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BODY AND MIND.

A Lecture

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SUNDAY LECTURE SOCIETY,

ON

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BY

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BODY AND MIND.

THE subject of this Lecture is one in regard to which a great change has recently taken place in the public mind. Some time ago it was the custom to look with suspicion upon all questions of a metaphysical nature as being questions that could not be discussed with any good result, and which, leading inquirers round and round in the same circle, never came to an end. But quite of late years there is an indication that a large number of people are waking up to the fact that Science has something to say upon these subjects; and the English people have always been very ready to hear what Science can say—understanding by Science what we shall now understand by it, that is, organised common sense.

When I say Science, I do not mean what some people are pleased to call Philosophy. The word "philosopher," which meant originally "lover of wisdom," has come in some strange way to mean a man who thinks it his business to explain everything in a certain number of large books. It will be found, I think, that in proportion to his colossal ignorance is the perfection and symmetry of the system which he sets up; because it is so much easier to put an empty room tidy than a full one. A man of science, on the other hand, explains as much as ever he can, and then he says, "This is all I can do; for the rest, you must ask the next man." And with regard to such explanations as he has given, whether the next man comes at all, whether there is any next man or any further explanation or no (and we may have to wait hundreds or even thousands of years before another step is made), yet if the original step was a scientific step, was made by true scientific methods, and was an organization of the normal experience of healthy men, that step will remain good for ever, no matter how much is left unexplained by it.

Now the supposition that this subject in itself is necessarily one which cannot be discussed to good purpose, that is to say, in such a way as to lead to definite results, is a

mistake. The fact that the subject has been discussed for many hundreds of years to no good purpose, and without leading to definite results, by great numbers of people, is due to the method which was employed, and not to the subject itself; and, in fact, if we like to look in the same way upon other subjects as we have been accustomed to look upon metaphysics—if we regard every man who has written about mathematics or mechanics as having just the same right to speak and to be heard that we give to every man who has written about metaphysics—then I think we shall find that exactly the same thing can be said about the most certain regions of human science.

Those who like to read the last number of the *Edinburgh Review*, for example, will find, from an article on "Comets," that it is at present quite an open question whether bodies which are shot out from the sun by eruptive force may not come to circle about the sun in orbits which are like those of the planets. Now that is not an open question; the supposition is an utterly absurd one, and has been utterly absurd from the time of Kepler. Again, those who are curious enough to read a number of pamphlets that are to be found here and there, may think it is an open question whether the ratio of the circumference of a circle to its diameter may not be expressed by certain finite numbers. It is not an open question to Science; it is only open to those people who do not know any Trigonometry, and who will not learn it. In exactly the same way there are numbers of questions relating to the connection of the mind with the body which have ceased to be open questions, because Science has had her word to say about them; and they are only open now to people who do not know what that word of Science is, and who will not try to learn it.

The whole field of human knowledge may be divided roughly, for the sake of convenience, into three great regions. There are first of all what we call *par excellence* the Physical Sciences—those which deal with inanimate matter. Next, there are those sciences which deal with organic bodies—the bodies of living things, whether plants or animals, and the rules according to which those things move. And lastly, there are those sciences which make a further supposition—which suppose that besides this physical world, including both organic

and inorganic bodies, there are also certain other facts, namely, that other men besides me, and most likely other animals besides men, are *conscious*. The sciences which make that supposition are the sciences of Ethics and Politics, which are still in the practical stage, and especially the more advanced science which is now to be considered—Psychology, the Science of Mind itself; that is to say, the science of the laws which regulate the succession of feelings in any one consciousness. Each of these three great divisions began in the form of a number of perfectly disconnected subjects, between which nobody knew of any relation; but in the history of science each of them has been woven together, in consequence of connections being found between the different subjects included in it, into a complete whole; and the further progress of the history of science requires that each of these great threads, into which all the little threads have been twined, should themselves be twined together into a single string.

Now with regard to the first two groups, the group of mechanical sciences as we may call them, or the physics of inorganic bodies, and the group of biological sciences, or the physics of organic bodies—the gulf between these two has in these last days been firmly bridged over. A description of that bridge, and an account of the doctrines which form it, will be found in Professor Huxley's admirable lecture delivered at Belfast before the British Association, which is printed in the November number of the *Fortnightly Review*. That bridge, as we have it now, is, in the conception of it, mainly due to Descartes; but parts of it have been worked out since his time by a vast number of physiologists, with the expenditure of an enormous amount of labour and thought. Such facts as that discovered by Harvey, that the movement of the blood was a mere question of Hydrodynamics, and was to be explained upon the same principles as the motion of water in pipes—facts like these have been piled up, one upon another, and have gradually led to the conclusion that the science of organic bodies is only a complication of the science of inorganic bodies.

It would not be advisable here to describe in detail the stones which compose this bridge; but we have to ask whether it is possible to construct some similar bridge between the now united Science of Physics, which deals

with all phenomena, whether organic or inorganic, in fact with all the material world, and the other science, the Science of Consciousness, which deals with the Laws of Mind and with the subject of Ethics. This is the question which we have now to discuss.

In order to make this bridge a firm one, so that it will not break down like those which philosophers have made, it is necessary to observe with great care what is the exact difference between the two classes of facts. If we confuse the two things together to begin with, if we do not recognise the great difference between them, we shall not be likely to find any explanation which will reduce them to some common term. The first thing, therefore, that we have to do is to realise as clearly as possible how profound the gulf is between the facts which we call Physical facts and the facts which we call Mental facts. The difference is one which has been observed from primeval times, when man or his prehuman ancestor found it not good to be alone; for the very earliest precept that we find set forth in all societies to regulate the lives of those who belong to them, is, "Put yourself in his place;" that is to say, ascribe to other men a consciousness which is like your own. And this belief, which the lowest savage got, that there was something else than the physical organization in other men, is the foundation of Natural Ethics as well as of the modern Science of Consciousness. But in very early times an hypothesis was formed which was supposed to make this belief easier. If you eat too much you will dream when you are asleep; if you eat too little you will dream when you are awake, or have visions; and those dreams of savages whose food was very precarious led them to a biological hypothesis. They saw in those dreams their fellows, other men, when it appeared from evidence furnished to them afterwards that those other men were not there when they were dreaming. Consequently, they supposed that the actions of the organic body were caused by some other body which was not physical in the ordinary sense, which was not made of ordinary matter, and this other body was called the Soul. Animism, as Mr. Tylor calls this belief, was at first, then, an hypothesis in the domain of biology. It was a physical hypothesis to account for the peculiar way in which living things went about.

But then when people had got this belief in another body which was not a physical body, after a long series of years they reasoned in this way. It is very difficult indeed to suppose that the ordinary matter which makes a man's body can be conscious. This Me is quite different from the flesh and blood which make up a man; but then as to this other body, or soul, we do not know anything about it, so that it may as well be conscious as not. That hypothesis put upon the soul, whose basis was in the phenomena of dreams, the explanation of the consciousness which we cannot help believing to exist in other men. I have mentioned this early hypothesis on the subject, because out of it grew the almost universal custom of holding at this time of the year the Festival of the Dead which we preserve in our All Souls' Day.

But now let us see what it is that Science can tell us, and what we can believe in place of that early hypothesis of our savage ancestors. In the first place, let us consider a little more narrowly what we mean by the body, and more especially what we mean by the nervous system; for it is the great discovery of Descartes that the nervous system is that part of the body which is related directly to the mind. This can hardly be better expressed than it is by the first of that series of propositions which Professor Huxley has stated in his lecture.

I. "*The brain is the organ of sensation, thought, and emotion; that is to say, some change in the condition of the matter of this organ is the invariable antecedent of the state of consciousness to which each of these terms is applied.*" We may complete this statement by saying not only that some change in the matter of this organ is the invariable antecedent, but that some other change is the invariable concomitant of sensation, thought, and emotion; and that is rather an important remark, as you will see presently.

Let us now look at the general structure of the brain and see what it is like. We can easily make a rough picture of it, which will serve our present purpose (see p. 12). A parachute is a round piece of paper, like the top of a parasol, with strings going from its circumference to a cork. Let us imagine a parachute with two corks, a red and a blue one; each of these corks being attached by

strings, not only to the circumference of our piece of paper, but to innumerable points in the inside of it. Moreover, let innumerable other strings go across from point to point of the paper, like a spider's web spun in the inside of a parasol. And the corks themselves must be tied to each other and to a third cork, say the white one, while from all three streamers fly away in all directions.

This is our diagram. Now the sheet of paper represents the *cerebral hemispheres*, a great sheet of grey nervous matter which forms the outside of your brain, and lies just under your skull. Our red and blue corks are two other masses of grey matter lying at the base of the brain, and called the *optic thalami* and the *corpora striata* respectively. The white cork is another mass of grey matter called the *medulla oblongata*, which is the top of the spinal cord. Our strings which tie part of the parachute together, and our streamers which go out in all directions from the corks represent the nerves, white threads that run all over the body. And they are of two kinds; there are some which go to the brain from any part of the body, and others which come from the brain to it. As regards the position of the nerves this is the same thing for both of them, but it is not the same thing with regard to what they do. The nerves which are called Sensory nerves, and which go to the brain, are those which are excited whenever any part of the body is touched. When your finger is touched a certain excitement is given to the nerves which end in your finger, and that excitement is carried along your arm and away up to the medulla, represented by our white cork. But when you are going to move your arm the excitement starts from the brain, and goes along the other set of nerves which are called Motor nerves, or moving nerves, and goes to the muscles which work the part of the arm which you want to move. And that excitement of the nerves by purely mechanical means makes those muscles contract so as to move the part which you want to move. We have then a connection between the brain and any part of the body which is of a double kind: there is the means of sending a message to the brain from this part of the body, and the means of taking a message from the brain to this part. The nerves which carry the message to the brain are called

the "Sensory nerves" because they accompany what we call sensation; the nerves which carry the message from the brain are called "Motor nerves" because they are the agents in the motion of that part of the body.

All this is expressed in Professor Huxley's second and third propositions.

II. "*The movements of animals are due to the change of form of the muscles, which shorten and become thicker; and this change of form in a muscle arises from a motion of the substance contained within the nerves which go to the muscle.*"

III. "*The sensations of animals are due to a motion of the substance of the nerves which connect the sensory organs with the brain.*"

I pass on to his fourth proposition:—

IV. "*The motion of the matter of a sensory nerve may be transmitted through the brain to motor nerves, and thereby give rise to a contraction of the muscles to which these motor nerves are distributed; and this reflection of motion from a sensory into a motor nerve may take place without volition, or even contrary to it.*"

Let us take that organ of sense which always occurs to us as a type of the others, because it is the most perfect—the eye. The optic nerve which runs from the eye towards the brain may be represented by one of our streamers going to the red cork, to which it is fastened by a knot that is called the "Optic ganglion." Supposing that you move your hand rapidly towards anybody's eye, a message with news of this movement goes along the nerve to the optic ganglion, and it comes away back again by another streamer, not direct from the ganglion, but from a point on the blue cork very near it, to the muscles which move the eyelid, and that makes the eye wink. You know that the winking of the eye, when anybody moves his hand very rapidly towards it, is not a thing which you determine to do, and which you consider about; it is a thing which happens without your interference with it; and in fact it is not you who wink your eye, but your body that does it. This is called Automatic or involuntary motion, or again it is called Reflex action, because it is a purely mechanical thing. A wave runs along that nerve, and comes back on another nerve, and that without any deliberation; and at the point where it

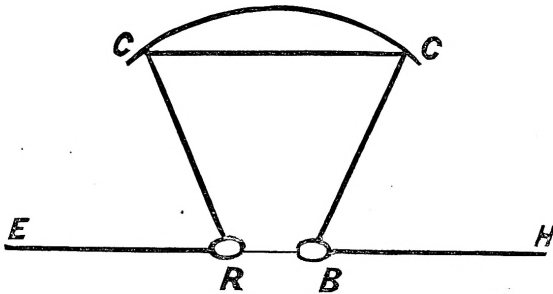
stops and comes back it is just a reflection like the wave which you send along a string and which comes back from the end of the string, or like a wave of water which is sent up against a sea-wall, and which reflects itself back along the sea.

V. "*The motion of any given portion of the matter of the brain excited by the motion of a sensory nerve, leaves behind it a readiness to be moved in the same way in that part, and anything which resuscitates the motion gives rise to the appropriate feeling. This is the physical mechanism of memory.*" We can, perhaps, make this a little more clear in the following manner:—Suppose two messages are sent at once to the brain; each of them is reflected back, but the two disturbances which they set up in the brain create, in some way or other, a link between them, so that when one of these disturbances is set up afterwards the other one is also set up. It is as if every time two bells of a house were rung together, that of itself made a string to tie them together, so that when you rang one bell it was necessary to ring the other bell in consequence. That, remember, is purely a physical circumstance which we know happens. There is a physical excitation or disturbance which is sent along two different nerves, and which produces two different disturbances in the brain, and the effect of these two disturbances taking place together is to make a change in the character of the brain itself, so that when the one of them takes place it produces the other.

Now there are two different ways in which a stimulus coming to the eye can be made to move the hand. In the first place, suppose you are copying out a book; you have the book before you, and you read the book whilst you are copying with your hand, and consequently the light coming into your eye from the book directs your hand to move in a certain way. It is possible for this light impinging upon the eye to send a message along the optic nerve into the ganglion, and that message may go almost, though not quite, direct to the hand, so as to make the hand move, and that causes the hand to describe the letter which you have seen in the book; or else the message may go by a longer route which takes more time. A simple experiment to distinguish between these processes was tried by Donders, the great Dutch physiologist. He made a sign to a man at a

distance, and when he made this sign the man was to put down a key with his hand. He measured the time which was taken in this process, that is to say, the time which was taken by the message in going from the eye to the ganglion, and then to the hand. Measurements of the rate of nerve-motions have also been made by Helmholtz. The velocity varies to a certain extent in different people, but it is something like one hundred feet a second. But Donders also made another measurement. Suppose it is not decided beforehand whether the man is to move the key with his right or his left hand, and this is to be determined by the nature of the signal, then before he can move his hand he has to decide which hand he will use. The time taken for that process of decision was also measured. That process of decision, when looked at from the physical side, means this. The message goes up from the eye to the ganglion. It is immediately connected there with the mass of grey matter represented by our red cork. From that mass of grey matter there go white threads away to the whole of the surface of the cerebral hemispheres, or the paper of our parachute, and they take that message, therefore, which comes from the eye to the ganglion away to all this grey matter which is put round the inside of your skull. There are also white threads which connect all the parts of this grey matter together, and they run across from every part of it to almost every other part of it. As soon as a message has been taken to this grey matter, there is a vast interchange of messages going on between those parts; but finally, as the result of that, a number of messages come upon other white threads to another piece of grey matter, which is represented by our blue cork; from that the message is then taken to the muscles of the hand. There are then two different ways in which a message may go from the eye to the hand. It may go to the optic ganglion, and then almost straight to the hand, and in that case you do not know much about it—you only know that something has taken place, you do not think that you have done it yourself; or it may go to the optic ganglion, and be sent up to the cerebral hemispheres, and then be sent back to the sensory tract and then on to the hand. But that takes more time, and it implies that you have deliberated upon the act.

The diagram here drawn may make this point more clear. Here E is the eye, R and B are the red and blue corks,



and H is the hand. The curve C C represents the cerebral hemispheres, or the top of our parachute. If the action is so habitually associated with the signal that it takes place involuntarily, without any effort of the will, the message goes from the eye to the hand along the line E R B H. This may happen with a practised performer when it is settled beforehand which hand he is to use. But if it is necessary to deliberate about the action, to call in the exercise of the will, the message goes round the loop-line, E R C C B H; from the eye to the optic thalami, from them to the cerebrum, thence to the corpora striata, and so through the medulla to the hand.

Besides this fact which we have just explained, the fact of a message going from one part of the body to the brain and coming out in the motion of some other part of the body, there is another thing which is going on continually, and that is this. There is a faint reproduction of some excitement which has previously existed in the cerebral hemispheres, and which calls up, by the process which we have just now described, all those that have become associated with it; and it is continually sending down faint messages which do not actually tell the muscles to move, but which begin to tell them to move as it were. They are not always strong enough to produce actual motions, but they produce just the beginnings of those motions: and that process goes on even when there is apparently no sensation and no motion. If a man is in a

brown study, with his eyes shut, although he apparently sees and feels nothing at all, there is a certain action going on inside his brain which is not sensation, but is like it, because it is the transmission to the cerebral hemispheres of faint messages which are copies of previous sensations; and it does not produce motion, but it produces something like it; it produces incipient motion, the beginnings of motion which do not actually take effect. Sometimes a train of thought may so increase in strength as to produce motion. A man may get so excited by a train of thought that he jumps up and does something in consequence. And the sensory impressions which are taken from the ganglia to the hemispheres may be so strong as to produce an illusion; he may think that he sees something, he may think that he sees a ghost, when he does not. This continuous action of the brain depends upon the presence of blood; so long as a proper amount of blood is sent to the brain it is active, and when the blood is taken away it becomes inactive. And it is a curious property of the nervous system that it can direct the supply of blood which is to be sent to a particular part of it. It is possible, by directing your attention to a particular part of your hand, to make a determination of blood to that part which shall in time become a sore place. Some people have given this explanation, which seems a very probable one, of what has happened to those saints who have meditated so long upon the crucifixion, that they have got what are called stigmata, that is, marks of wounds corresponding to the wounds in what they were thinking about.

That, then, is the general character of the nervous system which we have to consider in connection with the mind. There is a train of facts between stimulus and motion which may be of two kinds; it may be direct or it may be indirect, it may go round the loop-line or not; and also there is a continuous action of the brain even when these steps are not taking place in completeness. Moreover, when two actions take place simultaneously they form a sort of link between them, so that if one of them is afterwards repeated the other gets repeated with it. That is what we have to remember chiefly as to the character of the brain.

Now let us consider the other class of facts and the con-

nections between them—the facts of consciousness. An eminent divine once said to me that he thought there were only two kinds of consciousness—to have a feeling and to know that you have a feeling. Now it seems to me that there is only one kind of consciousness, and that is to have fifty thousand feelings at once, and to know them all in different degrees. Whenever I try to analyse any particular state of consciousness in which I am, I find that it is an extremely complex one. I cannot help at this moment having a consciousness of all the different parts of this hall, and of a great sea of faces before me; and I cannot help having the consciousness, at the same time, of all the suggestions that that picture makes, that each face represents a person sitting there and listening or not, as the case may be. And I cannot help combining with them at the same moment a number of actions which they suggest to me, and in particular the action of going on speaking. There are a great number of elements of complexity which I cannot describe, because I am so faintly conscious of them that I cannot remember them. Any state of our consciousness, then, as we are at present constituted, is an exceedingly complex thing; but it certainly possesses this property, that if two feelings have occurred together, and one of them afterwards occurs again, it is very likely that the other will be called up by it. That is to say, two states of consciousness which have taken place at the same moment produce a link between them, so that a repetition of the one calls up a repetition of the other.

Again I find a certain train of facts between my sensations and my exertions. When I see a thing, I may go through a long process of deliberation as to what I shall do with it, and then afterwards I may do that which I have deliberated and decided upon. But, on the other hand, I may, by seeing a thing, be quite suddenly forced into doing something without any chance of deliberation at all. If I suddenly see a cab coming upon me from the corner of a street where I did not at all expect it, I jump out of the way without thinking that it is a very desirable thing to get out of the way of the cab. But if I see a cab a little while before, and have more time to think about it, then it occurs to me that it will be unpleasant and undesirable to be run over by that cab, and that I can avoid it by walking

out of the way. You here see that there are in the case of the mind two distinct trains of facts between sensation and exertion. There is an involuntary train of facts when the exertion follows the sensation without asking my leave, and there is a voluntary train in which it does ask my leave.

Then, again, there is this fact : that even when there is no actual sensation and no actual exertion, there may still be a long train of facts and sensations which hang together ; there may be faint reproductions of sensation which are not so vivid as are the sensations themselves, but which form a series of pictures of sensations which pass continually before my mind ; and there will be faint beginnings of action. Now the sense in which there are faint beginnings of action is very instructive. Any beginning of an action is what we call a judgment. When you see a thing, you in the first instance form no judgment about it at all—you are not prepared to assert any proposition—you merely have the feeling of a certain sight or sound presented to you ; but after a very short space of time, so short that you cannot perceive it, you begin to frame propositions. If you consider what a proposition means, you will see that it must correspond to the beginning of some sort of exertion. When you say that A is B, you mean that you are going to act as if A were B. If I see water with a particularly dull surface, and with stones resting upon the surface of it, then, first of all, I have merely an impression of a certain sheet of colour, and of certain objects which interrupt the colour of that sheet. But the second thing that I do is to come to the conclusion that the water is frozen, and that therefore I may walk upon it. The assertion that the water is frozen implies a bundle of resolves ; which means, given certain other conditions, I shall go and walk upon it. So, then, an act of judgment or an assertion of any kind implies a certain incipient action of the muscles, not actually carried out at that time and place, but preparing a certain condition of the mind such as afterwards, when the occasion comes, will guide the action that we shall take up.

Now, then, what is it that we mean by the *character* of a person ? You judge of a person's character by what he thinks and does under certain circumstances. Let us see

what determines this. We can only be speaking here of voluntary actions—those actions in which the person is consulted, and which are not done by his body without his leave. In those voluntary actions what takes place is, that a certain sensation is communicated to the mind, that sensation is manipulated by the mind, and conclusions are drawn from it, and then a message is sent out which causes certain motions to take place. Now the character of the person is evidently determined by the nature of this manipulation. If the sensation suggests a wrong thing, the character of the person will be bad; if the sensation suggests in the great majority of cases a right thing, you will say that the character of the person is good. So, then, it is the character of the mind which determines what it will do with a given sensation, and what act will follow from it, which determines what we call the personality of any person; and that character is persistent in the main, although it is continually changing a little. The vast mass of it is a thing which lasts through the whole of every individual's life, although everything which happens to him makes some small change in it, and that constitutes the education of the man.

Now, then, the question arises, is there anything else in your consciousness of a different nature from what we have here described? That is a question which every man has to decide by examining his own consciousness. I do not find anything else in mine. If you find anything else in yours, it is extremely important that you should analyse it and find out all that you possibly can about it, and state it in the clearest form to other people; because it is one of the most important problems of philosophy to account for the whole of consciousness out of individual feelings. It seems to me that the account of which I have only given a very rough sketch, which was begun by Locke and Hume, and has been carried out by their successors, chiefly in this country, is in its great general features complete, and leaves nothing but more detailed explanations to be desired. It seems to me that I find nothing in myself which is not accounted for when I describe myself as a stream of feelings such that each of them is capable of a faint repetition, and that when two of them have occurred together the repetition of the one calls up the other, and that there are

rules according to which the resuscitated feeling calls up its fellows. These are, in the main, fixed rules which determine and are determined by my character; but my character is gradually changing in consequence of the education of life. It seems to me that this is a complete account of all the kinds of facts which I can find in myself; and, as I said before, if anybody finds any other kinds of facts in himself, it is an exceedingly important thing that he should describe them as clearly as he possibly can.

We have described two classes of facts; let us now notice the parallelism between them. First, we have these two parallel facts, that two actions of the brain which occur together form a link between themselves, so that the one being called up the other is called up; and two states of consciousness which occur together form a link between them, so that when one is called up the other is called up. But also we find a train of facts between the physical fact of the stimulus of light going into the eye and the physical fact of the motion of the muscles. Corresponding to a part of that train, we have found a train of fact between sensation, the mental fact which corresponds to a message arriving from the eye, and exertion, the mental fact which corresponds to the motion of the hand by a message going out along the nerves. And we have found a correspondence between the continuous action of the brain and the continuous existence of consciousness apparently independent of sensation and exertion.

But let us look at this correspondence a little more closely; we shall find that there are one or two things which can be established with practical certainty. In the first place, it is not the whole of the physical train of facts which corresponds to the mental train of facts. The beginning of the physical train consists of light going into the eye and exciting the retina, and then of that wave of excitation being carried along the optic nerve to the ganglion. For all we know, and it is a very probable thing, the mental fact begins here, at the ganglion. There is no sensation till the message has got to the optic ganglion, for this reason, that if you press the optic nerve behind the eye you can produce the sensation of light. It is like tapping a telegraph, and sending a message which has not come from the station from which it ought to have come;

nobody at the other end can tell whether it has come from that station or not. The optic ganglion cannot tell whether this message which comes along the nerve has come from the eye or is the result of a tapping of the telegraph, whether it is produced by light or by pressure upon the nerve. It is a fact of immense importance that all these nerves are exactly of the same kind. The only thing which the nerve does is to transmit a message which has been given to it; it does not transmit a message in any other way than the telegraph wire transmits a message—that is to say, it is excited at certain intervals, and the succession of these intervals determines what this message is, not the nature of the excitation which passes along the wire. So that if we watched the nerve excited by pressure the message going along to the ganglion would be exactly the same as if it were the actual sight of the eye. We may draw from this the conclusion that the mental fact does not begin anywhere before the optic ganglion. Again, a man who has had one of his legs cut off can try to move his toes, which he feels as if they were still there; and that shows that the consciousness of the motor impulse which is sent out along the nerve does not go to the end to see whether it is obeyed or not. The only way in which we know whether our orders, given to any parts of our body, are obeyed, is by having a message sent back to say that they are obeyed. If I tell my hand to press against this black board, the only way in which I know that it does press is by having a message sent back by my skin to say that it is pressed. But supposing there is no skin there, I can have the exertion that precedes the action without actually performing it, because I can send out a message, and consciousness stops with the sending of the message, and does not know anything further. So that the mental fact is somewhere or other in the region R C C B of the diagram, and does not include the two ends. That is to say, it is not the whole of the bodily fact that the mental fact corresponds to, but only an intermediate part of it. If it just passes through the points R B, without going round the loop from C to C, then we merely have the sensation that something has taken place—we have had no voice in the nature of it and no choice about it. If it has gone round from C to C we have a much larger fact—we have that

fact which we call choice, or the exercise of volition. We may conclude, then—I am not able in so short a space as I have to give you the whole evidence which goes to an assertion of this kind; but there is evidence which is sufficient to satisfy any competent scientific man of this day—that every fact of consciousness is parallel to some disturbance of nerve matter, although there are some nervous disturbances which have no parallel in consciousness, properly so called; that is to say, disturbances of my nerves may exist which have no parallel in my consciousness.

We have now observed two classes of facts and the parallelism between them. Let us next observe what an enormous gulf there is between these two classes of facts.

The state of a man's brain and the actions which go along it are things which every other man can perceive, observe, measure, and tabulate; but the state of a man's own consciousness is known to him only, and not to any other person. Things which appear to us and which we can observe are called *objects* or *phenomena*. Facts in a man's consciousness are not objects or phenomena to any other man; they are capable of being observed only by him. We have no possible ground, therefore, for speaking of another man's consciousness as in any sense a part of the physical world of objects or phenomena. It is a thing entirely separate from it; and all the evidence that we have goes to show that the physical world gets along entirely by itself, according to practically universal rules. That is to say, the laws which hold good in the physical world hold good everywhere in it—they hold good with practical universality, and there is no reason to suppose anything else but those laws in order to account for any physical fact; there is no reason to suppose anything but the universal laws of mechanics in order to account for the motion of organic bodies. The train of physical facts between the stimulus sent into the eye, or to any one of our senses, and the exertion which follows it, and the train of physical facts which goes on in the brain, even when there is no stimulus and no exertion, these are perfectly complete physical trains, and every step is fully accounted for by mechanical conditions. In order to show what is meant by that, I will endeavour to explain another supposition which might be made; that when stimulus comes

into the eye there is a certain amount of energy transferred from the ether, which fills space, to this nerve; and this energy travels along into the ganglion, and sets the ganglion into a state of disturbance which may use up some energy previously stored in it. The amount of energy is the same as before by the law of the conservation of energy. That energy is spread over a number of threads which go out to the brain, and it comes back again and is reflected from there. It may be supposed that a very small portion of energy is created in that process, and that while the stimulus is going round this loop-line it gets a little push somewhere, and then, when it comes back to the ganglia, it goes away to the muscle and sets loose a store of energy in the muscle so that it moves the limb. Now the question is, Is there any creation of energy anywhere? Is there any part of the physical progress which cannot be included within ordinary physical laws? It has been supposed, I say, by some people, as it seems to me merely by a confusion of ideas, that there is, at some part or other of this process, a creation of energy; but there is no reason whatever why we should suppose this. The difficulty in proving a negative in these cases is similar to that in proving a negative about anything which exists on the other side of the moon. It is quite true that I am not absolutely certain that the law of the conservation of energy is exactly true; but there is no more reason why I should suppose a particular exception to occur in the brain than anywhere else. I might just as well assert that whenever anything passes over the Line, when it goes from the north side of the Equator to the south, there is a certain creation of energy, as that there is a creation of energy in the brain. If I chose to say that the amount was so small that none of our present measurements could appreciate it, it would be difficult or indeed impossible for anybody to disprove that assertion; but I should have no reason whatever for making it. There being, then, an absence of positive evidence that the conditions are exceptional, the reasons which lead us to assert that there is no loss of energy in organic any more than in inorganic bodies are absolutely overwhelming. There is no more reason to assert that there is a creation of energy in any part of an organic body, because we are not absolutely sure of the exact nature of

the law, than there is reason, because we do not know what there is on the other side of the moon, to assert that there is a sky-blue peacock there with forty-five eyes in his tail.

Then it is not a right thing to say, for example, that the mind is a force, because if the mind were a force we should be able to perceive it. I should be able to perceive your mind and to measure it, but I cannot; I have absolutely no means of perceiving your mind. I judge by analogy that it exists, and the instinct which leads me to come to that conclusion is the social instinct, as it has been formed in me by generations during which men have lived together, and they could not have lived together unless they had gone upon that supposition. But I may very well say that among the physical facts which go along at the same time with mental facts there are forces at work. That is perfectly true, but the two things are on two utterly different platforms—the physical facts go along by themselves, and the mental facts go along by themselves. There is a parallelism between them, but there is no interference of one with the other. Again, if anybody says that the will influences matter, the statement is not untrue, but it is nonsense. The will is not a material thing, it is not a mode of material motion. Such an assertion belongs to the crude materialism of the savage. Now the only thing which influences matter is the position of surrounding matter or the motion of surrounding matter. It may be conceived that at the same time with every exercise of volition there is a disturbance of the physical laws; but this disturbance, being perceptible to me, would be a physical fact accompanying the volition, and could not be the volition itself, which is not perceptible to me. Whether there is such a disturbance of the physical laws or no, is a question of fact to which we have the best of reasons for giving a negative answer; but the assertion that another man's volition, a feeling in his consciousness which I cannot perceive, is part of the train of physical facts which I may perceive, this is neither true nor untrue, but nonsense; it is a combination of words whose corresponding ideas will not go together.

Then we are to regard the body as a physical machine, which goes by itself according to a physical law, that is to say, is automatic. An automaton is a thing which goes by

itself when it is wound up, and we go by ourselves when we have had food. Excepting the fact that other men are conscious, there is no reason why we should not regard the human body as merely an exceedingly complicated machine which is wound up by putting food into the mouth. But it is not *merely* a machine, because consciousness goes with it. The mind, then, is to be regarded as a stream of feelings which runs parallel to, and simultaneous with, a certain part of the action of the body, that is to say, that particular part of the action of the brain in which the cerebrum and the sensory tract are excited.

Then, you say, if we are automata what becomes of the freedom of the will? The freedom of the will, according to Kant, is that property which enables us to originate events independently of foreign determining causes; which, it seems to me, amounts to saying precisely that we are automata, that is, that we go by ourselves, and do not want anybody to push or pull us. The distinction between an automaton and a puppet is, that the one goes by itself when it is wound up and the other requires to be pushed or pulled by wires or strings. We do not want any stimulus from without, but we go by ourselves when we have our food, and therefore so far as that distinction goes we are automata. But we are more than automata, because we are conscious; mental facts go along with the bodily facts. That does not hinder us from describing the bodily facts by themselves, and if we restrict our attention to them we must describe ourselves as automata.

The objection which many people feel to this doctrine is derived, I think, from the conception of such automata as are made by man. In that case there is somebody outside the automaton who has constructed it in a certain definite way, with definite intentions, and has meant it to go in that way; and the whole action of the automaton is determined by such person outside. Of course, if we consider, for example, a machine such as Frankenstein made, and imagine ourselves to have been put together as that fearful machine was put together by a German student, the conception naturally strikes us with horror; but if we consider the actual fact, we shall see that our own case is not an analogous one. For, as a matter of fact, we were not made by any Frankenstein, but we made ourselves. I do not

mean that every individual has made the whole of his own character, but that the human race as a whole has made itself during the process of ages. The action of the whole race at any given time determines what the character of the race shall be in the future. From the continual storing up of the effects of such actions, graven into the character of the race, there arises in process of time that exact human constitution which we now have. By that process of Natural Selection all the actions of our ancestors are built into us and form our character, and in that sense it may be said that the human race has made itself. In that sense also we are individually responsible for what the human race will be in the future, because every one of our actions goes to determine what the character of the race shall be to-morrow. If, on the contrary, we suppose that in the action of the brain there is some point where physical causes do not apply, and where there is a discontinuity, then it will follow that some of our actions are not dependent upon our character. Provided the action which goes on in my brain is a continuous one, subject to physical rules, then it will depend upon what the character of my brain is; or if I look at it from the mental side, it will depend upon what my mental character is; but if there is a certain point where the law of causation does not apply, where my action does not follow by regular physical causes from what I am, then I am not responsible for it, because it is not I that do it. So you see the notion that we are not automata destroys responsibility; because, if my actions are not determined by my character in accordance with the particular circumstances which occur, then I am not responsible for them, and it is not I that do them.

Moreover, if we once admit that physical causes are not continuous, but that there is some break, then we leave the way open for the doctrine of a destiny or a providence outside of us, overruling human efforts and guiding history to a foregone conclusion. Now of course it is the business of the seeker after truth to find out whether a proposition is true or no, and not what are the moral consequences which may be expected to follow from it. But I do think that if it is right to call any doctrine immoral, it is right so to call this doctrine; when we remember how often it has paralysed the efforts of those who were climbing

honestly up the hillside towards the light and the right, and how often it has nerved the sacrilegious arm of the fanatic or the adventurer who was conspiring against society.

I want now, very briefly indeed, to consider to what extent these doctrines furnish a bridge between the two classes of facts. I have said that the series of mental facts corresponds to only a portion of the action of the organism. But we have to consider not only ourselves, but also those animals which are next below us in the scale of organisation, and we cannot help ascribing to them a consciousness which is analogous to our own. We find, when we attempt to enter into that, and to judge by their actions what sort of consciousness they possess, that it differs from our own in precisely the same way that their brains differ from our brains. There is less of the co-ordination which is implied by a message going round the loop-line. A much larger number of the messages which go in at a cat's eyes and come out at her paws go straight through without any loop-line at all than do in the case of a man; but still there is a little loop-line left. And the lower we go down in the scale of organisation the less of this loop-line there is; yet we cannot suppose that so enormous a jump from one creature to another should have occurred at any point in the process of evolution as the introduction of a fact entirely different and absolutely separate from the physical fact. It is impossible for anybody to point out the particular place in the line of descent where that event can be supposed to have taken place. The only thing that we can come to, if we accept the doctrine of evolution at all, is that even in the very lowest organisms, even in the *Amœba* which swims about in our own blood, there is something or other, inconceivably simple to us, which is of the same nature with our own consciousness, although not of the same complexity—that is to say (for we cannot stop at organic matter, knowing as we do that it must have arisen by continuous physical processes out of inorganic matter), we are obliged to assume, in order to save continuity in our belief, that along with every motion of matter, whether organic or inorganic, there is some fact which corresponds to the mental fact in ourselves. The mental fact in ourselves is an exceedingly complex thing; so also our brain is an exceedingly complex

thing. We may assume that the quasi-mental fact which corresponds and which goes along with the motion of every particle of matter is of such inconceivable simplicity, as compared with our own mental fact, with our consciousness, as the motion of a molecule of matter is of inconceivable simplicity when compared with the motion in our brain.

This doctrine is not merely a speculation, but is a result to which all the greatest minds that have studied this question in the right way have gradually been approximating for a long time.

Again, let us consider what takes place when we perceive anything by means of our eye. A certain picture is produced upon the retina of the eye, which is like the picture on the ground-glass plate in a photographic camera; but it is not there that the consciousness begins, as I have shown before. When I see anything there is a picture produced on the retina, but I am not conscious of it there; and in order that I may be conscious the message must be taken from each point of this picture along the special nerve-fibre to the ganglion. These innumerable fine nerves which come away from the retina go each of them to a particular point of the ganglion, and the result is that, corresponding to that picture at the back of the retina, there is a disturbance of a great number of centres of grey matter in the ganglion. If certain parts of the retina of my eye, having light thrown upon them, are disturbed so as to produce the figure of a square, then certain little pieces of grey matter, in this ganglion, which are distributed we do not know how, will also be disturbed, and the impression corresponding to that is a square. Consciousness belongs to this disturbance of the ganglion, and not to the picture in the eye; and therefore it is something quite different from the thing which is perceived. But at the same time, if we consider another man looking at something, we shall say that the fact is this—there is something outside of him which is matter in motion, and that which corresponds inside of him is also matter in motion. The external motion of matter produces in the optic ganglion something which corresponds to it, but is not like it. Although for every point in the object there is a point of disturbance in the optic ganglion, and for every connection between two points in the object there is a connection be-

tween two disturbances, yet they are not like one another. Nevertheless they are made of the same stuff; the object outside and the optic ganglion are both matter, and that matter is made of molecules moving about in ether. When I consider the impression which is produced upon my mind of any fact, that is just a part of my mind; the impression is a part of me. The hall which I see now is just an impression produced on my mind by something outside of it, and that impression is a part of me.

We may conclude from this theory of sensation, which is established by the discoveries of Helmholtz, that the feeling which I have in my mind—the picture of this hall—is something corresponding, point for point, to the actual reality outside. Though every small part of the reality which is outside corresponds to a small part of my picture, though every connection between two parts of that reality outside corresponds to a connection between two parts of my picture, yet the two things are not alike. They correspond to one another, just as a map may be said in a certain sense to correspond with the country of which it is a map, or as a written sentence may be said to correspond to a spoken sentence. But then I may conclude, from what I said before, that, although the two corresponding things are not alike, yet they are made of the same stuff. Now what is my picture made of? My picture is made of exceedingly simple mental facts, so simple that I only feel them in groups. My picture is made up of these elements; and I am therefore to conclude that the real thing which is outside me, and which corresponds to my picture, is made up of similar things; that is to say, the reality which underlies matter, the reality which we perceive as matter, is that same stuff which, being compounded together in a particular way, produces mind. What I perceive as your brain is really in itself your consciousness, is You; but then, that which I call your brain, the material fact, is merely my perception. Suppose we put a certain man in the middle of the hall, and we all looked at him. We should all have perceptions of his brain; those would be facts in our consciousness, but they would be all different facts. My perception would be different from the picture produced upon you, and it would be another picture, although it might be very like it. So that corresponding to all those

pictures which are produced in our minds from an external object, there is a reality which is not like the pictures, but which corresponds to them point for point, and which is made of the same stuff that the pictures are. The actual reality which underlies what we call matter is not the same thing as the mind, is not the same thing as our perception, but it is made of the same stuff. To use the words of the old disputants, we may say that matter is not of the *same* substance as mind, not *homocousion*, but it is of *like* substance, it is made of similar stuff differently compacted together, *homoi-ousion*.

With the exception of just this last bridge connecting the two great regions of inquiry that we have been discussing, the whole of what I have said is a body of doctrine which is accepted now, as far as I know, by all competent people who have considered the subject. There are, of course, individual exceptions with regard to particular points, such as that I have mentioned about the possible creation of energy in the brain; but these are few, and they occur mainly, I think, among those who are so exceedingly well acquainted with one side of the subject that they regard the whole of it from the point of view of that side, and do not sufficiently weigh what may come from the other side. With such exceptions as those, and with the exception of the last speculation of all, the doctrine which I have expounded to you is the doctrine of Science at the present day:

These results may now be applied to the consideration of certain questions which have always been of great interest. The application which I shall make is a purely tentative one, and must be regarded as merely indicating that such an application becomes more possible every day. The first of these questions is that of the possible existence of consciousness apart from a nervous system, of mind without body. Let us first of all consider the effect upon this question of the doctrines which are admitted by all competent scientific men. All the consciousness that we know of is associated with a brain in a certain definite manner, namely, it is built up out of elements in the same way as part of the action of the brain is built up out of elements; an element of one corresponds to an element in the other; and the mode of connection, the shape of the

building, is the same in the two cases. The mere fact that all the consciousness we know of is associated with certain complex forms of matter need only make us exceedingly cautious not to imagine any consciousness apart from matter without very good reason indeed; just as the fact of all swans having turned out white up to a certain time made us quite rightly careful about accepting stories that involved black swans. But the fact that mind and brain are associated in a definite way, and in that particular way that I have mentioned, affords a very strong presumption that we have here something which can be *explained*; that it is possible to find a reason for this exact correspondence. If such a reason can be found, the case is entirely altered; instead of a provisional probability which may rightly make us cautious, we should have the highest assurance that Science can give, a practical certainty on which we are bound to act, that there is no mind without a brain. Whatever, therefore, is the probability that an explanation exists of the connection of mind with brain in action, such is also the probability that each of them involves the other.

If, however, that particular explanation which I have ventured to offer should turn out to be the true one, the case becomes even stronger. If mind is the reality or substance of that which appears to us as brain-action, the supposition of mind without brain is the supposition of an organised material substance not affecting other substances (for if it did it might be perceived), and therefore not affected by them; in other words, it is the supposition of immaterial matter, a contradiction in terms to the fundamental assumption of uniformity of nature, without practically believing in which we should none of us have been here to-day. But if mind without brain is a contradiction, is it not still possible that an organisation like the brain can exist without being perceived, without our being able to hold it fast, and weigh it, and cut it up? Now this is a physical question, and we know quite enough about the physical world to say, "Certainly not." It is made of atoms and ether, and there is no room in it for ghosts.

The other question which may be asked is this: Can we regard the universe, or that part of it which immediately surrounds us, as a vast brain, and therefore the reality

which underlies it as a conscious mind? This question has been considered by the great naturalist Du Bois Reymond, and has received from him that negative answer which I think we also must give. For we found that the particular organisation of the brain which enables its action to run parallel with consciousness amounts to this—that disturbances run along definite channels, and that two disturbances which occur together establish links between the channels along which they run, so that they naturally occur together again. Now it will, I think, be clear to every one that these are not characteristics of the great interplanetary spaces. Is it not possible, however, that the stars we can see are just atoms in some vast organism, bearing some such relation to it as the atoms which make up our brains bear to us? I am sure I do not know. But it seems clear that the knowledge of such an organism could not extend to events taking place on the earth, and that its volition could not be concerned in them. And if some vast brain existed far away in space, being invisible because not self-luminous, then, according to the laws of matter at present known to us, it could affect the solar system only by its weight.

On the whole, therefore, we seem entitled to conclude that during such time as we can have evidence of, no intelligence or volition has been concerned in events happening within the range of the solar system, except that of animals living on the planets. The weight of such probabilities is, of course, estimated differently by different people, and the questions are only just beginning to receive the right sort of attention. But it does seem to me that we may expect in time to have negative evidence on this point of the same kind and of the same cogency as that which forbids us to assume the existence between the Earth and Venus of a planet as large as either of them.

Now about these conclusions which I have described as probable ones, there are two things that may be said. In the first place it may be said that they make the world a blank, because they take away the objects of very important and widespread emotions of hope and reverence and love, which are human faculties and require to be exercised, and that they destroy the motives for good conduct. To this it may be answered that we have no right to call the

world a blank while it is full of men and women, even though our one friend may be lost to us. And in the regular everyday facts of this common life of men, and in the promise which it holds out for the future, there is room enough and to spare for all the high and noble emotions of which our nature is capable. Moreover, healthy emotions are felt about facts and not about phantoms; and the question is not "What conclusion will be most pleasing or elevating to my feelings?" but "What is the truth?" For it is not all human faculties that have to be exercised, but only the good ones. It is not right to exercise the faculty of feeling terror or of resisting evidence. And if there are any faculties which prevent us from accepting the truth and guiding our conduct by it, these faculties ought not to be exercised. As for the assertion that these conclusions destroy the motive for good conduct, it seems to me that it is not only utterly untrue, but, because of its great influence upon human action, one of the most dangerous doctrines that can be set forth. The two questions which we have last discussed are exceedingly difficult and complex questions; the ideas and the knowledge which we used in their discussion are the product of long centuries of laborious investigation and thought; and perhaps, although we all make our little guesses, there is not one man in a million who has any right to a definite opinion about them. But it is not necessary to answer these questions in order to tell an honest man from a rogue. The distinction of right and wrong grows up in the broad light of day out of natural causes wherever men live together; and the only right motive to right action is to be found in the social instincts which have been bred into mankind by hundreds of generations of social life. In the target of every true Englishman's allegiance, the bull's-eye belongs to his countrymen, who are visible and palpable and who stand around him; not to any far-off shadowy centre beyond the hills, *ultra montes*, either at Rome or in heaven. Duty to one's countrymen and fellow-citizens, which is the social instinct guided by reason, is in all healthy communities the one thing sacred and supreme. If the course of things is guided by some unseen intelligent person, then this instinct is his highest and clearest voice, and because

of it we may call him good. But if the course of things is not so guided, that voice loses nothing of its sacredness, nothing of its clearness, nothing of its obligation.

In the second place it may be said that Science ought not to deal with these questions at all; that while scientific men are concerned with physical facts, they are *dans leur droit*, but that in treating of such subjects as these they are going out of their domain, and must do harm.

What is the domain of Science? It is all possible human knowledge which can rightly be used to guide human conduct.

In many parts of Europe it is customary to leave a part of the field untilled for the Brownie to live in, because he cannot live in cultivated ground. And if you grant him this grace, he will do a great deal of your household work for you in the night while you sleep. In Scotland the piece of ground which is left wild for the devil to live in is called "the good man's croft." Now, there are people who indulge a hope that the ploughshare of Science will leave a sort of good man's croft around the field of reasoned truth; and they promise that in that case a good deal of our civilising work shall be done for us in the dark, by means we know nothing of. I do not share this hope; and I feel very sure that it will not be realised. I think that we should do our work with our own hands in a healthy straightforward way, and not leave any croft to the good man from which his arrow may fly by night and in which his pestilence may walk in the noonday. It is idle to set bounds to the purifying and organising work of Science. Without mercy and without resentment she ploughs up weed and briar; from her footsteps behind her grow up corn and healing flowers; and no corner is far enough to escape her furrow. Provided only that we take as our motto and our rule of action, Man speed the plough.

