it, as well as of feeling and ensuing what is beneficial to it.

But the experiment on the frog may be made more striking and instructive. Touch with acetic acid the thigh of a decapitated frog over the internal condyle, and the animal rubs it off with the dorsal surface of the foot of the same side; cut off the foot, and apply the acid to the same spot, and the animal tries to get at it again with its foot, but, of course, having lost it, cannot. After some fruitless efforts, therefore, it gives up trying in that way, seems restless, as though, says Pflüger, it was seeking some other way; and at last it makes use of the foot of the other leg, and succeeds in rubbing off the acid. Notably we have here not merely contractions of muscles, but combined and harmonized contractions in due sequence for a special purpose. There are actions that have all the appearance of being guided by intelligence and instigated by will in an animal the recognized organ of whose intelligence and will has been removed.

What are we to say in explanation of movements that have such a look of adaptation? Are they mental, or are they only physical? If they are mental, it is plain that we must much enlarge and modify our conception of mind, and of the seat of mind; if physical, it is plain that we must subtract from mind functions that are essential to its full function, and properties that are the very foundations of its development

in the higher centres. Some eminent physiologists now maintain, on the strength of these experiments, that the accepted doctrine of reflex action is quite untenable, and that the spinal cord is really endowed with sensation and volition; and certainly these adapted actions seem to give us all the signs of being felt and willed, except telling us that they are so. Before accepting, however, this explanation of the obscure by something more obscure still, it were well to realize distinctly how dangerous a practice it usually is to apply deductively to the interpretation of simple phenomena ideas pertaining to the more complex, and how essential a principle of the method of induction it is to follow the order of evolution, and to ascend from the interpretation of the simple to that of the complex. The explanation savors of the old and evil tendency which has done so much harm in philosophy, the tendency to explain the facts of Nature by what we feel to go on in our minds; because we know that most of our actions take place consciously and voluntarily, we can hardly help thinking that it must be the same in the frog. Might we not, however, as well suppose and hold that positive attracts negative and repels positive electricity consciously and voluntarily, or that in the double decomposition of chemical salts one acid chooses voluntarily the other base? It is most necessary to be on our guard against the danger of misapplying ideas derived from internal observation of the functions of mind-centres to the interpretation of the functions of lower nerve-centres, and so of misinterpreting them. Assuredly we have sad experience enough to warn us against involving the latter in the metaphysical haze which still hangs over the functions of the supreme centres.

All the conclusion which the facts warrant is that actions for a definite end, having indeed the semblance of predesigning consciousness and will, may be quite unconscious and automatic; that the movements of the decapitated frog, adapted as they are to secure its well-being, are no more evidence of intelligence and will than are the movements of coughing,

sneezing, and swallowing in man. In the constitution of the animal's spinal cord are implanted the faculties of such movements for self-preservation, which it has inherited as a part of its nature, and without which it could hardly live a day; accordingly it acts necessarily and blindly; though it has lost its foot, it endeavors vainly to act as if its foot was still there, and only when the irritation continues unaffected by its futile efforts makes, in answer to it, those further reflex movements which are the physiological sequences of the unsuccessful movements: it supplements one series of reflex actions by another.* But, although these purposive movements are not evidence of intelligence and volition in the spinal cord, it is another question whether they do not evince the same physiological properties and the operation of the same laws of evolution as govern the development of intelligence and will in the higher centres.

I have taken the experiment on the frog to exemplify the proposition that designed actions may be unconscious and automatic, because the phenomena are more simple in it than in man, and more easy therefore to be understood; but the proposition is equally true of his spinal cord. In its case, however, we have to bear in mind that faculties are not innate to the same degree and extent as in the lower animals, but have to be acquired by education—to be organized, in fact, after birth. It must be taught, just as the brain must, before it can perform its functions as an organ of animal life; and, being much more under the control of the more highly-developed brain, feeling and volition commonly mingle largely in its functions, and its independent action cannot be so plainly exhibited. But, when its motor centres have been taught, when they have gained by education the power of executing what are called secondary automatic acts, it is cer-

* Wisely or unwisely, as the case may be; for reflex movements which commonly effect a useful end may, under the changed circumstances of disease, do great mischief, becoming even the occasion of violent suffering and of a most painful death.

tain that it can and does habitually execute them independently of consciousness and of will. They become as purely automatic as are the primitive reflex acts of the frog. To the statement, then, that actions bearing the semblance of design may be unconscious and automatic we have now to add a second and most weighty proposition—namely, that acts consciously designed at first may, by repetition, become unconscious and automatic, the faculties of them being organized in the constitution of the nerve-centres, and they being then performed as reflex effects of an external stimulus. This law, by which the education of the spinal cord takes place, is, as we shall hereafter see, a most important law in the development of the higher nerve-centres.

Let us now go a step further. The automatic acts, whether primary or secondary, in the frog or in the man, which are excited by the suitable external stimulus, may also be excited by an act of will, by an impulse coming downward from the brain. When this happens, it should be clearly apprehended that the immediate agency of the movements is the same; it is in the motor centres of the spinal cord; the will does not and cannot act upon the nerve-fibres of each muscle individually, but simply gives the order which sets in motion the organized machinery of the movements in the proper motor centres. This is a consideration of the utmost importance, for it exhibits how great a part of our voluntary acts is really the automatic action of the spinal cord. The same movements are effected by the same agency in answer to different stimuli—in the one case to an external stimulus, in the other case to an impulse of will; and in both cases the mind is alike ignorant of the immediate agency by which they are done. But while the automatic acts take place independently of will, the will is absolutely dependent on the organized experience in the cord for the accomplishment of its acts; without this it would be impotent to do a voluntary act. When, therefore, we have taken out of a voluntary act the large part which is due to the automatic agency of the motor cen-

tres, it clearly appears that we have subtracted no small proportion from what we are in the habit of comprising vaguely under mind. We perceive, indeed, how indispensable an exact and faithful observation of the functions of the spinal cord is to a true physiological inquiry into mind, and what an important means of analysis a knowledge of them yields us. Carrying the knowledge so gained into our examination of the functions of the higher nerve-centres, we observe how much of them it will serve to interpret. The result is, that we find a great part of the habitual functions of the higher centres to be similarly automatic, and to admit of a similar physiological interpretation.

There can be no doubt that the ganglionic nuclei of the senses—the sensorial nuclei—are connected with motor nuclei; and that we have in such anatomical arrangement the agency of a number of reflex movements. Most of the instinctive acts of animals are of this kind, the faculties being innate in them. In man, however, who is actually the most helpless, though potentially the most powerful, of all living creatures when he comes into the world, the sensory and associated motor nuclei must be educated, just as the spinal centres must. To illustrate this sensori-motor or instinctive action, we may take the results of Flourens's well-known experiment of removing the cerebral hemispheres of a pigeon. What happens? The pigeon seemingly loses at once all intelligence and all power of spontaneous action. It appears as if it were asleep; yet, if thrown into the air, it will fly. If laid on its back, it struggles on to its legs again; the pupil of the eye contracts to light, and, if the light be very bright, the eyes are shut. It will dress its feathers if they are ruffled, and will sometimes follow with a movement of its head the movement of a candle before it; and, when a pistol is fired off, it will open its eyes, stretch its neck, raise its head, and then fall back into its former attitude. It is quite evident from this experiment that general sensibility and special sensations are possible after the removal of the hemispheres; but they

are not then transformed into ideas. The impressions of sense reach and affect the sensory centres, but they are not intellectually *perceived*; and the proper movements are excited, but these are reflex or automatic. There are no ideas, there is no true spontaneity; and the animal would die of hunger before a plateful of food, though it will swallow it when pushed far enough into its mouth to come within the range of the reflex acts of deglutition. Here again, then, we have a surprising variety of adapted actions of which the body is capable without the intervention of intelligence, emotion, and will—without, in fact, mind in its exact sense having any part in them. The pigeon is brought to the level of the invertebrata, which have no higher nerve-centres than sensory ganglia, no centres of intelligence and will, and which execute all their varied and active movements, all their wonderful displays of instinct, through sensory and associated motor nuclei. They seek what is good for them, avoid what is hurtful to them, provide for the propagation of their kind—perform, indeed, all the functions of a very active life without *knowing* that they are doing so, not otherwise than as our pupils contract to light, or as our eyes accommodate themselves to vision at different distances, without consciousness on our part. The highest specializations of this kind of nerve-function are displayed by the ant and the bee; their wonderful instinctive arts show to what a degree of special perfection sensori-motor action may be brought.*

* I do not say that the ant and the bee are entirely destitute of any power of adaptation to new experiences in their lives—that they are, in fact, purely organized machines, acting always with unvarying regularity; it would appear, indeed, from close observation, that these creatures do sometimes discover in their actions traces of a sensibility to strange experiences, and of corresponding adaptation of movements. We cannot, moreover, conceive how the remarkable instincts which they manifest can have been acquired originally, except by virtue of some such power. But the power in them now is evidently of a rudimentary kind, and must remain so while they have not those higher nerve-centres in which the sensations are combined into ideas, and perceptions of the relations of things are acquired. Granting, however, that the bee or ant has these traces of adaptive action,

Unlike the bee and the ant, man must slowly learn the use of his senses and their respondent movements. This he does by virtue of the fundamental property of nerve-centres, whereby they react in a definite way to suitable impressions, organically register their experience, and so acquire by education their special faculties. Thus it is that many of the daily actions of our life, which directly follow impressions on the senses, take place in answer to sensations that are not perceived—become, so to speak, *instinctive*; some of them being not a whit less automatic than the instinctive acts of the bee, or the acts of the pigeon deprived of its hemispheres. When we move about in a room with the objects in which we are quite familiar, we direct our steps so as to avoid them, without being conscious what they are, or what we are doing; we *see* them, as we easily discover if we try to move about in the same way with our eyes shut, but we do not *perceive* them, the mind being fully occupied with some train of thought. In like manner, when we go through a series of familiar acts, as in dressing or undressing ourselves, the operations are really automatic; once begun, we continue them in a mechanical order, while the mind is thinking of other things; and if we afterward reflect upon what we have done, in order to call to mind whether we did or did not omit something, as for instance to wind up our watch, we cannot satisfy ourselves except by trial, even though we had actually done what we were in doubt about. It is evident, indeed, that in a state of profound reverie or abstraction a person may, as a somnambulist sometimes does, see without know-

it must be allowed that they are truly rudiments of functions, which in the supreme nerve-centres we designate as reason and volition. Such a confession might be a trouble to a metaphysical physiologist, who would thereupon find it necessary to place a metaphysical entity behind the so-called instincts of the bee, but can be no trouble to the inductive physiologist; he simply recognizes an illustration of a physiological diffusion of properties, and of the physical conditions of primitive volition, and traces in the evolution of mind and its organs, as in the evolution of other functions and their organs, a progressive specialization and increasing complexity.

ing that he sees, hear without knowing that he hears, and go through a series of acts scarcely, if at all, conscious of them at the time, and not remembering them afterward. For the most distinct display of sensori-motor action in man, it is necessary that his cerebral hemispheres, which are so largely developed, and intervene much in the functions of the subordinate centres, should be deeply engaged in their own functions, or that these should be suspended. This appears to be the case in those brief attacks of epileptic unconsciousness known as the *petit mal*, in which a person will sometimes go on with the work he was engaged in at the time of the attack, utterly unaware of the momentary interruption of his consciousness.* There are many instances of this sort on record, which I cannot stop to relate now; they prove how large a part sensori-motor functions, which are the highest nerve-functions of so many animals, play in our daily actions. We ought clearly to apprehend the fact that, as with the spinal cord, so here, the movements which take place in answer to the stimulus from without may be excited by the stimulus of the will descending from the hemispheres, and that, when they are so excited, the immediate agency of them is the same. The movements that are outwardly manifest are, as it were, contained inwardly in the appropriate motor nuclei; these have been educated to perform them. Hence it is that, when the left corpus striatum is broken up by disease, the right cannot do its special work; if it could, a man might write with his left hand when his right hand was disabled by paralysis.

Thus much, then, concerning our sensori-motor acts. When we have yielded up to the spinal cord all the part in our actions that properly belongs to it, and to the sensory ganglia and their connected motor nuclei all the part that belongs to them, we have subtracted no inconsiderable part from the phenomena which we are in the habit of designating

* For examples, I may refer to my work on "The Physiology and Pathology of Mind," 2d edition.

mental and including under mind. But we still leave untouched the highest functions of the nervous system—those to which the hemispherical ganglia minister. These are the functions of intelligence, of emotion, and of will; they are the strictly mental functions. The question at once arises whether we have to do in these supreme centres with fundamentally different properties and different laws of evolution from those which belong to the lower nerve-centres. We have to do with different functions certainly; but are the organic processes which take place in them essentially different from, or are they identical with, those of the lower nerve-centres? They appear to be essentially the same: there is a reception of impressions, and there is a reaction to impressions, and there is an organic registration of the effects both of the impressions and of the reactions to them. The external stimuli do not, it is true, ascend directly to the supreme centres as they do to the spinal centres and the sensory centres; they are transmitted indirectly through the sensory ganglia; it is through the senses that we get our ideas. This is in accordance with the anatomical observation—which, however, is disputed—that no sensory fibres go directly through to the hemispheres, and no motor fibres start directly from them; both sensory and motor fibres stopping at the corpora striata and thalami optici, and new fibres connecting these with the hemispheres. But this does not alter the fundamental similarity of the organic processes in the higher centres. The impressions which are made there are the physiological conditions of *ideas*; the feeling of the ideas is *emotion*—for I hold emotion to mean the special sensibility of the vesicular neurine to ideas—the registration of them is *memory*; and the reaction to them is *volition*. *Attention* is the maintenance of the tension of an idea or a group of ideas—the keeping it before the mind; and *reflection* is the successive transference of energy from one to another of a series of ideas. We know not, and perhaps never shall know, what mind is; but we are nevertheless bound to investigate,

in a scientific spirit, the laws of its functions, and to trace the resemblances which undoubtedly exist between them and the functions of lower nerve-centres.

Take, for example, the so-called faculty of memory, of which metaphysicians have made so much as affording us the knowledge of personal identity. From the way in which they usually treat of it, one would suppose that memory was peculiar to mind, and far beyond the reach of physical explanation. But a little reflection will prove that it is nothing of the kind. The acquired functions of the spinal cord, and of the sensory ganglia, obviously imply the existence of memory, which is indispensable to their formation and exercise. How else could these centres be educated? The impressions made upon them, and the answering movements, both leave their traces behind them, which are capable of being revived on the occasions of similar impressions. A ganglionic centre, whether of mind, sensation, or movement, which was without memory, would be an idiotic centre, incapable of being taught its functions. In every nerve-cell there is memory, and not only so, but there is memory in every organic element of the body. The virus of small-pox or of syphilis makes its mark on the constitution for the rest of life. We may forget it, but it will not forget us, though, like the memory of an old man, it may fade and become faint with advancing age. The manner in which the scar of a cut in a child's finger is perpetuated, and grows as the body grows, evinces, as Mr. Paget has pointed out, that the organic element of the part remembers the change which it has suffered. Memory is the organic registration of the effects of impressions, the organization of experience, and to recollect is to revive this experience—to call the organized residua into functional activity.

The fact that memory is accompanied by consciousness in the supreme centres does not alter the fundamental nature of the organic processes that are the condition of it. The more sure and perfect, indeed, memory becomes, the more uncon-

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conscious it becomes; and, when an idea or mental state has been completely organized, it is revived without consciousness, and takes its part automatically in our mental operations, just as an habitual movement does in our bodily activity. We perceive in operation here the same law of organization of conscious acquisitions as unconscious power, which we observed in the functions of the lower nerve-centres. A child, while learning to speak or read, has to remember the meaning of each word, must tediously exercise its memory; but which of us finds it necessary to remember the meanings of the common words which we are daily using, as we must do those of a foreign language with which we are not very familiar? We do remember them, of course, but it is by an unconscious memory. In like manner, a pupil, learning to play the piano-forte, is obliged to call to mind each note: but the skilful player goes through no such process of conscious remembrance; his ideas, like his movements, are automatic, and both so rapid as to surpass the rapidity of succession of conscious ideas and movements. To my mind, there are incontrovertible reasons to conclude that the organic conditions of memory are the same in the supreme centres of thought as they are in the lower centres of sensation and of reflex action. Accordingly, in a brain that is not disorganized by injury or disease, the organic registrations are never actually forgotten, but endure while life lasts; no wave of oblivion can efface their characters. Consciousness, it is true, may be impotent to recall them; but a fever, a blow on the head, a poison in the blood, a dream, the agony of drowning, the hour of death, rending the veil between our present consciousness and these inscriptions, will sometimes call vividly back, in a momentary flash, and call back too with all the feelings of the original experience, much that seemed to have vanished from the mind forever. In the deepest and most secret recesses of mind, there is nothing hidden from the individual self, or from others, which may not be thus some time accidentally revealed; so that it might well be

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that, as De Quincey surmised, the opening of the book at the day of judgment shall be the unfolding of the everlasting scroll of memory.*

As it is with memory so is it with volition, which is a physiological function of the supreme centres, and which, like memory, becomes more unconscious and automatic the more completely it is organized by repeated practice. It is not man's function in life to think and feel only; his inner life he must express or utter in action of some kind—in word or deed. Receiving the impressions from Nature, of which he is a part, he reacts upon Nature intelligently, modifying it in a variety of ways; thus Nature passes through human nature to a higher evolution. As the spinal cord reacts to its impressions in excito-motor action, and as the sensory centres react to their impressions in sensori-motor action, so, after the complex interworking and combination of ideas in the hemispherical ganglia, there is, in like manner, a reaction or desire of determination of energy outward, in accordance with the fundamental property of organic structure to seek what is beneficial and shun what is hurtful to it. It is this property of tissue that gives the impulse which, when guided by intelligence, we call volition, and it is the abstraction from the particular volitions which metaphysicians personify as *the will*, and regard as their determining agent. Physiologically, we cannot choose but reject *the will*; volition we know, and will we know, but *the will*, apart from particular acts of volition or will, we cannot know. To interpose such a metaphysical entity between reflection and action thereupon would bring us logically to the necessity of interposing a similar entity between the stimulus to the spinal cord and its reaction. Thus, instead of unravelling the complex by help of the more simple, we should obscure the simple by

The usual blunder of the screen-Test. Will is nothing but an abstraction! nothing exists but the power centres! This is precisely, but nothing which proceeds!

* An apt illustration, most true to Nature, of the recurrence of early impressions in the delirium of dying, is afforded by Falstaff, who, as he expires in a London tavern after a life of debauchery, babbles of green fields.

Volition, supposes the will to be anything but the mind without; mind under a special form or in a special attitude.

speculations concerning the complex. As physiologists, we have to deal with volition as a function of the supreme centres, following reflection, varying in quantity and quality as its cause varies, strengthened by education and exercise, enfeebled by disuse, decaying with decay of structure, and always needing for its outward expression the educated agency of the subordinate motor centres. We have to deal with will, not as a single undecomposable faculty unaffected by bodily conditions, but as a result of organic changes in the supreme centres, affected as certainly and seriously by disorder of them as our motor faculties are by disorder of their centres. Loss of power of will is one of the earliest and most characteristic symptoms of mental derangement; and whatever may have been thought in times past, we know well now that the loss is not the work of some unclean spirit that has laid its hands upon the will, but the direct effect of physical disease.

But I must pass on now to other matters, without stopping to unfold at length the resemblances between the properties of the supreme centres and those of the lower nerve-centres. We see that the supreme centres are educated, as the other centres are, and the better they are educated the better do they perform their functions of thinking and willing. The development of mind is a gradual process of organization in them. Ideas, as they are successively acquired through the gateways of the senses, are blended and combined and grouped in a complexity that defies analysis, the organic combinations being the physiological conditions of our highest mental operations—reflection, reasoning, and judgment. Two leading ideas we ought to grasp and hold fast: first, that the complex and more recondite phenomena of mind are formed out of the more simple and elementary by progressive specialization and integration; and, secondly, that the laws by means of which this formation takes place are not laws of association merely, but laws of organic combination and evolution. The growth of mental power means an actual addition.

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tion of structure to the intimate constitution of the centres of mind—a *mental organization* in them; and mental derangement means disorder of them, primary or secondary, functional or organic.

Although I have declared the hemispherical ganglia to be preëminently the mind-centres, and although it is in disorder of their functions—in disordered intelligence, in disordered emotion, and in disordered will—that insanity essentially consists, it is nevertheless impossible to limit the study of our mental operations to the study of them. They receive impressions from every part of the body, and, there is reason to believe, exert an influence on every element of it: there is not an organic motion, sensible or insensible, which does not, consciously or unconsciously, affect them, and which they in turn do not consciously or unconsciously affect. So intimate and essential is the sympathy between all the organic functions, of which mind is the crown and consummation, that we may justly say of it, that it sums up and comprehends the bodily life—that every thing which is displayed outwardly is contained secretly in the innermost. We cannot truly understand mind-functions without embracing in our inquiry all the bodily functions and, I might perhaps without exaggeration say, all the bodily features.

I have already shown this in respect of motor functions, by exhibiting how entirely dependent for its expression will is upon the organized mechanism of the motor centres—how, in effecting voluntary movements, it presupposes the appropriate education of the motor centres. Few persons, perhaps, consider what a wonderful art speech is, or even remember that it is an art which we acquire. But it actually costs us a great deal of pains to learn to speak; all the language which an infant has is a cry; and it is only because we begin to learn to talk when we are very young, and are constantly practising, that we forget how specially we have had to educate our motor centres of speech. Here, however, we come to another pregnant consideration: the acquired faculty of the

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educated motor centre is not only a necessary agency in the performance of a voluntary act, but I maintain that it positively enters as a mental element into the composition of the definite volition; that, in fact, the specific motor faculty not only acts downward upon the motor nerves, thus executing the movement, but also acts upward upon the mind-centres, thereby giving to consciousness the conception of the suitable movement—the appropriate motor intuition. It is certain that, in order to execute consciously a voluntary act, we must have in the mind a conception of the aim or purpose of the act. The will cannot act upon the separate muscles, it can only determine the result desired; and thereupon the combined contraction, in due force and rapidity, of the separate muscles takes place in a way that we have no consciousness of, and accomplishes the act. The infant directly it is born can suck, certainly not consciously or voluntarily; on the first occasion, at any rate, it can have no notion of the purpose of its movements; but the effect of the action is to excite in the mind the special motor intuition, and to lay the foundation of the special volition of it. We cannot do an act voluntarily unless we know what we are going to do, and we cannot *know exactly* what we are going to do until we have taught ourselves to do it. This exact knowledge of the aim of the act, which we get by experience, the motor intuition gives us.

The essential intervention of the motor intuition, which is, as it were, the abstract of the movement, in our mental life, is best illustrated by the movements of speech, but is by no means peculiar to them. Each word represents a certain association and succession of muscular acts, and is itself nothing more than a conventional sign or symbol to mark the particular muscular expression of a particular idea. The word has not independent vitality; it differs in different languages; and those who are deprived of the power of articulate speech must make use of other muscular acts to express their ideas, speaking, as it were, in a dumb discourse. There is no reason on earth, indeed, why a person might not learn to express

every thought which he can utter in speech by movements of his fingers, limbs, and body—by the silent language of gesture. The movements of articulation have not, then, a special *kind* of connection with the mind, though their connection is a specially intimate one; they are simply the most convenient for the expression of our mental states, because they are so numerous, various, delicate, and complex, and because, in conjunction with the muscles of the larynx and the respiratory muscles, they modify sound, and thus make audible language. Having, on this account, been always used as the special instruments of utterance, their connection with thought is most intimate; the Greeks, in fact, used the word λόγος to mean both reason and speech. But this does not make the relations of the movements of speech to mind different fundamentally from the relations of other voluntary movements to mind; and we should be quite as much warranted in assigning to the mind a special faculty of writing, of walking, or of gesticulating, as in speaking of a special faculty of speech in it.

What is true of the relations of articulate movements to mental states is true of the relations of other movements to mental states: they not only express the thought, but, when otherwise put in action, they can excite the appropriate thought. Speak the word, and the idea of which it is the expression is aroused, though it was not in the mind previously; or put other muscles than those of speech into an attitude which is the normal expression of a certain mental state, and the latter is excited. Most if not all men, when thinking, repeat internally, whisper to themselves, as it were, what they are thinking about; and persons of dull and feeble intelligence cannot comprehend what they read, or what is sometimes said to them, without calling the actual movement to their aid, and repeating the words in a whisper or aloud. As speech has become the almost exclusive mode of expressing our thoughts, there not being many gestures of the body which are the habitual expressions of simple ideas, we cannot present striking examples of the powers of other movements

x The converse of the proposition before expressed is the fact, viz. \pm their connec. w. thought being most intimate they have always been used as spec. instruments of utterance.—

to call up the appropriate ideas; yet the delicate muscular adaptations which effect the accommodation of the eye to vision at different distances seem really to give to the mind its ideas of distance and magnitude. No one actually sees distance and magnitude; he sees only certain signs from which he has learned to judge intuitively of them—the muscular adaptations, though he is unconscious of them, imparting the suitable intuitions.

The case is stronger, however, in regard to our emotions. Visible muscular expression is to passion what language or audible muscular expression is to thought. Bacon rightly, therefore, pointed out the advantage of a study of the forms of expression. "For," he says, "the lineaments of the body do disclose the disposition and inclination of the mind in general; but the motions of the countenance and parts do not only so, but do further disclose the present humor and state of the mind or will." The muscles of the countenance are the chief exponents of human feeling, much of the variety of which is due to the action of the orbicular muscles with the system of elevating and depressing muscles. Animals cannot laugh, because, besides being incapable of ludicrous ideas, they do not possess in sufficient development the orbicular muscle of the lips and the straight muscles which act upon them. It is because of the superadded muscles and of their combined actions—not combined contraction merely, but consentaneous action, the relaxation of some accompanying the contraction of others—that the human countenance is capable of expressing a variety of more complex emotions than animals can. Those who would degrade the body, in order, as they imagine, to exalt the mind, should consider more deeply than they do the importance of our muscular expressions of feeling. The manifold shades and kinds of expression which the lips present—their gibes, gambols, and flashes of merriment; the quick language of a quivering nostril; the varied waves and ripples of beautiful emotion which play on the human countenance, with the spasms of

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passion that disfigure it—all which we take such pains to embody in art—are simply effects of muscular action, and might be produced by electricity or any other stimulus, if we could only apply it in suitable force to the proper muscles. When the eye is turned upward in rapt devotion, in the ecstasy of supplication, it is for the same reason as it is rolled upward in fainting, in sleep, in the agony of death: it is an involuntary act of the oblique muscles, when the straight muscles cease to act upon it. We perceive, then, in the study of muscular action, the reason why man looks up to heaven in prayer, and why he has placed there the power "whence cometh his help." A simple property of the body, as Sir C. Bell observes—the fact that the eye in supplication takes what is its natural position when not acted upon by the will—has influenced our conceptions of heaven, our religious observances, and the habitual expression of our highest feelings.

Whether each passion which is special in kind has its special bodily expression, and what is the expression of each, it would take me too long to examine now. Suffice it to say that the special muscular action is not merely the exponent of the passion, but truly an essential part of it. Fix the countenance in the pattern of a particular emotion—in a look of anger, of wonder, or of scorn—and the emotion whose appearance is thus imitated will not fail to be aroused. And if we try, while the features are fixed in the expression of one passion, to call up in the mind a quite different one, we shall find it impossible to do so. This agrees with the experiments of Mr. Braid on persons whom he had put into a state of hypnotism; for, when the features or the limbs were made by him to assume the expression of a particular emotion, thereupon the emotion was actually felt by the patient, who began to act as if he was under its influence. We perceive then that the muscles are not alone the machinery by which the mind acts upon the world, but that their actions are essential elements in our mental operations. The superiority of the human over the animal mind seems to be

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essentially connected with the greater variety of muscular action of which man is capable: were he deprived of the infinitely-varied movements of hands, tongue, larynx, lips, and face, in which he is so far ahead of the animals, it is probable that he would be no better than an idiot, notwithstanding he might have a normal development of brain.*

If these reflections are well grounded, it is obvious that disorder of the motor centres may have, as I believe it has, no little effect upon the phenomena of mental derangement. In some cases of insanity there are genuine muscular hallucinations, just as there are in dreams sometimes, when the muscles are in a constrained attitude; and, where the morbid effects are not so marked, there is good reason to suppose that a searching inquiry along this almost untrodden path will disclose the mode of generation of many delusions that seem now inexplicable.

But we cannot limit a complete study of mind even by a full knowledge of the functions of the nervous and muscular systems. The organic system has most certainly an essential part in the constitution and the functions of mind. In the great mental revolution caused by the development of the sexual system at puberty we have the most striking example of the intimate and essential sympathy between the brain as a mental organ and other organs of the body. The change of character at this period is not by any means limited to the appearance of the sexual feelings and their sympathetic ideas, but, when traced to its ultimate reach, will be found to extend to the highest feelings of mankind, social, moral, and even religious. In its lowest sphere, as a mere animal instinct, it is clear that the sexual appetite forces the most selfish person out of the little circle of self-feeling into a wider feeling of family sympathy and a rudimentary moral feeling. The consequence is that, when an individual is sexu-

* There may be no little truth, therefore, though not the entire truth, in the saying of Anaxagoras, that man is the wisest of animals by reason of his having hands.

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ally mutilated at an early age, he is emasculated morally as well as physically. Eunuchs are said to be the most depraved creatures morally: they are cowardly, envious liars, utterly deceitful, and destitute of real social feeling. And there is certainly a characteristic variety of insanity caused by self-abuse, which makes the patient very like a eunuch in character.

It has been affirmed by some philosophers that there is no essential difference between the mind of a woman and that of a man; and that if a girl were subjected to the same education as a boy, she would resemble him in tastes, feelings, pursuits, and powers. To my mind it would not be one whit more absurd to affirm that the antlers of the stag, the human beard, and the cock's comb, are effects of education; or that, by putting a girl to the same education as a boy, the female generative organs might be transformed into male organs. The physical and mental differences between the sexes intimate themselves very early in life, and declare themselves most distinctly at puberty: they are connected with the influence of the organs of generation. The forms and habits of mutilated men approach those of women; and women, whose ovaries and uterus remain from some cause in a state of complete inaction, approach the forms and habits of men. It is said, too, that in hermaphrodites the mental character, like the physical, participates equally in that of both sexes. While woman preserves her sex, she will necessarily be feebler than man, and, having her special bodily and mental characters, will have to a certain extent her own sphere of activity; where she has become thoroughly masculine in nature, or hermaphrodite in mind—when, in fact, she has pretty well divested herself of her sex—then she may take his ground, and do his work; but she will have lost her feminine attractions, and probably also her chief feminine functions.

Allowing that the generative organs have their specific effect upon the mind, the question occurs whether each of

the internal organs has not also a special effect, giving rise to particular feelings with their sympathetic ideas. They are notably united in the closest sympathy, so that, although insensible to touch, they have a sensibility of their own, by virtue of which they agree in a consent of functions, and respond more or less to one another's sufferings; and there can be no question that the brain, as the leading member of this physiological union, is sensible of, and affected by, the conditions of its fellow-members. We have not the same opportunity of observing the specific effects of other organs that we have in the case of the generative organs; for while those come into functional action directly after birth, these come into action abruptly at a certain period, and thus exhibit their specific effects in a decided manner. It may well be, however, that the general uniformity among men in their passions and emotions is due to the specific sympathies of organs, just as the uniformity of their ideas of external Nature is due to the uniform operation of the organs of sense.^x

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It is probable that an exact observation of the mental effects of morbid states of the different organs would help the inquiry into the feelings and desires of the mind which owe their origin to particular organs. What are the psychological features of disease of the heart, disease of the lungs, disease of the liver? They are unquestionably different in each case. The inquiry, which has never yet been seriously attempted, is, without doubt, a difficult one, but I believe that the phenomena of dreams might, if carefully observed, afford some help. The ground-tone of feeling in a dream, the background on which the phantoms move, is often determined by the state of an internal organ, the irritation of which awakens into some degree of activity that part of the brain with which the organ is in specific sympathy; accordingly sympathetic ideas spring out of the feeling and unite in a more or less coherent dream-drama. How plainly this happens in the case of the generative organs it is unnecessary to point out: exciting their specific dreams, they teach a lesson concerning

physiological sympathies which, applied to the observation of the effects of other organs, may be largely useful in the interpretation, not of dreams only, but of the phenomena of insanity. Dreams furnish a particularly fruitful field for the study of the specific effects of organs on mind, because these effects are more distinctly felt and more distinctly declared when the impressions from the external senses are shut out by sleep. As the stars are not visible, although they still shine, in the daytime, so the effects of an internal organ may not be perceptible during the waking state while consciousness is actively engaged. But just as, when the sun goes down, the stars shine visibly, which before were invisible, veiled by his greater light, so when active consciousness is suspended, organic sympathies, which before were insensible, declare themselves in the mind. Perhaps it is in the excitation of its sympathetic feeling and ideas by a disordered organ during sleep that we may discover the explanation of a fact which seems to be undoubted, and to be more than accidental—namely, that a person has sometimes dreamed prophetically that he would have a particular internal disease, before he consciously felt a symptom of it, and has been afterward surprised to find his dream come true.

It is natural to suppose that the passion which a particular organ produces in the mind will be that which, when otherwise excited, discharges itself specially upon that organ. Notably this is the case with the sexual organs and the passion to which they minister. When we consider the effects which a joyful anticipation, or the elation of a present excitement, has upon the lungs—the accelerated breathing and the general bodily exhilaration which it occasions—we cannot help thinking of the strange hopefulness and the sanguine expectations of the consumptive patient, who, on the edge of the grave, projects, without a shadow of distrust, what he will do long after he will have been “green in death and festering in his shroud.” Observe how fear strikes the heart, and what anxious fear and apprehension accompany some

affections of the heart. Anger, disappointment, and envy, notably touch the liver; which, in its turn, when deranged, engenders a gloomy tone of mind through which all things have a malignant look, and from which, when philosophy avails not to free us, the restoration of its functions will yield instant relief. The internal organs are plainly not the agents of their special functions only, but, by reason of the intimate consent or sympathy of functions, they are essential constituents of our mental life.

The time yet at my disposal will not allow me to do more than mention the effects of mental states on the intimate processes of nutrition and secretion. Emotion may undoubtedly favor, hinder, or pervert nutrition, and increase, lessen, or alter a secretion; in doing which there is reason to think that it acts, not only by dilating or contracting the vessels through the vaso-motor system, as we witness in the blush of shame and the pallor of fear, but also directly on the organic elements of the part through the nerves, which, as the latest researches seem to show, end in them sometimes by continuity of substance. If they do so end, it is difficult to conceive how a strong emotion vibrating to the ultimate fibrils of a nerve can fail to affect for a moment or longer the functions of the organic elements. Be this so or not, however, the familiar observations—first, that a lively hope or joy exerts an enlivening effect upon the bodily life, quiet and equable when moderate, but, when stronger, evinced in the brilliancy of the eye, in the quickened pulse and respiration, in an inclination to laugh and sing; and, secondly, that grief or other depressing passion has an opposite effect, relaxing the arteries, enfeebling the heart, making the eye dull, impeding digestion, and producing an inclination to sigh and weep—these familiar observations of opposite effects indicate the large part which mental states may play, not in the causation of all sorts of disease alone, but in aiding recovery from them. A sudden and great mental shock may, like a great physical shock, and perhaps in the same way, par-

alyze for a time all the bodily and mental functions, or cause instant death. It may, again, produce epilepsy, apoplexy, or insanity; while a prolonged state of depression and anxiety is sometimes an important agent in the causation of chronic disease, such as diabetes and heart-disease. Can it be doubted, too, that the strong belief that a bodily disorder will be cured by some appliance, itself innocent of good or harm, may so affect beneficially the nutrition of the part as actually to effect a cure? To me it seems not unreasonable to suppose that the mind may stamp its tone, if not its very features, on the individual elements of the body, inspiring them with hope and energy, or infecting them with despair and feebleness. A separated portion of the body, so little that our naked eye can make nothing of it, the spermatozoon of the male and the ovum of the female, does at any rate contain, in a latent state, the essential characters of the mind and body of the individual from whom it has proceeded; and, as we are utterly ignorant how this mysterious effect is accomplished, we are certainly not in a position to deny that what is true of the spermatozoon and ovum may be true of other organic elements. And, if this be so, then those who profess to discover the character of the individual in the character of the nose, the hand the features, or other part of the body, may have a foundation of truth for speculations which are yet only vague, fanciful, and valueless.

Perhaps we do not, as physicians, consider sufficiently the influence of mental states in the production of disease, and their importance as symptoms, or take all the advantage which we might take of them in our efforts to cure it. Quackery seems to have here got hold of a truth which legitimate medicine fails to appreciate and use adequately. Assuredly the most successful physician is he who, inspiring the greatest confidence in his remedies, strengthens and exalts the imagination of his patient: if he orders a few drops of pepper-mint-water with the confident air of curing the disease, will

he not really do more sometimes for the patient than one who treats him in the most approved scientific way, but without inspiring a conviction of recovery? Ceremonies, charms, gesticulations, amulets, and the like, have in all ages and among all nations been greatly esteemed and largely used in the treatment of disease; and it may be speciously presumed that they have derived their power, not from any contract with the supernatural, but, as Bacon observes, by strengthening and exalting the imagination of him who used them. Entirely ignorant as we are, and probably ever shall be, of the nature of mind, groping feebly for the laws of its operation, we certainly cannot venture to set bounds to its power over those intimate and insensible molecular movements which are the basis of all our visible bodily functions, any more than we can justly venture to set bounds to its action in the vast and ever-progressing evolution of Nature, of which all our thoughts and works are but a part. This much we do know: that as, on the one hand, in the macrocosm of Nature, it is certain that the true idea once evolved is imperishable—that it passes from individual to individual, from nation to nation, from generation to generation, becoming the eternal and exalting possession of man—so, on the other hand, in the microcosm of the body, which some ignorantly despise, there are many more things in the reciprocal action of mind and organic element than are yet dreamed of in our philosophy.