THE SOUL

A STUDY AND AN ARGUMENT

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BY

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"OUTLINES OF AN INDUSTRIAL SCIENCE," "REPRESENTATIVE GOVERNMENT IN ENGLAND," AND "THE MODIFICATION OF ORGANISMS"

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PREFACE

In publishing this book I have no expectation that it will prove much of an attraction to the general reader. The utmost that I look for is that it will provoke further inquiry amongst those who, like myself, are profoundly dissatisfied with current opinion on the subjects herein discussed. I do not profess to have done more than give an outline of my views, and that in the briefest manner possible, for to treat these thoroughly would have taken a much larger volume. The fact that these views differ widely from those generally entertained by my contemporaries may be a sin past praying for in

the opinion of the many, but a saving grace in the estimation of the few. I shall be more than content if they meet with the approval of the latter.

THE AUTHOR.

MELBOURNE,
Nov. 30th, 1902.

INTRODUCTION

The term Soul—What the soul really is—Method of investigation—The brain not the sole seat of sensation—Nerves, nerve cells and their functions—A theory of reflex action—On organic modifications—The phenomena of unconscious mental action.

Is there a soul? Is there any purpose or design in nature? Is there any after life? These questions are simple in statement but not in solution; they must occur to all who care to consider, even in an incidental way, their own existence or the system of things of which they form a part. Most of us at times feel an interest as to the warrant we have for believing as we are taught, or as to the reasons that others have for their opinions on these subjects. We speak lightly of Life and Mind, Matter and Spirit, Sensation and Consciousness, and of many other entities or attributes of which knowledge is assumed. As a matter of fact,

however, there is no agreement among our doctrinaires or experts as to what any such terms actually represent. The purpose of this little book is to arrive if possible at a clear idea of what is signified by these terms, and a better understanding of some elementary truths which all of us have an interest in finding and keeping if we can. If the opening pages appear somewhat technical or abstruse it is because the authorities generally relied upon, and whose views it was necessary to explain, have been very technical in their treatment of their subjects.

In breaking new ground, or in the turning up of old, some preliminary clearing is generally necessary. We must at least remove such obstructions as will permit us to see the character of the land we propose operating upon before putting in the plough. As in the following pages I shall have occasion to say a good deal about Mind, it will be advisable to clear the ground of any false ideas on this subject before entering on any discussion as to its relations, its functions and its sphere of action.

We have what we are pleased to call a Science of Mind, but we have no settled idea as to its

subject matter—a Psychology, as Schopenhauer said, but no Psyche. Opinions on this subject vary in a remarkable degree. According to some writers, Mind is a State; according to others, it is a Quality or Property; by many again it is a Product, and by not a few it is regarded as a Function. It has been variously described as Consciousness, as the Non-extended, as Soul (without the definite article), as Thought and as the Thinking Process. The last word on this subject is from Professor James, and according to him it is none of these. The term Soul, he says, "explains nothing and guarantees nothing. Its successive thoughts are the only intelligible things about it, and definitely to ascertain the correlations of those with brain processes is as much as Psychology can empirically do," and he accordingly apologises for employing the term on the ground that it is in common use. The term Soul is, therefore, according to Professor James, a mere figure of speech, and the thing itself a pure fiction.

Consciousness, described by Mill as a "series of states," and by Mr. Herbert Spencer as "feelings and the relations of feelings," is a

radically defective definition of mind, as Perception and Volition, both properties of mind, can in no sense be regarded as "states" or "feelings." But assuming mind to be a State we are compelled to ask, What is the subject of that state? If it be a Quality or Property, What is the substance in which this property inheres? If Thought, What is the thinking subject of which it is the product? And, lastly, if it is a Function, What is the operating agent? These questions confront us at the very outset, for it is manifest we cannot have a state without a subject, a property without a substance, thought without a thinking subject, or function without an operating agent.

The two prevailing theories on this subject are—(1) that mind is a function of the nervous system, especially of the brain, or more specifically of the cerebral hemispheres; (2) that it is a metaphysical entity, an undefined and suppositious something which has the property of non-extension. That mind, according to our experience of it, is invariably associated with organic matter, no one can entertain a doubt; but to argue that because of that relationship mind is the function of the nervous

system is to beg the whole question at issue. We might with more reason assert that mind operates through the organism, or that organised matter is the product of mind. On the other hand, mind in the metaphysical sense is an illusion. It is not an entity because it is not a substance, but at the most only the property of a substance, which process has by a process of mental legerdemain been substituted for a substance—a hypothetical property of mind for mind itself. Non-extension is a purely negative property, and conveys no idea of any positive quality whatever—a property, in fact, that is non-existent. Nevertheless, this view of mind was not only held by the older metaphysicians, but also by the later, like Sir William Hamilton, and is even now entertained by the modern school of physiological psychologists like Professors Bain and Ladd.

There is, however, another theory, which represents mind, not as an abstraction, nor as a negation or property, but as a substance; as that something which feels, thinks and wills—the thinking substance, subject or agent; The Mind, in fact, as distinguished from its counterpart the body. But the substance has been so

refined away in these latter days that there is now nothing left but the shadow.

If we must proceed scientifically, we must alter our method of investigation; we should begin with the simplest mental phenomena, and thence proceed to the more complex. But we reverse this process. We begin by introspection, we interrogate our own minds, which exhibit mental phenomena in their highest state of complexity. The system of gradation in organic beings shows that nature reverses the order followed by the psychologist. She begins with the simple, and thence proceeds to the complex. The unicellular precedes the multicellular organism, and organic complexity corresponds with functional efficiency. Nature proceeds by the aggregation of units and by the differentiation of functions. We have first the single cell, then its multiplication by division, then the aggregation of the cells thus produced into tissues and organs and systems of organs, each organ having its own special function and sphere of action. The same method is followed in the formation of the nervous systems; first the single nerve cell or ganglion makes its appearance, next its multiplication by division,

then the aggregation of the cells into organs or centres or systems of centres, each organ again having its own special function and its own special sphere of action. Thus the tissue cell is the physiological unit, the multicellular cell an aggregation of such units ; the nerve cell is also a unit, and the nerve centres aggregations of such nerve units. To select one of these centres (say, the brain) for investigation, and to ignore all the other centres, or all the units of which they are composed, is to proceed on altogether wrong lines, for it is as necessary for the psychologist to understand the functions of the other centres, and of the units composing them, as it is for the physiologist to know the functions of the organs of the body and of the units of which they are constituted. The tissue cell is the physiological unit, because it manifests all the phenomena of a living being—assimilation, dissimilation, growth, reproduction and decay. Can we say that the nerve cell is the psychological unit ? The invariable association of mental action with nerve action would indicate that an affirmative answer should be given to this question, and if the relation between the mind and a ganglion be that of the thinking

subject or agent to its organ, or medium of communication, then the ganglion may without impropriety be provisionally regarded as the psychological unit.

Introspection should not be neglected, however. It is necessary, but it is not sufficient. Our own minds do not supply the requisite data, nor are the data always reliable. Minds differ, and conclusions founded upon personal experience also differ. Besides, absolutely correct observation is impossible. We cannot think and at the same time observe ourselves thinking; we cannot be subject and object at the same moment. By introspection we can only get a glimpse of the process of thinking when we have done thinking. It is because of the persistent adherence to this method of investigation that Psychology has become a mere catalogue or classification of mental faculties, and classification is not explanation. What we want is a Comparative Psychology. We require to study mind in its least as well as in its most complex form; in the lowest as in the highest organisms. I am aware that psychologists deny that the lowest organisms are conscious beings, at least in the same sense that man is a

conscious being. But are we justified in drawing an arbitrary line between the lower organisms and the higher, and in asserting that all above that line are conscious beings, while all below it are mere automata? We have first to determine the criterion of "consciousness." Whether or not a monad or a mammal is a conscious being is a question of evidence.

It is also necessary to understand the nature and functions of the different nerve centres in the human body, and their relation to each other. In the cerebral hemispheres there are large masses of ganglia in the cranial subcentres, and in the spinal cord there are smaller masses, while numerous groups of ganglia are distributed throughout the organism, all interlaced and bound together by a network of nerves. What is the meaning of this arrangement? All the nerves are supposed to reach the cerebral hemispheres (although often by very circuitous routes), and it is therefore assumed that the cerebral hemispheres constitute the organ where all stimuli converge, and from whence all motor power proceeds. If we are to believe our text-books it is an indisputable fact that the cerebral hemispheres are

the sole seat of sensation ; that we do not really feel where consciousness assures us that we feel ; that it is a delusion to suppose that we see with our eyes, hear with our ears, smell with our nose, taste with our palate, or feel with our finger tips ; that when we have a sensation of pain in the finger the sensation is really not there at all, but in the brain, or in that particular part of the hemispheres called the sensorium. This is neither good physiology nor good psychology. It is not good physiology, because molecular motion does not proceed direct from the periphery, nor even from the end organs of sense, direct to the brain, for such stimuli are liable to be, and in fact are, constantly intercepted, deflected, reflected (as in the case of reflex action), or inhibited by the nerve cells along the lines of communication. It is not good psychology to assert that consciousness deceives us, for in such cases the testimony of consciousness is confirmed by the evidence of our senses, which is the very evidence that the empiricist relies upon to prove the contrary. If I bruise my finger I feel a sensation there, and not in my brain, and by looking at my bruised finger I

have ocular demonstration that consciousness is right, and that the empiricist is wrong in his diagnosis. When John Hunter asked his paralysed patient whose leg jerked when the skin was irritated, if he felt any pain in it, he replied, "No, sir, but you see my leg does."

We must bear in mind the difference between a nerve and a nerve cell. Nerves are only conductors, nerve cells are generators of nerve force, and it is with the latter that sensation is associated, whether these cells are located at the periphery, at the end organs of sense, in the sub-centres or in the cerebral hemispheres. If all the nerves were directly connected with the hemispheres, and all the nerve cells centred in the same organ, it might reasonably be concluded that the hemispheres were the sole seat of sensation. But such is not the case; all the nerves are not in direct communication with the hemispheres, and the nerve cells are not confined to that organ, but are located in such positions as render it highly probable that they perform similar functions to the nerve cells in the hemispheres. The mere fact that no sensation is experienced in the chief nerve centre if the nerve connecting the periphery, the end

organ of sense, or the sub-centres, with the brain —as in the case when the nerve is severed— proves nothing. It only shows that the molecular motion has not reached the brain, as of course it could not in the circumstances. The sensation might nevertheless have been experienced in the peripheral cells, or at the nerve junctions ; and, if so, and the connection with the brain were intact, what would reach those cells as stimuli might by them be converted into sensation, and be passed on to the brain *qua* sensation, and would appear as a local sensation as represented in consciousness. Somewhere the stimulus becomes sensation ; the question is where that transmutation takes place.

Nerve cells occur along the lines of nerve fibres, which obviously interrupt or obstruct the passage of the molecular motion from the periphery to the brain, or the nerve force from the brain to the periphery. There are also nerve cells at the junctions in the lines of nerves between the periphery and the brain which serve as switching places where the nerve force is modified, deflected, reflected or inhibited. How is the presence of these nerve cells to be accounted for on the theory that all sensation is

in the brain? Not only would these nerve cells be of no use where they are, but they would prove a positive obstruction to the passage of the molecular motion. The end organs of sense are also provided with special groups of nerve cells lying between these organs and the brain, which we may assume to exist for the purpose of interpreting and transmitting as sensation to the brain the external stimuli which they receive through these organs. And surely a stimulus which did reach the brain and did not indicate whence it came would be as valueless to consciousness as a telegraph message would be to the recipient without the address of the sender.

The spinal cord is a column of nerve cells, bound together for the reception, modification and distribution of sensory impulses, and it performs its functions independently of the brain. The Medulla is another important centre, which controls the functions of the heart, the blood-vessels and the respiration and certain reflex actions. The basal ganglia of the brain and of the cerebellum are sub-centres for the co-ordination of muscular movements with the impulses of sense, all of which perform their

functions unconsciously. What conceivable purpose can these organs serve unless they share with the cerebral hemispheres the control of organic functions? Why should it be assumed that the ganglia at the periphery and in the sub-centres perform functions not only different in degree but of a different order from the ganglia in the brain? The assumption could only be justified by evidence showing that the ganglia in the brain are different in kind from those in other parts of the organism, or that the mere aggregation or massing of them in the brain will enable them to act differently from those elsewhere; but no evidence whatever has been produced in favour of either alternative. On the other hand, the behaviour of brainless and headless frogs and other animals proves conclusively that the brain is not the sole organ of sensation and of consciousness.

Moreover, the theory under consideration altogether ignores the principle of division of labour which almost everywhere prevails in organic life. Only in the very lowest forms of life (the unicellular) do we find the whole organism employed in performing every organic

function ; in all animals higher in the scale special organs are provided for the performance of special functions. But if the brain were the sole seat of sensation it would also be the sole means of communication between the organism and the outside world, and all organic functions, voluntary and involuntary alike, would be directly controlled by the brain, and there would consequently be no necessity for any system of division such as now exists.

The recognition of the principle of the division of labour in mental science will throw a flood of light on a large class of phenomena, and help us towards the solution of many difficult problems. For example, it will explain—

(1.) The true character of reflex action. As the term implies, reflex action is a twofold process ; it is action and reaction, both of which are generally supposed to be physical in their nature. Literally, reflex action is action thrown, and action thrown back—a bound and a rebound ; but the bound is not of the same nature as the rebound. The former is no doubt mechanical ; but the latter, or reaction proper, is action of another kind ; it is a response to the mechanical movement, an answer to a call

or an intimation of some sort. But there can be no response to a movement, molecular or mechanical, which has not been felt. Sensation must therefore precede the response, otherwise the latter would be a mere repetition of the molecular movement, which would be meaningless and futile. The most simple reflex action must necessarily have a psychical content, whether it proceeds from the brain or from a sub-centre, or a peripheral ganglion. The sub-centres and ganglia react on a stimulus precisely in the same manner as the brain reacts on a stimulus. In both a sensation precedes a response ; in both the sensation is accompanied by consciousness ; but the sensation in the one case is local, and in the other it is general, the stimulus in the latter case having reached the chief centre (the brain) of sensation and of consciousness. Such stimuli as do not reach the chief centre are not lost ; they are intercepted and dealt with by the sub-centres or the local ganglia. There is the same system of division of labour here as in the social community. In the latter there is a chief centre, and there are also local and provincial centres ; so in the cell community there is a chief centre

and sub-centres, and the chief centre concerns itself as little with purely local matters as does the high court of Parliament with the affairs of the parish vestry. Or we may compare the system of mental division of labour to the relation existing between the premier and his colleagues under responsible government. In this case the cabinet is not only a corporation ; it is also a personality. The premier rules with the assistance of his colleagues, who have the management of their own departments. But these colleagues he may transfer from one department to another, or he may dismiss and replace them by others if he thinks proper. His is the synthetic activity which moulds the policy of the cabinet. In the smaller matters of their departments his colleagues act on their own initiative, but in matters of importance the premier is paramount. He is the Ego, the personality, the ruling power.

(2.) On the same principle I explain the origin of organic modifications. These are not the result of physical causes, as Darwin supposed, but of psychical laws. The physical conditions are the occasions, not the causes, of organic modifications. Organic changes I conceive to

be the result of unconscious psychical action; unconscious because sensation has not reached the chief centre of consciousness, and psychical because sensation, desire and volition are concerned in the production. When certain nerve cells are affected by the conditions of existence the result is discomfort, irritation or pain, followed by a desire for relief, hence efforts are made to adjust the parts affected to their environment. Needs and Efforts are the factors concerned in organic modifications, adverse external stimuli being the conditions or occasions which call these forth. The chief centre of sensation and of consciousness adapts the organism as a whole to the conditions of existence by adopting modes of living suitable to the climate and the amount of energy expended. Thus the inhabitants of the colder regions feed on carbonised food, those in the tropics use only oxygenised food, while those living in the temperate regions partake of both kinds. So the local nerve centres, consciously to themselves, but unconsciously to the chief centre, modify themselves to the conditions under which they may be placed, as, for example, when animals or birds put on a thicker coat of hair, fur or

feathers in winter than in summer, or modify the lining of their stomachs to suit the particular kind of food provided for them. Both cells and organism possess the same power of adaptation. The struggle for existence is not confined to the organism as a whole, but is maintained in every part of it. Lewes, Professors Roux and Weissmann held that the cells of which the organism is composed are in constant warfare with each other, and that those that are best equipped for the struggle drive the others out of existence.

According to Darwin, structural modifications are the result of variations. True; but what are structural modifications except variations of structure? The question is, How do these variations arise? Either they are due to the conditions of existence, or to the nature of the organism, or to both combined. The conditions of existence cannot be a *vera causa* of organic changes, although they constitute an important indirect factor. I say indirect, for the environment is only the condition, or the occasion, not the cause, of modification. It is absurd to speak of a condition as a cause. It is the organism which modifies itself to the

conditions, not the conditions which modify the organism. It is the power of adaptation which the organism possesses which is the real factor in organic modifications.

If all sensation were concentrated in the brain, then all organic action would be voluntary, and every movement of the body would be under the control of the brain. In such a case the visceral and other vital and involuntary movements of the organism would be unintelligible. These latter movements are supposed to be mechanical; but what reason have we for believing that what we call mechanical movements are not controlled by sensation in the same way as voluntary movements are controlled? When the presence of food in the mouth produces saliva, when the same food enters the stomach it produces gastric juice, is it not the contact of the food with the nerve cells that is the cause of these results, in other words, the sensation of touch? Every organic change originates in the cells. The growth, direction or movement of the cells is conditioned by the resistance they meet with. Organic forms are the result of motion of the cells in the direction of the least resistance. Pressure

on the cells in one direction diverts the motion in another direction. But a piece of dead mechanism would not move. It would not be sensitive; it would not adjust itself to pressure. If all life and all growth are cellular, and all structure is cellular differentiation, we are warranted in assuming that, according to the principle of division of labour, and the unity and continuity of nature, the cell exercises functions which constitute it the chief, if not the sole, factor in organic modifications.

(3.) On the same principle I explain the phenomena of unconscious mental action. Unconscious action as I understand it is action which has not originated in, or been conducted to, the chief centre of sensation and of consciousness. It is obvious that there can be no unconscious mental action if the brain be the sole seat of sensation, as consciousness is an invariable accompaniment of sensation. Unconscious mental action, therefore, involves the existence of other centres of sensation, and the mental division of labour provided for by these centres enables us to understand the otherwise inexplicable phenomena of unconscious mental action. The psychical division of labour is

thus capable of wide application. On this principle we can account for the origin of dreams, somnambulism, hypnotism, the spontaneous unreasoned inflow of ideas into consciousness, which we call inspiration, the reproduction and recollection of forgotten events and ideas, and various other mental phenomena.

Briefly, I maintain that mind is a real substance, and not a product, property or function of some other real or supposititious substance ; that sensation and consciousness are not the accompaniments of nerve action in the brain only, but are concurrent with all nerve action whatsoever ; that the brain is the chief but not the sole organ of sensation and of consciousness, or the exclusive medium of communication with the external world ; that the distribution of nerve centres, and their location and functions, provide for a division of labour, which leaves subordinate functions to subordinate centres, preserving the more important functions to the chief centre, whose operations alone are revealed in consciousness as ordinarily understood.

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CHAPTER I

WHAT IS LIFE? Soul?

Definitions of life—The theory of a Vital Principle—Physical and chemical theories of life—The relation of heredity to life—The prodigality of nature in providing for the perpetuation of races—True cause of heredity—The cell—The complexity of the tissue cell—The germ cell—Life not a product, a sum, or a condition—Definition of life.

WHAT is Life?

Many volumes have been written, and innumerable answers have been given, in reply to this question, but so far scientific investigators have arrived at no settled agreement among themselves as to what it really is. The multifarious and divergent definitions may be grouped into two classes, namely, one which describes it as a function, a product or a property of the organism; the other which declares it to be an internal force, the

primum mobile, which actuates it. In the one case Life is the result, the sum or expression of certain physical forces; in the other it is the cause of organic phenomena. The former is the view held by the physicist, the latter by the vitalist.

Lamarck, John Hunter, Dr. Abernethy and other physiologists identified Life with electricity. Dr. John Brown, Dr. Fletcher and Dr. Carpenter maintained that Life is a product, or is the sum of the actions of organised beings.

Huxley, on the other hand, insisted that Life or vitality is a property—a property of protoplasm; and the properties of protoplasm, he explains, "result from the nature and disposition of its molecules"—a not very satisfactory explanation unless we know what protoplasm is, and also "the nature and disposition of its molecules."

Johannes Mueller describes Life "as the influence of a force, existing before the parts, which are in fact formed by it during the development of the embryo," and this force he declares to be "rational and creative." Henle believed it to be "a non-material

agent" associated with the organism, "presiding over the metabolism of the body, capable of reproducing the typical form with endless division without diminution of intensity." Much to the same effect are the views of Haeker, Dumas and Reil. According to Bichat, Life is "the sum of the functions which resist death"—a truism, but wholly inadequate as a definition, as is also that of Lamarck, "that state of things which permits organic movements," and that of De Blainville, "the twofold internal movement of composition and decomposition, at once general and continuous."

Mr. Herbert Spencer's definition is much more elaborate, but not more satisfactory. According to him Life is "the definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external co-existences and sequences"—a definition which would be applicable to many pieces of mechanism in motion. One might as well describe an eight-sided crystal as "an inorganic body which assumes the form of an octrahedron." To the elucidation of this definition Mr. Spencer devotes no less

than three chapters of his *Principles of Biology*. What idea does this definition convey to us? What is it that distinguishes a dead organism from a living one? Changes? Many things change: everything changes. Inanimate bodies, water, sky, the earth beneath our feet, all change, each according to its constitution and the force moving it. A dead organism also changes, and sometimes very rapidly. But while a living organism changes it also exhibits phenomena of a very special kind. It is extremely complex, and maintains that complexity; it grows; it assimilates and dissimilates matter; is many functioned, and yet one whole, self-adjusting self-renewing and apparently self-conscious; it experiences pleasure and pain; it reproduces other organisms like itself. Obviously the difference between a living and a dead body consists in the nature of its constitution, and not in mere external manifestations.

G. H. Lewes's definition of Life is much to the same effect as Spencer's. He admits the similarity, but claims priority in publication. Life, according to Lewes, is a series of definite and successive changes, both in structure and

composition, which take place within an individual, without destroying its identity," and elsewhere as "the sum of the properties of matter in a state of organisation." Such definitions are valueless. What are "changes"? What is changed? Of what do the sums and series consist? Changes, activities, movements are merely indications, and not even essential indications, of life. Cataleptic patients have been known to show no slightest sign of change of any kind for days together, while fishes and worms and other cold blooded animals have been frozen for months without losing their vitality.[1]

Following Henle, Dr. L. Beale defines life as "a power, force or property, of a special and peculiar kind, temporarily influencing matter and its ordinary forces, but entirely different from and in no way co-related with these." This is Vitalism pure and unadulterated. Dr. Beale proceeds to explain that this power, force or property (property of what?) is not mind, "since life exists where brain and nerves, the instruments of mind, are not found." He thus evolves mind from life, not life from

[1] Appendix A.

mind, while at the same time he seems to identify life with mind when he describes the latter as "a vital power of a particular form of bioplasm," and affirms that "the movements of this mental bioplasm" are communicated to the nerve mechanism, while further on he identifies this "mental bioplasm" with the Ego.[1]

Huxley contemptuously describes the theory of a vital force as "illogical and unscientific." Why either the one or the other? If living matter manifests properties not possessed by matter that is not living, a fact which no one disputes, how can it be illogical or unscientific to assume the existence of a special something to account for the existence of special phenomena? I do not hold with the view that life is a special force, but confess I can see nothing either illogical or unscientific in assuming such an hypothesis. The theory held by Bichat, Cuvier, Lewes and physiologists generally, that life is the sum, aggregate or *ensemble* of the various properties of the organism, need not detain us long. According to this view, an organism is a systematic arrangement of parts capable of exercising peculiar functions, and life

[1] *Protoplasm of Matter and Life*, pp. 313, 319.

is the product of the assemblage of these and the association of these functions. In the first place, it assumes the existence of certain organic parts and functions, the sum total of which is said to produce life, while the origin of the separate parts and different functions is left unaccounted for. In the second place, it does not explain how the sum or aggregation of these produces the resultant life and the unity of life, as the mere aggregation of units will not necessarily differ from the individuals which compose the aggregation.

The Physical Theory of Life

Like Huxley and other physicists, G. H. Lewes contends that the ordinary physical forces are quite sufficient to account for the phenomena of life, proof of which he professes to discover in the fact that the fundamental properties of organised matter are recognisable in ordinary matter, and alleges that the only reason why the physicist has hitherto failed in forming a living body is because we have not yet acquired the requisite knowledge to make the proper adjustments and combinations. "If

we can decompose the organic into the inorganic, this shows that the elements of the one are the elements of the other ; and if we are not able to recompose the inorganic elements into organic matter (not at least in its more complex forms), may not this be due to the fact that we are ignorant of the proximate synthesis, ignorant of the precise way in which those elements are combined ?" He goes on to say, "I may have every individual part of a machine before me, but unless I know the proper position of each I cannot with the parts reconstruct the machine." The physicist thus admits that so far he has failed to solve the problem.

Supposing, however, that Nature succeeded where science failed, and that all the diversified forms of life which we see around us are the products of physical adjustments and combinations, then, it must be acknowledged, she has been eminently erratic in her mode of procedure. If life, like some chemical compound, is the result of such combinations, why so careful to preserve existing types ? This, surely, would have been a work of supererogation. Nature has been far from niggardly in providing for their maintenance. Every care

has been taken to prevent the possibility of failure in succession. If a branch of a fruit-bearing tree be partially barked, or a ligature tied tightly round it, or the roots severely pruned, or the tree in any way injured so as to endanger its life, that particular branch, or that individual tree, as if eager to provide for the continuation of the type, immediately puts forth fruit buds to an extent never before attempted. Nature often employs more than one mode of reproduction in order to ensure the succession in type. Numerous plants and animals reproduce themselves by two or more processes. Thus in many species the same plant is capable of propagating by seed, by buds, by tubers, and sometimes also by foliage, so that if from any cause a plant should fail to propagate by one process, there will still be other processes in reserve. This provision is also common in animals of the lower orders. The Protozoa, for example, propagate both sexually and asexually; the Radiolaria by fission and by the detachment of the intercapsular sarcode; the Amaeba, by fission and by the detachment of a pseudo-podon and by the production of masses of sarcode; the Vorticella, by fission,

by emanation, by the breaking up of the nucleus and by endo-genesis division. Then, again, the fecundity of animals, especially those of the lower orders, is extraordinarily profuse. A single cod will in a single year produce a million of eggs ; a single aphid a quintillion in the same period. If not for the preservation of the type, why this extraordinary fecundity ? Why these provisions to ensure the succession of types if organisms can be manufactured, so to speak, by simple addition *ad libitum* and in infinite variety by mere combination ? One must assume that contrivances and adaptations of various kinds which now exist for the perpetuation of types are not resorted to unnecessarily. According to the physical theories referred to, there would have been no transmission of parental likenesses, and no fixity of type ; but only a chaos of unstable individualities, unrelated to each other and incapable of association.

Heredity in Relation to Life

Another difficulty, if we take the physicist's view of life, is Heredity. Haeckel seeks to

account for the transmission of ancestral qualities by a molecular process which he calls the "perigenesis of the plastidules," which he describes as "a developing impulse," transferred from the ancestral cell, and which he conceives as assuming the form of "a branching wave motion."[1] Berthold, followed by Gautier and Giddes, on the other hand, adopts the chemical theory, and asserts that inheritance is to be explained on the basis that in the chemical processes carried on within the organism "the same substances and mixtures of substances are reproduced in quantity with regular periodicity."

To all such theories Du Bois-Raymond's question is a sufficient reply. "How," he asks, "can a number of senseless carbonic, nitrogenic, oxygenetic and hydrogenetic atoms be otherwise than indifferent to where they are placed or how they are moved? We

[1] We must be careful not to take Haeckel too seriously. He is a past master in the coinage of phrases which often represent nothing but his own imaginings. His vocabulary, like Wisemann's, forms an amazing collection. It includes cell souls and soul cells, tissue souls and nerve souls, psychical cells and will souls. His "plastitudes" he himself describes as purely "hypothetical."—*The Riddle of the Universe*, p. 122.

can in no way imagine how their mere interaction can beget in them consciousness." Some recent experiments on the influence of low temperatures on bacterial life, conducted by Sir James Crichton-Browne and Professor Dewar, would seem to dispose of the chemical theory of life. A typical series of bacteria were employed for this purpose which were first exposed to the temperature of liquid air for twenty-four hours—about 190 deg. C.—and in no instance was there any impairment of the vitality of the organisms. The organisms were again subjected to the same temperature for seven days with a like result. The same series of organisms were next subjected to the temperature of liquid hydrogen—about 250 deg. C.—a temperature at which molecular movement and the entire range of chemical and physical activities are supposed to cease, and far below that at which chemical action is known to take place, and yet the bacteria survived. These experiments, therefore, go to show that life is not dependent on chemical reactions.[1]

[1] Lecture before the Royal Institute of Great Britain by Dr. Allan Macfadyen.

Professor Hering presents us with another theory of heredity. He regards memory as a function of organic matter, and the reproduction of parental likenesses as the result of the "unconscious recollections of the past," the basis of which he professes to have discovered in the persistence of the "undulatory movements," which he supposes to be characteristic of molecules. But if the "undulatory movements" are an efficient cause, why increase our perplexity by adding the mental concept—the "unconscious recollection of the past"? "Unconscious recollection," moreover, is an absurdity. That there may be unconscious registration of events, and unconscious reproduction of these events, but not unconscious recollection, as recollection implies consciousness, is a view which is as old as Aristotle. We cannot recollect an event without being conscious of it as a prior experience. Haeckel also calls to his aid a similar factor, which he terms "organic memory." But memory is not a physical, but a mental, attribute, and we might as well speak of "organic mind" or "body mind," as of "organic memory." Either the physical theory is adequate, or it is not. If

adequate, there is no occasion for supplementing it by a new and incompatible factor; if inadequate, it should be abandoned altogether. Indeed, the adoption of a concept of this nature is a flagrant abandonment of the physical theory. Moreover, the theory of organic memory is in this connection quite untenable. Historically, we are able to trace a long series of likenesses from remote ancestors, and it is therefore assumed that the likenesses are causally connected with memory. But memory is a looking back, while the transmission of type is a looking forward. We have therefore to reverse the position and trace the succession onwards from the primordial organism which left its impress on its posterity.

Some physicists contend that heredity is due to the conditions of existence, as like conditions produce like effects. But if environment were a determining factor, how is it that we find organisms of a widely different character existing side by side, each appropriating different materials from the same external medium, the vertebrata, for instance, assimilating the phosphates, the mollusca the carbonate of lime, the articulata chetin, and each with these building

a different edifice? Obviously, the assimilation of the material, and the consequent character of the structure, is determined by the nature of the organism, and not the organism by the nature of the external medium. No doubt the formative impulse is conditioned by the environment, but a condition is not a cause.

The True Cause of Heredity

The phenomenon of heredity may be accounted for by the simple process of cell-division. All life originates in the cell; all reproduction takes place by the division of the cell. In cell division each half of the divided cell is exactly alike, and so the qualities of the original cell are necessarily transmitted to the cells produced by division. That which moves the cell to self-division, to the parting of half its substance for the benefit of posterity, we assume to be an impulse not of its own creating, which we may describe as a self-perpetuating instinct. This instinct may be observed in full vigour in annual plants, which die as soon as they have matured their seed, as

if they lived only for this purpose, and in many insects which die immediately they have consummated the act which secures the perpetuation of their species.

The Cell

If we would understand what life is we must go back to the cell. The cell of a multicellular organism differs in no respect from a unicellular organism, except that the former leads a double life (in relation to itself and to other adjoining cells), while the latter has an independent existence. That the cell possesses some degree of feeling can hardly be disputed ; if the feeling is pleasurable, there should exist the power of conserving or increasing it ; if painful, and it cannot be diminished or relieved, it must result in modifications either qualifying it to resist the suffering or causing it to sink under the burden. If it can feel, it must possess other mental powers if only in a rudimentary form. As Hegel said, "Everything is in sensation."

Of course I shall be told that nothing so low down in the scale of life as a cell is capable

of mental action, and I am aware that in holding a contrary view there are high authorities against me. If it be contended that nerves and brain are necessary to mental functions, I reply that zoophytes and other infusory organisms possess neither nerve nor brain, and yet they display feeling, and even intelligence, in their movements. We might with equal reason assert that because certain animals have no special organs of sight or of hearing, that they are insensitive to light and sound, which would be incorrect, as every student of Binomics knows. That special organs of sense are advantageous no one will dispute, but the difference between these special organs and the general organ of touch (which includes them all) is one of degree only, not of kind. So it is with regard to nerves and brain. We have no grounds for asserting that such sensibility as unicellular organisms possess differs in any respect from that of animals of a higher grade except in degree. Place a polype in a glass of water along with a living infusorian, and the former, without any special organ of sense, somehow sees the latter, and thereupon raises a whirlpool with its tentacles

in order to bring it within its grasp and devour it. Apparently the monad has the sensation of hunger, as it searches for food; it has discrimination, as it selects the proper food it requires; it has volition, as it seizes and devours the food it has selected. It is now acknowledged that nerve cells and nerve fibres are nothing more than protoplasm developed in a particular manner.

Descartes held, what is now considered to be an extreme view, that all animals other than man were only a superior class of automata, eating without pleasure, dying without pain, desiring nothing, knowing nothing, and only simulating intelligence as the bee simulates a mathematician. "I desire," said Descartes, "that you should consider that these functions in the machine naturally proceed from the mere arrangements of its organs; neither more nor less than the movements of a clock or other automaton, from that of its weights and wheels; so that, so far as these are concerned, it is not necessary to conceive any other vegetative or sensitive soul, or any other principle of motion or life, than the blood or the spirits agitated by the fire which burns continually in the heart,

and which is in no wise essentially different from all the fires which exist in inanimate bodies." From the evolutionist's point of view, Huxley's reply to this is conclusive, namely, that the unity and continuity in nature forbid such a view, and the argument has equal force against those who contend that even the lowest organisms are incapable of mental action. The evolutionist cannot logically permit any break in the mental continuity between the monad and man.

In the whole world of nature there is nothing so wonderful as the cell. It alone possesses life. A compound or multicellular organism is only an aggregation of living cells; all else is dead or formed matter, the product of these cells. A monad, which is a unicellular organism, has no visible structure, no organs of sense, of locomotion or of prehension, not even an organ of digestion. It throws out processes from its body to seize its food, and, having secured it, forthwith wraps its body around it and digests it. But other cells have improved on the method of the monad, for they have associated themselves into compound organisms, and have constructed separate organs

for the discharge of separate functions ; they have, in fact, established a system of division of labour whereby the work is more efficiently executed, and at less expense than if each cell performed the whole for itself.

If an elementary body like a monad possess intelligence, we may well assume that this attribute will not be absent from these other cells which proceed to lay out their work in such a business-like manner. Are we to suppose that the cell has no share in the building up of its own organism ? That is the common belief. Those close observers of plant life, Kerner and Oliver, however, have no hesitation in stating that "the walls of plant cells themselves are the work of the protoplasts, and that it is not a mere phrase, but a literal fact, that the protoplasts build their abodes themselves, divide and adapt the interiors according to their requirements, store up the necessary supplies within them, and, most important of all, provide the wherewithal needful for nutrition, for maintenance, and for reproduction." [1] It is in the cell that the mysteriously equipped and wonderfully complex human organism has its beginning. If we reject

[1] *The Natural History of Plants*, p. 42.

the physical theories of life, are we to fly to the other extreme and maintain that every step in the formation of this organism is due to an Omnipotent Power, or to what Lotze, with fine metaphysical flavour, calls the "interaction of the Absolute"? Is it not more rational to assume that the cell has been endowed with the power to form its own organism?

The reader must bear in mind that the cell is not a simple homogeneous jelly speck, with a cell wall, or that it is a quiescent molecule of matter. On the contrary, it is a complicated mechanism and the centre of extraordinary activity. When protoplasm was first discovered it was believed to be nothing more than a simple homogeneous mass of jelly-like substance without any kind of structure, and it was fondly supposed that in this would be found the basis of life. Improvements in the microscope and more careful observation, however, led to the discovery that the contents of the cell consisted of other things besides protoplasm, and the attempt to solve the problem of life by chemical analysis and synthesis was accordingly abandoned. It was found that the cell, so far from consisting of

a simple homogeneous substance, possessed a most complex structure undreamed of by earlier observers. Inside the cell wall, long believed to be the most important part of the cell, there was discovered a mass of reticulated fibres, consisting of minute threads, and within the meshes of this a clear transparent fluid or protoplasm, together with granules called microsomes, small thread-like objects termed chromosomes, believed to be connected with the process of cell division and heredity, and two objects like double stars on each side of the nucleus, which displayed extraordinary activity. The nucleus also was found to be a much more complicated piece of mechanism than was formerly supposed, and is now regarded as a fundamental part of the cell. From experiments made on unicellular organisms it has been found that a cell deprived of its nucleus is incapable of assimilating its food or of reproduction. Within the nucleus there are also two small bodies called nucleoli, which perform certain vital functions, and a granular material called chromatine, which has the power of absorbing stains. Altogether the cell is now recognised

as an organism of a very complex character, possessing all the physical properties of a multicellular body, such as irritability, sensitiveness, contraction, assimilation and dissimilation (metabolism), and reproduction. Moreover, the contents of the cell are, under a powerful microscope, seen to be in a state of great activity. The protoplasm is in constant motion, now moving in one direction and now in another, swerving suddenly from left to right and from right to left, carrying along with it the granules, nucleus and other contents of the cell. The movements seem perfectly spontaneous, and are not the results of a jar, shock or stimulus from without, but are to be regarded as movements proper to the protoplasm. Dr. Beale witnessed under a powerful microscope some minute amœbæ, several less than 100,000th of an inch in diameter, in a state of most active movement, the alteration in form being very rapid, and the different tints in the different parts of the moving mass were most distinctly observed.[1] From all this one can conclude that in the lowest, as in the highest, forms of life, within the protoplastic

[1] *Protoplasm*, p. 50. See Appendix B.

envelope, as without, there is present a formative energy, which fashions the mechanism of the body, and maintains that mechanism in motion.

What Life is

Life is not a mechanism, nor the result of a mechanism. An organism may have every tissue intact, every organ perfect, and all its connections complete and in proper order, and yet it may be dead.[1] Nor is life a state, or the condition of an organism. Virchow held that it was a state of irritability: Lewes that it was

[1] There may be said to be two modes of life, an actual and a potential. Actual life is manifested in plants and animals, potential life in seeds, which may live for an indefinite period if excluded from the disintegrating effects of the atmosphere by being enclosed in air-tight capsules. Fishes, frogs and worms, which have been frozen hard in solid ice, and have thereby been effectually excluded from the atmosphere, have in many instances been restored to actual life by careful thawing. Seeds and frozen animals may therefore be said to have potential life, which may become actual life under certain conditions. An elevated reservoir may in like manner possess potential power; it may drive a mill or a dynamo if the proper connections are made, but the reservoir, even with its connections, would not be of the slightest service without the force of gravitation; and an organism, however perfect its mechanism, can never possess more than potential life unless it has a life-giving force.

a state of sensitiveness or sensibility. But a state, not being a force, can effect nothing. An organism may even be insensitive, and yet be alive, as in the case of syncope and suspended animation; and it may be sensitive and yet not alive, as a dead body will exhibit sensitiveness when an electric battery is applied to it. The difference between a living body and a dead body is not that the one is sensitive and the other insensitive, but that the former resists decay and the latter does not. Bichat's definition of life, as "the sum of the functions which resist death," is good as far as it goes, but it does not go far enough, for what are those functions he refers to which resist death?

Life is the resultant of a process, or rather of two processes. There is a process which results in decay, and there is another process which resists decay, and life may be said to be the resultant of these two processes. Exposure to the oxygen of the atmosphere will disintegrate any organism, living or dead: the living organism resists disintegration, and the dead organism offers no resistance. Oxidation and nutrition are the two processes that are constantly in operation in every living body. Oxidation is

waste and decay; nutrition counteracts the effects of this waste and arrests decomposition.

Reference has already been made to the theory of a vital principle. If by this is meant an entity which is neither physical nor mental in its character, I must demur to the theory. I believe that vital phenomena may be accounted for without having recourse to an unknown principle or entity such as this is. Aristotle went even further than the vitalist in his endeavour to account for the phenomena in question, for having assumed that there were three kinds of life—a vegetative, animal and mental—he provided each with an independent soul. The well-known canon, that it is undesirable to multiply causes unnecessarily, is especially applicable in this case. We want but one theory of life, which will embrace all vital phenomena, but one cause which will account for all modes of life. I shall here endeavour to indicate such a cause.

We may conceive of a mind of a low order, semi-conscious, without perception, and with no other attributes except Appetency and Will. Such a mind we may suppose to belong to the lowest orders of the vegetative and animal

kingdom. Grant this much, and we may proceed to indicate the relations of such a mind to life.

In every being there exists an impulse to withstand aggression, to fight against adverse circumstances, to strive to provide for unsatisfied wants—in a word, to resist extinction. This *vis resistendi* is mind in its embryotic or rudimentary stage. We assume that there are orders and degrees of mental capacity as there are orders and degrees of corporeal complexity and efficiency. In plants we have the simplest of all organic structures—a mere series of cells; in man a most complex system of tissues and organs. In plants we have intelligence of the lowest order, in man of the highest. To resist disintegration some kind of force is obviously necessary. No action is possible without effort. No being can live by simply doing nothing, for inertion is death. It is impulse that turns the plant to the sunlight and sends its roots long distances in search of moisture. It is the same impulse which compels man to provide for his material, social and mental wants at an ever increasing ratio. It is this conservative force which the older physiologists recognised as *vis*

medicatrix, which was supposed to play such an important part in maintaining the integrity of the organism, and it is this same impulse which has now become familiar to us as the "struggle for existence." I consider that it is this impulse which produces the phenomena which we call life. In a future chapter I will endeavour to show how this impulse operates in organic modifications or the origination of species.

If, as biologists assure us, all life is in the cell, that the cell is the only part of our organism that is alive, it is vain to look for life elsewhere than in the cell. What, then, is it that animates the cell? I believe it to be this primordial impulse I have described.

It may be objected that life is not identical with mind. True, to live is not the same as to think; to be alive is something less than to be conscious. But thinking and consciousness are special developments of the primordial mind, and with special developments come specialisation of functions. All mental faculties do not rank alike even in the same individual, and do not perform the same functions. There is a wide gap between mere impulse and the higher attribute of perception, and so there is also

between simple sensation and the reasoning faculty. I believe, therefore, that it is the action of this primordial mind, this integrating, formative energy, conceived of as Appetency and Will, which constitutes life. In this sense I consider that Life is a function of mind.

CHAPTER II

REFLEX ACTION

Reactions and their character—Ganglionic responses—The functions of the nervous system—Phenomena exhibited by decapitated animals—Cerebral responses—Mr. Herbert Spencer on conscious and unconscious reflex actions.

Reflex action is regarded by physiologists and psychologists alike as purely physical, like the rebound of an elastic ball, or the reaction of chemical agents. It may be described as the response which a ganglion cell makes through its efferent (outgoing) nerve to an impression conveyed to it by its afferent (ingoing) nerve, the whole constituting what is called a nervous arc or circle ; the impression on the ganglion cell, not being passed on to the cerebral hemispheres, is said to be unconscious, and it is therefore assumed that the response or reaction of such ganglion is a purely automatic process. Understood in this sense, I submit that there is no such thing as reflex action.

Reflex action consists of two distinct processes—(1) an external stimulus conveyed to a ganglion cell, and (2) a response by the ganglion cell to that stimulus. The first may be described as physical, but not the second, which I regard as psychical. It is generally supposed, however, that both processes are physical, and that only when the stimulus reaches the cerebral hemispheres the reaction which follows becomes psychical, and is accompanied by consciousness. In my opinion every response, whether transmitted by a ganglion or by the cerebral hemispheres, has a psychical content, and is accompanied by consciousness, and the psychical content with its accompanying consciousness pertains to the responding centre, whatever that may be.

It would be begging the whole question to conclude that because the reaction of the ganglion is local, and not cerebral, it therefore possesses no psychical content. If a ganglion receives a stimulus and responds to it without reference to the cerebrum, the only inference to be drawn is that the ganglion acts independently of the cerebrum, which leaves the question as to the character of the response unsettled.

On the other hand, it may be assumed from the fact that the stimulus is not conveyed to the cerebrum that the matter is of local interest only, and is therefore within the scope of the functions of the local ganglion. As a rule, a slight stimulus seldom proceeds beyond the local nerve centre, while a violent excitation will reach the supreme nerve centre, and so affect a larger area. Tickle a sleeper's foot lightly and he will withdraw it; increase the stimulation and the nerve excitation will extend to the brain, and he becomes conscious and awake. Touch lightly any spot on the outside of the shell of a sea urchin, and the spines in the neighbourhood will bend towards that spot; but if the shell be irritated, the spines of the other segments will come into play, and the animal will move in a straight line away from the point of irritation. The animal thus exhibits two forms of activity—the one a merely local response to a stimulus, the other a co-ordinated response of the whole organism. The former is controlled by the local ganglia alone; the latter by the supreme centre, corresponding to the brain of vertebrates.

Ganglionic Responses

On what principle do we concede psychical action to the cerebrum and deny it to the ganglion? What evidence is there to justify an artificial severance of the nervous system, which is and acts as one whole, into two parts so differently endowed? The distinction cannot be defended. The mechanism is the same in both cases. In both there is a nerve centre, in both there are afferent and efferent nerves, and in both there is a nervous arc or circle, and the ganglion responds to an impression apparently in the same manner as the cerebrum responds to any stimulus which reaches it. In the latter case it is admitted that there is, first, the sensation, then perception, and lastly volition. Have we any reason to believe that the same process does not take place when the ganglion responds directly to a stimulus without reference to the cerebrum? That the response is prompt and almost instantaneous in the latter case only shows that the mechanism is in good working order, and that the distance traversed is shorter. That we are

conscious of the brain process, and that we are not conscious of the ganglion process, does not affect the question in the least, as, for aught we know, the ganglion may have a consciousness of its own. Consciousness is a purely personal matter. An individual cannot be conscious of another individual's consciousness. Consciousness is not a faculty, it is the cognition of an individual's feelings or experiences. I am that of which I am conscious, no more and no less. My feelings, or rather my knowledge of my feelings, constitute myself.

The simplest nervous system is that of the ascidian, which consists of a single ganglion, with nerve fibres branching out from it in several directions. (Fig. 1.)

These nerves or fibres are either afferent or efferent (some authorities maintain that each nerve is both afferent and efferent), and they vary considerably in number. Now, suppose a stimulus is conveyed from some outpost on the periphery of the organism to a ganglion or nerve cell from which fibres radiate, the ganglion has to determine — first, the quarter from which the stimulus has come;

secondly, the nature and urgency of the stimulus; thirdly, the character of the response required of it; and, lastly, through which nerve or channel it will send that response. In the case of an animal with a complicated nervous system, such as a vertebrate, it will

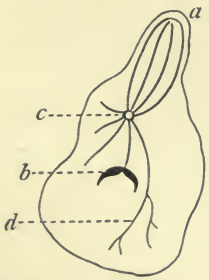

FIG. 1.—NERVOUS SYSTEM OF THE ASCIDIAN.

(a) Mouth; (b) The Vent; (c) Ganglion; (d) Nerves.

also have to be decided whether the matter is of sufficient importance to require to be referred to the cerebrum. The fact that there are usually several nerves connected with even a single ganglion renders the process a most complicated one. The response involves even a greater amount of intelligence than that of an operator at a central telegraph station, who has only to receive a message from one out station and forward it to another without

requiring to understand its meaning. The simplest ganglionic reflex action would, therefore, seem to involve the exercise of mental faculties. Even the reaction of the muscles of the back of the mouth to a stimulus is not effected without discrimination and will. Touch the back of your mouth with a feather, and a convulsive contraction of the gullet is the result, probably followed by vomiting; but the same nerve centre responds in a totally different fashion if the stimulus comes from the pressure of food. The nerve centre distinguishes; and what makes distinctions except intelligence? Even such so-called reflex actions as sneezing or coughing are caused by excitations in the respiratory organs, and are really intelligent efforts to expel substances from the air passages.

There is, indeed, direct evidence to show that ganglionic reaction is not different in kind from cerebral reaction. The well-known experiments on decapitated frogs and other animals is usually cited as conclusive evidence in favour of physical reaction. But they prove the very opposite. If the foot of a decapitated frog be pinched, the frog will withdraw

its foot, or it will endeavour to remove itself from the source of irritation. If acetic acid be applied to the inner part of the thigh, the foot on the opposite side will wipe it away; and, if that foot be cut off, the same movement will be made by the other foot. Hundreds of experiments of this character have been made on decapitated animals with similar results. But they all demonstrate the opposite of what they were intended to prove. The cerebrum is assumed to be the sole organ of psychical activity, and any action, therefore, on the part of the decapitated animal must, it is supposed, be of a purely physical character. But that is begging the whole question. Let us look at the facts. It is beyond a doubt that in the case quoted the foot felt the pinch, and the foot is consequently withdrawn; that the thigh felt the pain caused by the acetic acid, and an endeavour is made to wipe it off, first by one foot, and, when that is cut off, then by the other. Here we have exhibited feeling, perception and volition, all distinctly psychical phenomena. In such cases there could, of course, have been no cerebral action, as the cerebrum had been removed, but there was undoubtedly psychical

action : the stimulus was carried along an afferent nerve to a ganglionic centre, and from thence along an efferent nerve to the muscles, thus producing the effects we have described. The true test of a psychical action is its teleological content—aim, and adjustment of means to ends to attain that aim. A purposive action must be regarded as a psychical action, and all so-called reflex actions are purposive.[1]

Cerebral Responses

We are not warranted in affirming that the ganglia of the cerebrum are in any respect different in their structure, composition or function from the ganglia in other parts of the organism. It is possible that the former, being in close contact with each other, and being the centre of communication with the ganglia in all parts of the organism, may thus be able the more effectually to co-operate for the discharge of more complex psychical functions than the latter ; but the mere massing or aggregation of ganglia in the cerebrum

[1] See Appendix C.

cannot alter their character or their function. Multiplication of like units leaves them units still. A man in John o' Groats in no respect differs from the man in London; but the latter has special advantages in being in closer association with his fellows, and in being in constant communication with all sections of the community. All ganglia alike receive and respond to stimuli, and, as I maintain, in the same manner, so that we cannot affirm of one set of ganglia that its action is automatic and of the other that it is psychical and conscious. The cerebral responses are just as much automatic as are the ganglionic. Indeed, physiologists speak of the reflex action of the brain and of mental automatism as freely as they do of the reflex action of a ganglion, and with quite as much reason.

Spencer's Theory of Consciousness

Reflex action is the basis of Mr. Herbert Spencer's system of Psychology. In his opinion all forms of psychical activity have been developed from reflex action. According to him we have first single reactions; then compound; then

more compound ; then instinct steps in, which consists of reflexes still more compounded ; and, last of all, reflexes of an order still more compounded and complicated, resulting in mental activity. This is how he explains the genesis of consciousness :—

"In reflex action of the earliest kind, a single stimulus at the periphery of an afferent nerve sends a wave of molecular change to a nerve centre, whence, through ready made channels, the wave instantly escapes in a more or less augmented form along an efferent nerve and excites some organ or organs . . . and such fully established reflex action, not delayed a moment in its course, is unconscious. A compound action that is fully established . . . is also unconscious —the passage through the central plexus not occupying the time which cousciousness implies. But compound reflex action, in which the co-operating stimuli produce the combined motive impulses only after a pause, caused by the incompleteness of the permeability of the central plexus, may be presumed to have some accompanying consciousness. Each compound reflex action, accompanied at first by consciousness, but made by perpetual repetition automatic and unconscious, becomes a step towards reflex action still more compound. These, during their stage of partial establishment, imply consciousness that is somewhat more complex and varied than the earlier consciousness which has been lost in automatic action." [1]

[1] *Psychology*, vol. i. pp. 559, 560.

Here a single reflex action is described as unconscious; a compound reflex action is also unconscious, but it may be accompanied by consciousness under certain specified conditions; that is to say, if "the molecular wave of change" in its passage through the central plexus is delayed owing to the incompleteness of the impermeability of the plexus, the process may be assumed to be accompanied by consciousness. Elsewhere Mr. Spencer defines reflex action as "the sequence of a single contraction upon a single irritation."[1] It would appear from this that he regards reflex action as a purely physiological process. A compound reflex action may therefore be described as a multiple contraction upon a multiple irritation. There would be no difference in kind between a single reflex action and a compound reflex action. Add bricks to bricks and the result is bricks. A house is made of bricks; but the intention, the will and the skill which their construction evidences, point to the introduction of another and entirely different factor, which is not in the bricks, but which uses them for its purpose. Why, then, should

[1] *Psychology*, vol. i. p. 427.

it be assumed that a compound reflex action may be accompanied by consciousness and a single reflex action not be so accompanied? Because of the "pause" in the passage from the central plexus to the periphery, says Mr. Spencer. But why should consciousness be conditioned by a "pause"? There is here no self-evident connection between the condition and the resultant; nor is it obvious how consciousness comes on the scene at all. When there is a "pause," owing to the organic connections not being fully established, he tells us that reflexes are accompanied by consciousness, and when these connections are fully established, and there is no longer a "pause," that consciousness disappears. There is here no continuity of the conscious life. Consciousness begins with a "pause," and it ends with the absence of a "pause." No doubt the organic connections are necessary. When fully established they facilitate the transmission of messages between the end organs and the nerve centres, and, *vice versâ*, between the nerve centres and the end organs. But their establishment, or disestablishment, should not involve the existence of consciousness.

To me it appears that consciousness manifests itself only when the nerve centres respond to the message transmitted by the end organs, and not before. Mr. Spencer also supposes that this curiously acquired consciousness may at last be lost, as compound reflexes by perpetual repetition again become unconscious, and thus we are brought back to where we started from—minus a Psychology.

It seems to me that the principle of unity and uniformity in nature demands that every nerve centre should be recognised as an organ of psychical activity, that what holds good of one ganglion, wherever situated, should hold good of all, whether single or in masses. Some animals have only one ganglion; some have more than one, and others have large aggregations of them. Quality, not quantity, should be the criterion. A single ganglion in one animal may be as indispensable to that animal as a million of them may be to another animal; and so one ganglion at the periphery of an animal should be as necessary to the locality over which it presides as a mass of ganglia to a wider area in the same organism. It is admitted by physiologists that the sensory

ganglia, which form nearly the entire Encephalon of fishes, are homologous with the Cephalic ganglia of Vertebrates, and as such are the organ of consciousness;[1] and it would therefore be correct to assume that the single ganglion with which many animals are alone furnished is also homologous with the Cephalic ganglia; and if the sensory ganglia are, in one case, the organ of consciousness, may we not also assume that all ganglia subserve the same purpose?

The fact that a ganglion often acts without reference to the cerebrum does not support the view that its action has no psychical content. The ganglia outside the cerebrum have a more limited range of functions than those which are massed within it; but that has no bearing on the question at issue. That the functions of a provincial council are limited to matters within its own province, while those of the central government embrace the whole community, does not constitute a difference in kind, but only in degree. Like the provincial council, the outside ganglia act on their own initiative in purely local affairs, only communicating with the cerebrum on matters of vital interest to the

[1] Carpenter's *Comparative Physiology*, p. 691.

organism ; while on the other hand, the cerebrum, being in communication with all the ganglia, is in a position to determine what is good for the whole, and to act accordingly. The arms of the cuttle fish are provided with numerous contractile suckers, and each individual sucker has its own ganglion. In consequence of this arrangement, every individual sucker may be made to contract of its own will, and attach itself to any substance without communicating with the supreme centre ; and this action will take place when the arm to which the sucker is attached is separated from the body. If mental activity is invariably associated with molecular motion in the ganglia of the brain, we are justified in assuming that it is also associated with the action of the ganglia elsewhere. In reflex action so-called an excitation is followed by a response ; so it is in conscious action. In reflex action an afferent nerve moves a ganglion or nerve centre, and the nerve centre responds through its efferent or motor nerve, forming what is called an arc or circle. Precisely the same process takes place in conscious action, only that the circle is wider, the excitation being transmitted from the periphery to

the central hemispheres, and thence back to the periphery, while in so-called reflex action the distance is much shorter. If, therefore, the ganglia in the hemispheres are in no respect different in constitution from the ganglia elsewhere, and their mode of responding to excitations is the same, why should we imagine that their functions are so widely different? Why intrude so foreign a conception merely to satisfy preconceived theories? There is nothing in any recorded observations to support them. If there is any analogy between a nerve cell (which is merely a more sensitive cell than the tissue cell) and the social unit, we must assume that the former, like the latter, actively participates in the maintenance of the organic community. Physiologists draw a line of demarcation between the central and other ganglia; such movements as reflex action, the muscular contraction of the heart, the peristaltic movements of the intestinal canal, which are not controlled by the conscious will (the Ego), they say, have no psychical content—are, in fact, the result of physical or chemical agencies. But we cannot divide the organic forces in this fashion and unwarrantably assert that this part

is controlled by will and that other part by physical and chemical forces. We might with equal propriety divide the social unity into two classes, and one we may describe as men, the other as marionettes.

If, however, we adopt this classification, and divide all organic movements into either voluntary and conscious, or involuntary and unconscious, we have to ask, What is that power which produces involuntary movements? To will to move one's arm is a voluntary and conscious act, but one cannot will the peristaltic movements of the intestinal canal. The latter movements Sir James Paget ascribes to what he calls "rhythmical nutrition,"[1] which is just as good an explanation of the phenomena as any I have met with. To assert that they are due to reflex action does not help us in the least, for we still want to know what causes reflex action; and the further assertion that "the ganglionic cells have an independent power of action"[2] has no meaning, unless we are to understand by this statement that such cells have the power of action possessed

[1] Croonian Lecture before the Royal Society, 1857.
[2] Maudsley's *Physiology of Mind*, pp. 136, 145.

by Cephalic cells, which is what we contend for.

It may be objected, however, that if there were two or more centres of psychical activity in the same body, there would be two or more separate and independent powers, which is absurd. There may be two or more separate, but certainly not independent, powers. There are subordinate nerve centres, and there is a supreme nerve centre, just as there are local centres and a supreme centre in the social organism.[1] In like manner, we may assume there are local psychical centres, as we know there is a supreme psychical centre. Almost all physiologists now admit that there is in all organisms, except the lowest, at least one other great centre besides the cerebrum, namely, the spinal cord. Maudsley held that the spinal cord exercises volition ; Vulpian, that its action is systematic, adaptive and intelligent in every instance ; while Greisinger, Prochaska, Nasse, Carus, Schiff, Legallois, Landry, Laycock, Carpenter and Lewes maintained that the actions of the spinal cord are of the same order as those of the cerebrum. If it were necessary

[1] Appendix D.

one might take, seriatim, the other sub-centres between the cerebrum and the spinal cord, and show how each of these has its own psychical functions, and thence proceed to exhibit the psychical functions of the ganglia elsewhere. But, once admit that there are more centres than one, and the objection falls to the ground; and if more than one, where are we to stop? How are we to draw a line between a ganglion in the cerebrum, another in the spinal cord, and a third at the periphery?

CHAPTER III

CONSCIOUS AND UNCONSCIOUS STATES

The term Conscious—Evolution of the nervous system—On the co-extension of mind and consciousness—Objections to this view—What is herein involved—Evidence in favour of unconscious mental states—The phenomena of alternate consciousness—Limitations of the Ego—Correspondence between the sub-centres and the hemispheres—The Unconscious.

STRICTLY speaking the term consciousness can be applied only to our own individual feelings and experiences, not to the feelings and experiences of others. I may say I am conscious that I entertain no ill feeling towards a certain person, but not that I am conscious that a certain person has no ill feeling towards me. Consciousness is a wholly personal matter. The term is used to indicate the state of the knowing subject, the conscious self, the Ego. Hence it is inaccurate and often misleading to use it to denote psychical activity generally,

or as a synonym for mind, as is often done. But we have to retrace our steps.

All organisms consist either of a single cell, or of an aggregation of cells, and all multicellular organisms begin life as a single cell, which divides and redivides, and so multiplies into a coherent mass of cells forming a compound organism. All the cells in this compound organism having orignated in a single germ cell, and been propagated by division, would, in the first instance, be exactly alike in composition, structure and disposition, and would therefore have a common ideal, and would work for a common end. But as the structure developed a division of labour would take place, different cells would exercise different functions, and eliminate different materials from their environment for the building up of the organism. Thus, modifications in the composition and in the character of the cells would, in course of time, arise, and so a cell which produces muscle tissue would differ from a cell producing fat or bone or nerve tissue. Cells would also assume different shapes according to the position which they occupied in the tissue, owing to the presence or absence of strain or pressure on

the parts. Some cells would also be called upon to perform higher functions than others in the cell community, and these being endowed with higher capacities, there would arise a hierarchy of cells. In this hierarchy the nerve cell occupies the place of honour.

But something more than the formation of various kinds of tissue and organs would still be required. The organs have to be adjusted one to another, and to the organism as a whole, so that each part may promptly co-operate with every other part for a given end. In an organism in which no rapid movements are necessary, as in a plant which is rooted in the ground, there would indeed be reciprocal dependence of parts, but each individual cell would act on the adjoining cells only, and there would be no necessity for a nervous system ; so also a unicellular organism floating in its watery element has no call for exertion, as its food is brought within reach ; and for the same reason free moving animals, when they become parasites, lose the use of their sensory and locomotive organs, as these are no longer required in their struggle for life. It is different with animals which have to search

for their food and protect themselves from their enemies. Keen sight, hearing and scent then become necessary, along with a capacity for rapid movement, either for offence or defence. Under such conditions a nervous system becomes indispensable, in order that each part may instantly communicate and co-operate with every other part. Hence, also, the more active the life, the higher the nervous organisation required.

The Nervous System

A nervous system may consist of a single ganglion, with its attached fibres, or of groups or centres of ganglia, with their associated fibres, which serve as means of communication between the various parts of the organic structure over which they preside. These centres are generally classified into two main divisions, called respectively the Cerebro-spinal and the Sympathetic systems. The other ganglia are not included in this classification. The Cerebro-spinal, or, as I shall here call it, the Cerebral system, consists of the cerebral hemispheres, which are situated in the cavity of the skull at

the apex of the spinal column. Below the cerebral hemispheres there are sub-centres consisting of the Medulla Oblongata, the Corpora Striata, the Thalami Optici and the Cerebellum; and below these again the Spinal marrow. It is not necessary to discuss here what precisely are the functions of the sub-centres, nor is it yet accurately known what these are. It is sufficient for our purpose to state that they are connected and co-operate with both the cerebral hemispheres above and the spinal marrow below. The Sympathetic system is situated in the front of the spine, in the thoracic and abdominal cavities from which radiate a series of trunks and branches of nerves to the muscular wall of the intestinal canal, the various glandular organs, the heart and the great blood vessels, the organs of reproduction and other viscera. The sympathetic system is not entirely distinct from the cerebral, as it is connected by means of fibres and fibrils at several points, which provides for a limited amount of communication and co-operation between the two systems; but, as Kölliker has pointed out, the sympathetic generally acts quite independently of the cerebral system, and Kirke, Landois and

Bastian take a similar view. Outside of these two systems there are smaller nerve centres, or ganglia, which, owing to their being dispersed over the organism, can hardly be called a system, but are nevertheless very important. First in order of time come the ganglia, singly or in pairs ; next the sympathetic system, and last of all, but first in importance, the cerebral system. It would appear, therefore, that in the course of time nerve centres which were once supreme have had to take a lower position.

Composition and Structure of Nerve Cells

It was at one time believed that essential differences existed between the various ganglia, more especially between those of the sympathetic and of the cerebral systems, but Jacubowitsch and Virchow have demonstrated that there are no differences whatever. Yet, though the ganglia in the hemispheres are of the same composition and structure as are those in other parts of the organism, it may be noted that they exist in larger masses, and are more closely packed in the brain than in any other part of

the organism, and this concentration of ganglia in the hemispheres may possibly have some relation to the high functions exercised by this centre. Like the cellular system, the nervous system is composed of innumerable units, and each unit, whether isolated or in masses, may be described as a centre of force, and each contributes its quotum of energy towards the maintenance of the organism. As in the body politic, there are individuals and aggregations of individuals, local, provincial, and general councils with corresponding functions, so in the organic community there are ganglia whose functions are local, others which have a wider sphere of operations, and others again which have a still higher jurisdiction, to which, on occasion, all the other ganglia, local or provincial, make their appeal, and only such appeals which come before this high court are revealed to consciousness. This high court of appeal is the cerebral hemispheres.

So much for the physiology of the nervous systems; let us now turn to the psychological side of the subject. Every nerve cell is not only a centre of neural force, but is also a centre of mental activity, and wherever there

is the greatest concentration of ganglia, as in the hemispheres, there also is the greatest concentration of this activity. Not that neural processes and mental processes are identical, or that a neural act may be transformed into a mental act, or the converse. The neural element remains neural and the mental element continues to be mental to the last.

Mental and Conscious States

James Mill has laid down the general principle that "consciousness is the widest word in our vocabulary, and embraces everything that mind embraces."[1] Much to the same effect is the view taken by Hamilton. "Mind is to be understood," he says, "as the subject of the various internal phenomena of which we are conscious. Consciousness is to the mind what extension is to matter. We cannot conceive of mind without consciousness, or a body without extension."[2] This is the view generally held by metaphysicians.

On the other hand, modern psychologists are

[1] *Analysis of the Human Mind*, p. 227.
[2] *Lect. Meta.*, chap. ix.

almost unanimously of opinion that consciousness is not coextensive with mental activity. Beginning with the "obscure ideas" of Liebnitz and the "unconscious sensations" of Kant, the general trend of thought has been all in this direction. Maudsley, perhaps, more than any writer of recent times, has emphatically pronounced in favour of this view. "The brain," he says, "not only receives impressions unconsciously, registers impressions without the cooperation of consciousness, elaborates material unconsciously, calls latent powers into activity without consciousness, but it responds also as an organ of organic life to the internal stimuli, which it receives unconsciously from the body." G. H. Lewes pertinently remarks—"That we can have thoughts and not be conscious of them, perform actions and not be conscious of them, are facts which prove that a theory of mind which is limited to conscious states must be very imperfect, unless the meaning of the term Conscious be extended so as to include unconscious states." [1]

In this connection another question arises. Can we properly speak of a psychical state as

[1] *Problems of Life and Mind*, p. 144.

unconscious, or of an unconscious state that is not a psychical state? I think not. A psychical state is a conscious state; a psychical act is a conscious act. We cannot feel without being conscious of feeling. It is the consciousness of feeling that is the feeling; without the consciousness the feeling could not exist. It is the same with other mental activities. We cannot discriminate, desire, or will without being conscious of discriminating, desiring, and willing. There can be no mental state without the consciousness of that state; no mental act without the consciousness of that act. It is through my consciousness that I know that I exist, that I know I think, that I know I have mental states, that I know I perform mental acts. Any acts unconsciously performed are not my acts, or acts for which I am responsible. As Cousin says, "To think, without knowing that we think, is as if we should not think." So says Reid: "No man can perceive an object without being conscious that he perceives it. No man can think without being conscious that he thinks." Here, however, I distinguish between acts performed by me and acts performed on my behalf, between the consciousness of which the cerebral

hemispheres are the organs, and that consciousness of which the sub-centres are the organs. The question of the coextension or non-coextension of consciousness with mental activity is a fundamental one. If it can be proved that mental action can be carried on in the absence of consciousness, we shall have to reconstruct our whole system of psychology. Those who hold with J. S. Mill and others that unconscious action is a neural and not a mental process may consistently maintain with the elder Mill and metaphysicians generally that consciousness embraces all that mind embraces. In this case there can be no unconscious mental activity. On the other hand, those who hold that mental operations may be carried on without our being conscious of them are in a different position. They cannot maintain the doctrine of unconscious mental activity while they hold that the brain is the sole organ of sensation, for sensation and mental activity cannot be dissociated. Unconscious mental activity is only conceivable on the assumption that there are other organs of sensation besides the brain. If we restrict consciousness to the cerebral hemispheres (which I here assume to be the

organ of the central consciousness), we must ignore all the evidence in favour of unconscious mental activity, which evidence, in my opinion, is overwhelming. The phenomena of dreams, anæsthesia, somnambulism, hypnotism and delirium cannot be explained on any other hypothesis. The single fact of alternate consciousness demonstrates the existence of mental activity apart from consciousness. Take, for example, the case (a very common one) mentioned by Abercrombie :—

"A boy, at the age of four, fractured his skull, for which he underwent an operation of trepanning. He was at the time of the operation in a state of perfect stupor, and, after his recovery, retained no recollection either of the accident or of the operation. At the age of fifteen, however, during the delirium of fever, he gave his mother an account of the operation, and of the persons who were present at it, with a correct description of their dress, and other minute particulars. He had never been observed to allude to it before ; and no means are known by which he could have acquired the circumstances which he mentioned."[1]

Here we have two distinct conscious states or personalities, each unknown to the other. In his normal state the boy knew nothing

[1] *Intellectual Powers*, p. 149.

about the accident or the subsequent operation ; in his abnormal or unconscious state he was fully cognisant of everything which occurred. The evidence of mental activity is quite as strong in the one case as in the other ; and the patient's powers of observation were apparently as acute, and his memory as retentive, in the unconscious as in the conscious state.

In the somnambulic and hypnotic states the same phenomena occur. When in these states, the subject knows nothing of what happened to him when in his normal or waking state, and when in his normal state he has no knowledge of what passed while in the somnambulic state. He is really two personalities. Sometimes, indeed, there are more than two personalities. Thus Bertrand's patient sometimes passed into three different states besides the normal one. When in the normal state she knew nothing of what occurred in her somnambulic state. When in the latter state, however, she recollected events which occurred to her in the two other somnambulic states ; but in this respect the case is an exceptional one, for as a rule there is an absolute severance of the personalities in each state. Shornbeck describes the case of

another female somnambulist who had four distinct states or personalities, each with its own life history and memory.[1] In all such cases the patients showed as much intelligence in the abnormal as in the normal state.

It would appear that these alterations of personalities are due to certain changes in the psychical condition of the subject of them. In delirium, for instance, if the fever is low, the patient represents one personality; if high, another, and if still higher, a third. Hamilton mentions the case of an Italian gentleman who died in New York of yellow fever, who spoke English in the early stage of the fever, French in the middle, and Italian on the day of his death. In somnambulism the change of personality appears to be due to the depth of the trance, as in a light trance there is one personality, and in a more profound trance there is another. The phenomena are explicable on the theory of the reconstruction of mental centres. When the normal consciousness is from some cause inactive, a reconstruction may

[1] *Schubert's Gesch der Seele II.*, p. 205-207. Du Prel in his *Philosophy of Mysticism* has collected a large number of similar cases. See also Griesinger's *Mental Pathology*, and Professor James's *Principles of Psychology*.

take place, new alliances may be formed, some of the subordinate centres may come into greater prominence, and a new co-ordination of mental forces forming a new centre may create what appears to us a new personality, or Ego. Or we may suppose these alternations of personalities are due to breaches of memory. We know our personal identity from day to day because we remember what we were yesterday and feel that we are the same to-day. A man gets a blow on the head in the street, and he wanders about unable to tell the police who he is, his name, or place of abode. A lunatic generally considers that he is somebody other than he is.

We have seen that there are two great nervous systems, the cerebral and the sympathetic, and that there are other nerve centres outside of these systems. The Ego does not operate throughout the whole organism, but only within the area covered by the cerebral system ; and, except in a very indirect way, it exercises no influence on the movements of the heart, or of respiration or of the viscera, which are controlled by the sympathetic system. But even in its own domain the Ego is not

the supreme autocrat he is supposed to be. He can do nothing without the assistance of his subordinates. He may will to act, but he cannot execute. I will to write this sentence, but I do not know how to proceed about it. For the performance of this simple act there must be a molecular movement in the cerebral hemispheres, another in the cerebellum, another along the spinal marrow, another along the nerves of the arm and fingers, to be followed at length by the contraction of the muscles of these organs. The Ego knows nothing about these various physiological processes, any more than it is cognisant of those other processes on which the life of the organism depends from moment to moment. In the one case, as in the other, the Ego is at the mercy of the subordinate mental centres who direct and control the necessary movements. May we therefore not conceive that new conditions may arise necessitating new groupings of the mental centres, that may result in apparently new personalities ?[1]

[1] As we descend lower in the scale of animal life this process is common enough. In the Annelids each ganglion corresponds to a segment of the body. Each of these segments is a complete animal, the whole animal being formed of several elementary

Correspondence between the Sub-centres and the Hemispheres

If the cerebrum be the sole seat of consciousness, then conscious states are not co-extensive with mental states ; on the other hand, if there are other centres of consciousness, as I maintain there are, if each nerve centre is also the seat (or preferably the organ) of consciousness, then consciousness may still be co-extensive with mental states. Psychical action is pre-eminently manifested in the cerebral hemispheres, and this action is conscious ; but psychical action is also, as we have seen, manifested in the subordinate nerve centres, and this also must be assumed to be conscious, not to the cerebral hemispheres, however, as the organ of the Ego, but to the nerve centres elsewhere, each nerve centre having a consciousness of its own.

Introspection confirms the view here set forth. Mind has been described as a series of states

animals placed one after the other. Thus when an animal is deprived of its head (its Ego), it immediately evolves another head out of the next segment, and if that again is destroyed, out of the segment following.

of consciousness, and consciousness again as a stream of sensations or thoughts. When walking in the open fields, or in the streets, or sitting at our own fireside, we are conscious of an inflow of thoughts. We are also conscious that this inflow is not the result of our volition, or of any effort on our part, while the thoughts themselves are often so disconnected as to lead one to suppose that they emanate from different sources. This is the testimony of consciousness, and we have no reason to question its truth. No doubt the action of external objects has ordinarily a good deal to do with this ; but the stream flows on just the same when the mind is not influenced by sense impressions as when it is. When the organs of sense are inactive, as during sleep, we find the same process in operation. In dreams, when the senses are closed, we have the same experience. Whence this inflow of thoughts ? May we hazard the explanation that, as the central and subordinate nerve centres are organically connected, and the central consciousness being in sympathy with the consciousness of the subordinate centres, this inflow may have its source in the latter, which merges into the Egoistic

Consciousness when it reaches the cerebral hemispheres ?

This hypothesis also helps to explain the phenomena of mysticism. The mystic believes that by cutting himself off from sense-consciousness and by subduing his will he is able to hold communion with the Divine Spirit. Jacob Bohme declares: "I do not know how it happens to me that, without having the impelling will, I do not even know what I should write. For when I write the Spirit dictates it to me in great, wonderful knowledge, that I often do not know whether I am in my spirit in this world, and rejoice exceedingly, since then the constant and certain knowledge is given to me, and the more I seek the more I find." This is clearly a delusion on the part of the mystic. He imagines his soul to be in communion with God, whereas it is only in communion with itself, and the communications which he receives are only the result of the interaction between his central consciousness and the lower centres.

We are now able to explain certain mental phenomena which have hitherto puzzled Psychologists. There is an immense accumulation

of facts showing that ideas, memories and suggestions, quite unsought for by us, are presented to our minds in our waking state and in dreams. We find ideas arranged for us that we have in vain tried to put in order; problems are solved which baffled all previous attempts at solution; events are suddenly brought to our recollection after many fruitless attempts to recall them. It would seem as if there were a spirit within us, like the Daimon of Socrates, which prompts us, offers suggestions to us, and moulds our opinions for us without any efforts of our own. The phenomena may be accounted for by supposing that the sub-centres and the ganglia distributed throughout the organism are in correspondence with the cerebral hemispheres and co-operate with them—not a very improbable hypothesis when we consider that all these sub-centres and ganglia are structurally connected with the brain, and more especially if we bear in mind that there is no difference in the composition and functions of the ganglia whether in the hemispheres, the sub-centres or elsewhere. The Ego may be compared to the head of a State who is prompted by his Ministers, and who

receives communications, protests, remonstrances and suggestions from his subjects in all parts of his dominions.

It is to this enlarged view of the human mind that Wundt refers when he says : " The unconscious soul, like a benevolent stranger, works and makes provision for our benefit, pouring out the mature fruits into our laps " ; and of which Oliver Wendell Holmes speaks when he says—

" Our definite ideas are stepping-stones ; how we get from the one to the other we do not know ; something carries us, we do not take the step. A creating and informing spirit, which is with us and not of us, is recognised everywhere in real and in storied life. . . . It comes to the least of us as a voice that will be heard ; it tells us what we must believe ; it frames our sentences ; it lends a sudden gleam of sense or elegance to the dullest of us all ; we wonder at ourselves, or rather not at ourselves, but at the divine visitor who chooses our brain for his dwelling place, and invests our naked thought with the purple of the Kings of speech and of song." [1]

Sir Benjamin Brodie thus records his own experience of similar phenomena :—

" It seems to me that on some occasions a still more remarkable process takes place in the mind, which is

[1] *Mechanism of Thought and Morals*, p. 59.

even more independent of volition than that of which we are speaking, as if there were in the mind a principle of order which operates without our being at the time conscious of it. It has often happened to me to have been occupied by a particular subject of inquiry; to have accumulated a store of facts connected with it, and to have been able to proceed no further. Then, after an interval of time, without any addition to my stock of knowledge, I have found the obscurity and confusion in which the subject was originally enveloped to have cleared away; the facts seemed all to have settled themselves in their right places, and their mutual relations to have become apparent, although I have not been sensible of having made any distinct effort for that purpose." [1]

Dr. Gregory (as quoted by Abercrombie) mentions that thoughts, which sometimes occurred to him in dreams, and even the particular expressions in which they were conveyed, appeared to him afterwards, when awake, so just in point of reasoning and illustration, and so good in point of language, that he has used them in his college lectures and in his written lucubrations; and Condorcet relates that when engaged in some profound and obscure calculations he was often obliged to leave them in an uncompleted state and retire to rest, and

[1] *Psychological Inquiries*, vol. i. p. 20.

that the remaining steps and the conclusion of his calculations had more than once presented themselves in his dreams.

The same phenomena is manifested in memory. Very often we cannot recall a familiar word, name, idea or event; so have to wait for it; perhaps think of something else, and what we are in quest of will come to us spontaneously. Referring to this, Miss Cobbe says :—"The more this phenomenon is studied, the more I think the observer of his own mental processes will be obliged to concede that, so far as his own conscious self is concerned, the research is made absolutely without him. He has neither pain nor pleasure, nor sense of labour, in the task, any more than if it were performed by some one else; and his conscious self is all the time suffering, enjoying or labouring on totally different grounds."[1] Such phenomena as these are quite inexplicable on the supposition that the cerebral hemispheres are the sole organs of mental activity, but intelligible enough if we assume there are subordinate centres of psychical activity co-operating with the supreme centre.

[1] *Macmillan's Magazine*, Nov. 1870, p. 25.

We conclude, therefore, that each psychical centre has a consciousness of its own, and that this consciousness is related to the supreme consciousness (the Ego), as the subordinate nerve centres are related to the supreme nerve centre (the cerebral hemispheres). The relationship would be similar to that which subsists in the social organism. In the psychical as in the social organism the springs of action are from below, not from above. Every unit counts, and the majority rule, the consensus of thought being the communal consciousness. Hamilton's assertion that "What we are conscious of is constructed out of what we are not conscious of" is only partially true, for the brain is itself the chief centre of consciousness, to which the subcentres or ganglia are only the contributaries.

The term "unconscious" is now much in vogue, and is often used in a vague and indefinite sense, as signifying a state of nescience, the unknown, or unrevealed; or it is personified as the Unknown or the Unknowable of Spencer, or as the Unconscious or the metaphysical World-Substance of Hartmann. The use of the term in any such metaphorical sense is to

be deprecated. The term unconscious should signify only that which is unknown to the supreme centre, the cerebral hemispheres, the Ego, but which may nevertheless be cognisant to the subordinate nerve centres.

CHAPTER IV

MIND AND MATTER

The term Mind—Mind as the unextended—The relationship between mind and matter—Professor Bain's theory of this relationship—*Modus vivendi*—Is mind a function of brain ?

PERHAPS no word in the English language is used in so loose a manner as the term Mind. I recently took up a book on mental science, written by an author of note, and I found Mind described as Consciousness, as the Sentient Principle, as the Immaterial Spirit, as the Thinking Principle, in one long sentence ; and, in addition, as the Spiritual Principle, as the Spirit, as Thought—all in one short paragraph. Not one of these terms describes a concrete entity, or a Real Substance. Mind has come to be looked upon as a mere abstraction. It is no longer fashionable to speak of a Soul, as that term does not readily lend itself to denote an abstract idea. Even theologians have discarded the use of the term

except in a metaphorical sense. The transformation in the meaning of this word would make an interesting chapter in the history of mental science. Plato's soul was a real thing; it inhabited a body; it was the self-moving, and in moving itself it also moved the body. Aristotle's vegetative and sensative souls (ψῦχαι) were also very real things, and even his ethereal intellectual soul (νους) had a local, if only temporary, habitation. In the following pages I shall understand Mind to be The Mind—a concrete reality—not an abstraction. I shall assume it to be that something within the human organism which feels, thinks and wills—the *Substantia Cogitans*.[1]

Matter has been defined as the Extended, mind as the Non-extended. These definitions have been arrived at by a process of elimination. In his analysis of matter, Descartes proceeded by abstracting all its contingent properties, such as density, colour, elasticity and the like, with the view of retaining that property alone which is common to every form of matter; and he concluded that there was only one property common to all kinds of matter, and that

[1] Appendix E.

property he termed Extension. Mind, on the other hand, he found did not possess any of the properties of matter, not even extension, and so he defined Mind as the Non-extended. And he was confirmed in this conclusion from the view he held of the nature of Thought, which he considered to be the "essence" of Mind, and which he assumed to be non-extended. But if we conceive of mind as an agent, of which thinking is the function, then assuredly thought is not mind, but the product of mind. Metaphysicians have followed the same line of argument as Descartes, and have arrived at the same conclusion. I maintain that Mind, as the Thinking Agent, cannot be Thought any more than music (the product) can be the musical operator whose function is playing.[1]

Mind as the Unextended

There may be some justification for regarding mind (in the abstract) as unextended, as it is

[1] I have mentioned Descartes as the author of these definitions, but St. Augustine had previously described matter as the Extended and mind as the Non-extended, and his views were adopted by Thomas Aquinas and the Schoolmen, and only elaborated by Descartes. These views pervade the whole system of psychology at the present day. See Appendix F.

difficult to locate an abstraction. An abstraction separated from that of which it is the abstraction is a quality without a subject—an adjective without its substantive. It exists only as an idea. But even an idea, or a thought, exists in space, and in space which is well defined, as it is in the mind, therefore cannot be said to be unextended, for the mind, so far as we know or can trace it, is in the body, about whose extension there can be no manner of doubt. Professor Bain, who may be taken as an exponent of modern philosophy in this country, distinctly endorses Descartes's view of the non-extension of mind. "The one great feature," he says, "usually signalised as present in all material phenomena, and absent from all states of the conscious mind, is that mode of co-existence called Order in Place, Extension. . . . Extension is but the first of a long series of properties all present in matter, all absent in mind."[1] I demur to this conclusion so far as mind is concerned. Mind, as the unextended, is to me a definition that is wholly inadequate and utterly incomprehensible. Inadequate, because whatever we

[1] *Mind and Body*, p. 123.

may think of extension as a property of matter, the negation of that property as an attribute of mind leaves the latter without any property at all; incomprehensible, because to me unextended or non-spacial mind is inconceivable.

The Relationship between Mind and Matter

It is when we come to consider the relationship between mind and matter that the inadequacy of Descartes's definition becomes apparent. There can be no possible relationship between matter as extended and mind as unextended, for the two substances are worlds apart; they do not belong to the same universe. Yet no one will deny that there is a close relationship between them. The connection between a molecular motion and a sensation, and between a sensation and a molecular motion, is indisputable. But no interaction can take place between an unextended mind and an extended body. It follows, therefore, either that mind is unextended, and there is no interaction between mind and body, or that mind is extended, and there is interaction.

But the non-extensionist accepts neither of these alternatives. He practically admits that there is a relationship between the mind and the body, but theoretically he denies it. He insists that mind is unextended, and is therefore forced to deny that it can have any causal connection with the extended, as that would be obviously absurd. He will neither admit that mind is extended nor altogether deny that there is any relationship between the mind and the body. Nay, he admits there is a relationship of some sort, as he cannot help admitting, but he denies that it is causal. It may be anything else you like to name, but not that. When pressed to explain, he calls it a Correspondence, a Concomitancy, a Juxtaposition, a Concurrency, or a Psychophysical Parallelism. The physical and the psychical processes, he supposes, proceed together like two clocks, which keep excellent time, like two parallel lines, which are always equidistant. But why are there two clocks and not one? Why two lines always parallel? Why a parallelism at all? According to the non-extensionist's own showing, it is a parallelism without a purpose.

Here the Monist steps in, and attempts to

save the situation by presenting what he conceives to be a solution of the difficulty. He asserts that there is no necessary antinomy between the physical and the psychical; the difference is merely a question of aspects. We know nothing of the real nature of matter, and we know nothing of the real nature of mind. In the last analysis, mind and matter may be one and the same substance, as Spinoza held; as it is, we only see the same phenomena under two different aspects, according as they are viewed from the objective or the subjective, the outer or the inner, the convex or the concave side. This is Professor Bain's opinion, and so thought Lewes, and so argued Taine. According to the latter, the mental event and the physical event appear to us to be irreducible, because presented to us differently, the one being known to us directly from consciousness; the other indirectly from molecular movement through the senses. But why should the phenomena have two sides? "There are," as Tyndall says, "plenty of molecular motions which do not exhibit this two-sidedness. Water does not think or feel when it runs into frost ferns upon a window frame; and why should

molecular motion of the brain be yoked to this mysterious companion, consciousness?"[1] Were the phenomena presented to two different subjects we could understand the explanation, as then one subject might view it from one side only, and the other subject look at it from another side. But here there is only one subject and two kinds of phenomena, so that, whether the presentation be from within or from without, whether it be direct or indirect, makes no difference. It is made to one conscious subject, and the conscious subject has to deal with it. I cannot know anything without knowing that I know it. I cannot take one part of my knowledge and label it "conscious," and another part and brand it as "unconscious." I may arrive at the solution of a question by two different processes, say, by the deductive method and by the inductive; but my investigations should not therefore result in two different and irreconcilable conclusions, but in only one; and the fact that I had arrived at the same conclusion by investigating the phenomena from two different points of view, always supposing both methods to be correct, should

[1] *Nineteenth Century*, November, 1878.

rather confirm me in the correctness of the result. It is true that an object, say a tree, if seen by the visual organs, would appear as one object, and if examined by the tactile organs would seem to be another object; but the two views would not be irreconcilable, but rather supplementary to each other, otherwise a multiplicity of senses would be a hindrance instead of an aid to knowledge.

Professor Bain candidly admits the difficulty of maintaining the position he has taken up. "We are in this fix," he says, "mental states and bodily states are utterly contrasted; they cannot be compared; they have nothing in common except the most general of all attributes—Degree and Order in Time."[1] What has "degree" to do with the question? And if by "order in time" he means union in time, or simultaneity, even here he is on untenable ground, for neural processes and mental processes are not concurrent, as Professor Bain must be well aware. It has been proved by numerous experiments that the transmission of a neural shock requires a measurable interval of time, according to the distance it has to travel.

[1] *Mind and Body*, p. 135.

It has also been proved that a further interval of time elapses before the physical excitation merges into consciousness; so that there are two intervals of time between the occurrence of the objective shock and the resultant subjective sensation, and, therefore, there can be no exact union in time. On the other hand, there is union in place, as the neural process and the mental process occur within the same body. This is how Professor Bain solves the difficulty :—

"This, then, as it appears to me, is the only real difficulty of the physical and mental relationship. There is an *alliance with matter*, with the object, or extended world; but the thing allied, *the mind proper*, has itself no extension, and cannot be joined in local union. We understand union in the sense of local connection; here is a union where local connection is irrelevant, unsuitable, contradictory; for we cannot think of mind without putting ourselves out of the world of place. When, as in pure feeling—pleasure or pain—we change from the object attitude to the subject attitude, we have undergone a change not to be expressed by place; the fact is not properly described by the transition from the *external* to the *internal*, for that is still a change in the region of the extended. The only adequate expression is a CHANGE OF STATE: a change from the state of the extended cognition to a state of unextended cognition. By various theologians heaven has been spoken

of as not a place, but as a state ; and this is the only phrase we can find suitable to describe the vast, though familiar and easy, transition from the material or extended, to the immaterial or unextended side of our being. When, therefore, we talk of incorporating mind with brain, we must be held as speaking under an important reserve or qualification. Asserting the union in the strongest manner, we must yet deprive it of the almost invincible association of union in place." [1]

Union between mind and body in the sense of local connection is thus, according to Professor Bain, "irrelevant, unsuitable and contradictory," and for local connection he would substitute the theologian's idea of heaven as a state. But a state is a mode of existence, and conveys no idea of mind, while the theologian's idea of heaven is that it is within us, and, therefore, has a local connection. He says that the change from the object attitude to the subject attitude can only be expressed by the change from "the state of extended cognition to a state of unextended cognition." This is perplexing. Can we also speak of cognition as extended or unextended ; and can a cognition be both extended and unextended ? Here, as

[1] *Mind and Body*, p. 137. The italics and capitals are Professor Bain's.

throughout, Professor Bain employs the term "mind" in an abstract sense. No doubt, in this sense, it can have no local connection. By its very nature an abstraction is wholly detached from everything.

As an exposition of a philosophic dogma, it would be difficult to match the above passage. We are here told in the same breath that there is a union and that there is no union; that there is an alliance and that there is no alliance; that there is a local connection, but that this connection is "irrelevant, unsuitable and contradictory." In what sense can "pure feeling" be a change from an "object attitude to a subject attitude," or what connection can there be between the theologian's heaven and the relationship of mind and matter? How can feeling be an "object attitude" at all, and where can the theologian's heaven be if not localised in the human mind? And, lastly, how can a local connection exist which is contradictory"? But we need not pursue this subject further. Professor Bain's position is utterly untenable.

It is obvious that the Mind (in the concrete sense) is extended, as it is in the body, and

the body, we know, is in space. Sir William Hamilton puts the issue plainly, if not very conclusively, when he says that "we cannot attribute a local seat to the soul, without clothing it with the attributes of extension and place."[1] But tradition and authority bound him to the old dogma, for he adhered to the last to the theory of the non-extension of Mind, even though he had to confess that to him the union of mind and body appeared to be an altogether inexplicable fact. "How," he remarks, "the immaterial can be united with matter, how the unextended can apprehend extension, how the indivisible can measure the divided—this is the mystery of mysteries to man."[2] How, indeed? Yet Hamilton would have been the first to insist that the object of philosophy, as of science, is to explain, not to apostrophise, the mysterious. The mystery here is how such a profound thinker should prefer an impossible theory to an indisputable fact.

[1] *Lectures on Meta.*, vol. ii. p. 128.

[2] Note to Reid's *Works*, p. 880.

A *Modus Vivendi*

Let us try and explain this relationship. A special characteristic of living organisms is their extreme sensitiveness. This sensitiveness I consider to be a physical, not a psychical, property. We call a delicately adjusted mechanism, like a seizometer, for instance, a "sensitive instrument." The same term in the same sense may be applied to the mechanism of the end organs of sense (witness, *e.g.* the extraordinary sensitiveness of the gustatory flasks of the end organ of taste), which are admirably adjusted to intercept the slightest molecular vibrations. We conceive this sensitiveness to be a condition precedent to sensation, as sensation is a condition precedent to perception, and as perception is to volition. Feeling, thinking and willing are attributes of mind, none of which inhere in body; density, divisibility, colour, and so forth, are properties of body, none of which inhere in mind. But mind and body have one thing in common. They are both extended, both exist in space, both are in juxtaposition, and, as we have said, each influences the other. But, though

in juxtaposition, mind is so unlike matter, the psychical so unlike the physical, that, although they mutually interact, they remain disparate and inconvertible entities. We cannot conceive of the conversion of the one into the other.

The fact that mind is only found in association with living matter should give us the key to the solution of the problem. Living matter is sensitive matter, and in this sensitive matter we have the appropriate medium through which the mind may act on the body, and the body may act on the mind. Sensitiveness is the special property of nerves. Nerves have also the special property of conductivity. The central nerve organs, or the cerebral hemispheres, and the end organs of sense are, as the microscope reveals, structures of the most exquisite sensitiveness, and are adapted to receive the slightest wave of motion either from within or from without. Modes of motion act on these nerves and create nerve commotion, which again produces sensation; the mind acts on the same medium, again producing nerve commotion, which is again followed by modes of motion. As the sensitive plate of the photographer receives an impression from the light,

so the sensitive body receives an excitation from a physical object. This is the first stage in the process, which, so far, is purely physical. As the sensitive plate has to be manipulated before a representation can be produced, so has the excitation made by the physical object on the sensitive body to be interpreted before there can be a mental representation of the physical object. In like manner the mind may convey a stimulus to this sensitive medium, which is transmitted through the nerves, which, as we have said, are both a sensitive and a conducting medium, to the muscular system, which terminates in physical action.[1]

Let me illustrate. An explosion takes place; a shell bursts at your feet in the field of battle, or a wave dashes over you on board ship; a shock follows, and for the moment you are simply stunned. So far there is no mental content; you have experienced a nerve commotion, and nothing more. It is only when sensation follows, either pleasurable or painful, that a mental event takes place. You feel; and when perception comes to the aid of sensation you realise what has happened, and there is a

[1] Appendix G.

response. The physical shock strikes the nerves at the periphery of the body, whence it is carried along by the conducting nerves to the cerebrum, where it is receiveed and interpreted. There is no union of mind and matter, and no conversion of matter into mind, or of mind into matter; but there is interaction, and the medium of interaction is the special organs of sensitiveness and of conduction, namely, the nervous structures.

Is Mind a Function of Brain?

The physicist tells us that mind is the function of brain, and in proof of this he triumphantly asks, Is it not the blood that nourishes the brain and enables it to do its work: and what would become of mind without this brain-nourishing blood supplied by the food we eat? No one at the present day would be foolhardy enough to deny the fact that a bloodless brain would be incapable of action; but the physicist surrenders his position when he adds that it is the food we eat that supplies the blood. For what is it that impels the owner of the brain to eat the food so essential to mental action?

Mental action, we are assured, is due to a proper supply of blood to the brain. But it is the initial mental action to which we have referred which the physicist has to account for; and before he can proceed to speak of the action of the brain he has to account for the existence of the brain itself, and not only of the brain, but of the organism of which the brain forms a part. The idea of evolution presupposes a something which evolves. The thing evolved must have a root, a rudiment or a germ. Those who speak of life or of the mind as "the sum of the co-operant conditions," or as "the expression of the whole organism," are using words without meaning. Maudsley informs us that, after the most careful consideration, he has arrived at the assured conviction that mind is the function of the brain.[1] He is by no means singular in holding this opinion; it is only his mode of presenting it that is peculiar, his assurance that

[1] "By the observation of mental phenomena, whenever displayed, and of whatever sort, by experiment, by reasoning—by all the means which serve him in other scientific inquiries, he has come to the assured conviction that mind does not exist in nature apart from the brain."—*Physiology of Mind*, by Maudsley, p. 126. Again, "Mind is without doubt the direct function of brain."—*Ibid.* p. 37.

it is the correct view being apparently all that he thinks requisite to ensure its acceptance. If mind had not appeared on the scene till after the advent of brain, there might have been some justification for the statement, however difficult it might be to understand ; but brain is only the last of a long series of structural developments in animal life, in which the mind has played a not unimportant part. If he had explained How mind is the function of brain, his contribution to one's knowledge would have been valuable. The physicist always assumes that the organism and its various intricate physiological processes existed before the mind made its appearance, and that the mind is the product of these processes. But he has first to show how inert matter can produce a living organism ; next, how physiological processes can produce mental function. A mechanical toy may be made to play all sorts of pranks, and even to speak ; but a piece of mechanism that will feel, think and will has yet to be invented. The fundamental error of the physicist is his assumption that matter preceded mind, instead of the reverse, namely, that mind preceded matter.

No good purpose can be served by comparing mind with matter. What has feeling, thinking, desiring and willing, in common with hardness or softness, length or breadth, lightness or heaviness? We might as well compare a volt of electricity with a quarter of wheat. The analogue of mind is force. Mind is related to organic matter as force is related to inorganic matter. Force moves inert matter, and mind moves organic matter. Force is a something that attracts or repels—creates motion. Mind is a something that feels, perceives, wills and purposes. In order to feel, the organism with which the mind is associated must be perfectly adjusted to receive the slightest impression, whether from within or from without. Sensitiveness is at once the condition of mind and of life; insensitiveness is the condition of death, mental and physical. When insensitiveness supervenes, and interaction has been suspended, the mind ceases to act on the body and the body on the mind; the end has come, the book of life has closed.

CHAPTER V

TELEOLOGY

Teleology a discarded doctrine—The argument stated—The evidences of design—How to discover the designer—The theory of Divine Intelligence—The sanguiferous system—The physical theory—The theory of natural selection—Variations, how they arise—Profitable and unprofitable variations—What becomes of the unprofitable—The hypothesis of slight variations—Relation of mind to body—Wants and efforts—Cellular modifications.

TELEOLOGY is as much out of fashion nowadays as the *Bridgewater Treatises* are out of date. Since Darwin's time the reign of physical law has been extended over the realm of Life and Mind. The modification of organisms, or the origin of species, is now almost universally acknowledged to be the result of physical and physiological processes, and of these alone. It is no longer considered proper to speak of purpose or design in connection with any changes of this nature ; and intelligence is not

so much ignored as it is absolutely excluded, for we are assured that the most subtle organic contrivances, the most wonderful adaptations of means to ends, may be accomplished without the expenditure of any intelligence whatsoever.

Notwithstanding the array of great scientific authorities that support this view, I believe that the argument from the picture of Zeuxis, and the statue of Polyclectus, used by Socrates to confute Aristophanes, which is of the same character as that employed by Paley in his *Natural Theology*, is as sound to-day as ever it was. By the term Design I do not mean Adaptation merely, but Purposed Adaptation, the adjustment of means to purposed ends. Adaptation may be the result of physical laws, as water adapts itself to the law of gravitation, a river follows the line of least resistance, a crystal conforms to the law of chemical affinity. But design, in the sense here understood, involves mental action ; it is a psychical, not a physical, act. No one imagines an accurately painted picture, a correctly modelled statue or a complex piece of machinery like a watch to be merely the product of physical laws, any more than he can believe it to be the result of chance.

Each of these objects clearly reveals intention on the part of some intelligent subject. As to who that intelligent subject is, is a question to be discussed later on. Some people are so intent in repudiating the idea of a Deific Designer that they go the length of denying organic design altogether. There is as much design, we are told, in the formation of a crystal as in organic modification, "as the particles of a crystal aggregate after a definite plan, and thus strictly manifest design."[1] There is no parallel between a crystal and an organism, as the writer has unconsciously pointed out. It is because a crystal is formed after a "definite" plan that the want of parallelism is manifested. A crystal invariably takes the definite form of the mould in which it is cast; an organism, on the other hand, can be modified to any extent when a purpose is to be served or an end to be gained. Darwin's mind seems to run in the same direction, for what we designate design in organic structures is, according to him, either the result of Divine purpose or it is not purposive at all. "Have we any right," he asks, "to assume that the Creator works by intellectual

[1] Maudsley, *Physiology of Mind*, p. 141.

powers like those of man?"[1] And as he cannot conceive that the Creator works by adapting means to ends, he concludes that what appears to be purposive is only the result of the operation of physical and physiological laws. He can see no intermediate hypothesis between these two extremes; but it is a far cry from Deific design to Darwinism. Let us see if another theory is not possible.

That there is ample evidence of design in organic nature is to me beyond a doubt. The constant struggle that is carried on by the organism to adapt itself to its environment; the efforts of one organ to adjust itself to changes in other organs; the fact that there are no superfluous organs which are not accounted for by the law of disuse; that every organ has special functions to perform, and that no organ interferes with any other organ which is in a normal condition; and that when an organ from some cause ceases to perform its proper function another organ thereupon undertakes the duty, all this, in my opinion, goes to prove the fact of organic design. Indeed, scientific inquirers, whatever their creed or

[1] *Origin of Species*, p. 136.

colour, recognise and act upon this fact, as whenever they find an organ they invariably seek to discover its function, and whenever they discover a function they never rest till they have found its organ. Physicists and physiologists alike recognise the unity and congruity of organic nature, and carry on their investigations on this assumption.

The fact of design being here assumed, we have next to discover its author. We say author, and not cause, as design is not the result of any law, either physical, physiological or chemical, or of any combination of such laws ; it is a mental act, and therefore implies a mind of some kind, and motive, not cause, is the antecedent of all mental acts. But how are we to determine Whose is the designing mind in any particular instance ? In the investigation of organic structure and processes where design is most in evidence this question always comes to the fore. There seems to me to be only one way of arriving at a satisfactory answer to it, and that is by investigating the nature of the design. The nature of the designing mind may be inferred from the nature of the design, in the same

manner as we may trace the cause from the nature of the effect produced. By an inductive process we ascertain the nature of the design, and by a deductive process we infer the nature of the designing mind. From the nature of his actions we deduce the character of the man ; a silly action indicates a weak intellect ; a statesmanlike action a sagacious mind. We shall therefore apply this test to the phenomena of organic structures.

There are three recognised theories of the origin of these structures—(1) that they are the work of Divine Intelligence, (2) that they are due to the operation of physical laws, and (3) lastly, that they are the result of natural selection. Later on I shall venture to advance a fourth theory, but in the meantime I shall test these various theories by the rule here laid down.

The Divine Architect Theory

(1.) The theory of Deific design is that which is generally entertained, especially by theologians, and it is also the most easily understood. With the view of presenting the argument in

its most favourable aspect, let us take for illustration the sanguiferous and excretory systems of the human organism, which are undoubtedly the most perfect of all existing systems, and whose structure and processes are supposed to exhibit design of the highest order.

The heart is the most important organ in the body, and it is most carefully protected from injury or displacement by any movement or overlapping of the adjacent organs, by being suspended in a fibrous membrane, like a foot-ball bladder in its leather covering. The blood is pumped from the heart and propelled into and along the arteries by muscular contraction, first from the ventricles and then from the auricles alternately (like a double action pump), thus enabling the organ to perform continuous work (for there must be no intermission here) at a high rate of speed without too great a strain upon one set of muscles. Valves are provided which regulate the flow, and the arteries are lined with flat cells closely cemented together, so as to present a perfectly smooth surface along which the blood may pass swiftly; and in case of any obstruction in the main trunks,

provision is made by which a due supply of blood may be retained in the branches by lateral communications called anastomoses. The excretory system again shows a similar adaptation of means to ends, while the process is altogether different. The lining of the arteries is smooth ; that of the intestinal canal is rough to a degree, the latter consisting of projecting muscles which surround the canal. In the arteries the blood is forced continuously along by pressure ; in the intestinal canal, as pressure would fail in effecting the removal of the semi-fluid contents of the stomach, a different process had to be resorted to, and the material is pushed along by means of the muscles referred to, which contract along the whole length of the canal, thus producing the peristaltic motion like the movement of a caterpillar ; and this peristaltic motion, unlike the action of the heart, is intermittent; it acts only when there is some material to be removed, and ceases the moment everything is expelled. Suppose an intelligent visitor were to inspect the vast water supply and sewerage systems of a great city : that he saw the water was pumped from the reservoir into which it had been gathered ; that it was conveyed into

tanks to be purified before being conveyed into the main conduit ; that these conduits were of large capacity when the body of water to be conveyed was large, and that they were gradually reduced in size as the demand decreased ; that the reticulation pipes were smooth inside so as to permit the water to flow freely ; that there were valves, stop-cocks, or taps, permitting the water to be turned off or on as required. Suppose, again, our visitor saw side by side another series of conduits or pipes for the conveyance of sewage, graduated like the former, but in the opposite way, the stream passing in another direction ; that instead of the inside of the pipes being smooth like the pipes carrying the water, which would be useless in conveying a thick fluid like sewage, there was a special mechanism for pushing or raking the material along to the outlet ; suppose our intelligent visitor observed all this, and saw how one part fitted into another part, and each into the whole, with no part superfluous and no necessary part absent, but all admirably suited to meet the requirements of a great city, he would be forced to the conclusion that the whole was the work of an intelligent, designing mind. And he

would be right; there is nothing here wanting to indicate a designing mind of a high order; that is to say, if we take the plans as a whole, as now presented to us. It would appear at first sight that the two cases were exactly parallel, that the sanguiferous and excretory systems of the human organism manifest design in the same way as is displayed in the water supply and sewerage systems of a great city. But can we assume that the former is the work of *one* designing mind, as we suppose the latter to be? Have we any evidence to show that the sanguiferous system, for instance, as now presented, was conceived by one mind or by several minds; that in its inception it was not much less perfect than it now is; that the original plan was not altered here, and added to there, till it is scarcely recognisable; that in fact a whole series of minds had not laboured successively over long periods of time to produce the result we see before us?

Unfortunately, we have no such evidence; on the contrary, the probabilities are all the other way. It does not require a profound acquaintance with comparative physiology to know that the sanguiferous system has been

gradually developed by an immensely slow process out of rude structures, which necessarily performed the function of distributing the nutrient fluid (for which we must suppose they were designed) in an imperfect manner, and that as these structures were improved the process of distribution became more and more effective. In many of the lower animals, for example, there is no provision made for circulation at all, the nutrient fluid being simply deposited in the digestive cavity; in others the circulation is carried on in a most primitive fashion, often through excavations formed between the digestive sac and other parts of the organism. As we ascend in the animal scale we find a special sac for the nutrient fluid; next we meet with a heart, but as yet no arteries, the fluid being simply propelled between the tissues and the organs; still higher in the scale, as in the Holothuria, distinct arteries make their appearance, and in the Myriapoda we have the multiple heart. Between these various forms there are gradations innumerable, and every conceivable method is employed for conveying the nutrient fluid to the tissues and organs requiring it.

We cannot conceive that the sanguiferous system as exhibited in the human body was so designed from the first, or why was this plan not perfected at once, without passing through the various stages which we have indicated? There is undoubtedly evidence of design in all these various organic modifications and processes; but not design in the orthodox sense of the term. It is not creative design. It is not the design of one mind, but of many minds; it is not the product of one period, but of a succession of periods. As our laws, our social and political institutions are the result of ages of effort and experimentation, so have the same processes moulded our organic structures into what they now are. First, there must be a realisation of the want felt, and, second, an intelligent effort to supply that want. Wants and efforts are the real factors in organic modifications. In the sanguiferous system the object aimed at, however imperfect may have been the performance, was to provide the organism with the necessary nutrient material; but the numerous tentative changes made in the system show the absence of unity of plan which we would expect if it were the product of a single

mind, while at the same time they indicate either want of knowledge or of power on the part of the designer to carry out an efficient scheme in the first instance. We cannot conceive of an Omniscient and Omnipotent Being making mistakes; and the innumerable instances of rudimentary, atrophied, aborted and imperfect organs prove that mistakes have been made. Nor can we even imagine such a being rectifying mistakes which He has made. The idea of a blundering workman-god is repugnant to all our notions of Deity. That blunders have been made can hardly be questioned, because they have been rectified. If the elaborate sanguiferous system of the human organism, with its pump, arteries and valves, indicates a high order of mind, what are we to think of the mental capacity which devised the systems exhibited in the lower animals, in which the blood, if it is distributed at all, circulates in channels which are mere excavations in the tissues, and along which the fluid is propelled by the movements of the body? The heart, also, which now serves the purpose of propelling the blood to all parts of the organism, has but one cavity in the lower class

of animals, but it has four cavities in the higher, with corresponding efficiency. So with the lungs. In the lower animals the blood is imperfectly aerated, owing to the fact that the lungs are supplied with blood from a branch of the great arterial system, instead of from the main trunk, and in consequence of this only a portion of the blood is properly aerated ; but in the higher organisms this defect has been remedied, and the lungs are supplied from the main trunk, and therefore all the blood passes through them before returning to the heart. Are we to suppose that the Supreme Being did not know at once how to make a proper channel for the passage of the blood, or how to provide a suitable pumping apparatus, or that the heart should have four cavities instead of only one, or that He was so ignorant that He connected the lungs with the arteries in such a blundering fashion in the first instance that the blood could not be properly aerated, although we must suppose it was His intention that it should be so ? But these evidences of imperfection are quite consistent with the theory that the organism was the work of an artificer of finite knowledge and capacity.

How otherwise can we account for the extraordinary variety and imperfection of organic forms? All living beings have the same end in view, but they all vary as regards the means of attaining that end. They are all struggling to maintain existence, as if it were something good in itself, the one thing worthy of preservation, but they all differ as to the manner in which the struggle should be maintained. Hence the innumerable devices and contrivances for alimentary, defensive and offensive purposes, resulting in the manifold diversity of organic structures now existing on the earth. Some of these are beautiful, many of them can make no claim to the possession of that quality, while numbers of them are hideous or simply fantastic; but all are useful as all subserve the great purpose of life.

It may be said that these imperfect structures are suited to the nature of the animal. This may be true; it depends entirely on whether they are effective for the purpose for which they were intended, and I cannot conceive that a more perfect structure would not be more effective than an imperfect one. The objection would be pertinent enough if I were disputing

the existence of design in these instances, but I am not; on the contrary, I maintain to the fullest extent that the whole organic structures, of the lowest as well as of the highest organisms, are designed, and am now endeavouring to discover from the nature of the design the character of the designing mind. I can scarcely conceive the mind which designed the sanguiferous system of the lower animals to be the same mind which planned the corresponding system in man, as there is such a marked poverty of invention manifested in the one case, and such a marked fertility of resource in the other. If we accept the criterion of testing the character of the designing mind by the nature of the design, we are forced to the conclusion that organic structures are not the work of one designing mind; that these structures vary according to the mental capacity of the species, the lower mind producing an inferior, and the higher mind a superior, design; that, in fact, the adaptation of means to purposed ends is devised by the creatures themselves.

By organic design, however, I do not mean it to be implied that an organism will modify itself according to a preconceived plan, or

even that it will have a clear idea of a purpose. It will have a dim notion that something is wrong, and it will strive to put it right in a semi-conscious way. It will grope its way, it will keep struggling on, it may be in the dark, always moving, always striving, and so step by step it will gain experience, and it will gradually profit by that experience.

The Theory of Physical Laws

The second theory refers all organic changes to the operation of physical laws. Intelligence, mind, design, are equally ignored by the advocates of this theory. Design, if the idea of it can be entertained at all, is "only a physical result of a particular intimate constitution or organisation of nervous matter."[1] This of course is neither argument nor evidence, not even an intelligible explanation of what is understood by design. As for mind, that is considered to be a mere collateral product, the expression or synthesis of the organic forces.[2] If that be

[1] Maudsley, *Physiology of Mind*, p. 430.

[2] Lewes says :—"If the soul be the subjective side of the life, the spiritual aspect of the material organism, then, since it is a

so, then leave it out altogether, and let us imagine an organism without a mind. Physicists are fond of comparing an organism to a machine. No doubt an organism is a machine; but it is a machine of a very unique kind. It is a self-moving, self-adjusting and self-propagating machine. I know of no machine that is absolutely automatic except a living organism; and if such a machine as that supposed ever existed, it would be operated solely by physical laws. But that a living organism is not so operated upon, a slight acquaintance with physiology will render plain enough. The presence of food in the mouth excites the flow of saliva; the contact of food with the stomach stimulates the discharge of gastric juice; the pyloric orifice remains shut as long as undigested food presses against it, but opens at once to allow the chyme, or digested food, to pass through. The cells also allow certain substances from the blood to pass through them and intercept others (osmosis); foreign bodies are expelled by suppuration, by capsulation and by

synthesis of all the organic forces, the consensus of all the sentient phenomena, no one part can usurp the prerogatives of all, but all are requisite for each. And this is indeed what few physiologists would nowadays dispute."—*The Physical Basis of Mind*, p. 439.

absorption, and portions of injured bones are disposed of by necrosis. New nerves, new muscle, and in cold blooded animals even new limbs, are substituted for damaged or lost ones. If any lesion takes place in any part of the organism an intelligence is at hand to repair it; if a nerve be severed an effort will be made to join the ends, and if this fail a new nerve will be developed from the cells; if a blood vessel be destroyed, a similar effort will be made to repair it before proceeding to replace it by another.

The adaptation of means to ends such as we have described is not the process of physical force; it is the method of intelligence. But not of Divine Intelligence which cannot err, and need not hesitate, alter or amend, as it possesses absolute mastership of all materials and perfect knowledge of all methods of employing them. Physical force follows on the lines of least resistance. It has no aims; it never designs or contrives. But here we have plans and purposes. So far from organic structure and function being subject to physical laws, as often as not they set those laws at defiance. The pumping action of the heart is not in accordance with

the law of gravitation. The opening and shutting of the valves ; the peristaltic action of the intestinal canal ; the movements of the pyloric orifice ; the lashing of the ciliated cells in the bronchial tubes for driving the mucus up to the mouth instead of allowing it to fall by gravitation into the lungs ; the contracting of the muscular coats of the stomach in such a manner as to bring every part of the food in contact with the gastric juice ; the action of the cells in passing certain substances and intercepting others ; the discharge of saliva into the mouth and gastric juice into the stomach when food is introduced, and the repair and renewal of damaged tissue or of lost limbs, are illustrations of our statement. None of these various movements are in accordance with ordinary physical laws. The living organism not only resists the physical forces without, but the chemical forces within. Many of the chemical compounds secreted by the organism, such as bile, urea, gastric juice, are themselves poisons, which would destroy the organism if not counteracted. Gastric juice, for instance, so necessary for digestion, corrodes the stomach as soon as life is extinct. These phenomena

cannot be explained by any known physical laws. No doubt mechanical appliances are employed in their production, for the whole organism is a most complicated piece of mechanism ; but the fact that this mechanism works so perfectly must not be assigned as a proof that it is itself the cause of the phenomena. That would be a singular conclusion to arrive at, as the fact that the mechanism works so perfectly is rather a proof of the intelligence of its maker. The physicist attempts to explain these phenomena by ascribing them to certain properties of the organism. Neurility is the property of nerve tissue ; contractability is the property of muscular tissue, and so on ; true, but a property is not a force ; it is only a potentiality—a something that may be used by a force. Take muscular action, for instance. No doubt muscular contraction plays an important part in the production of these phenomena, contraction being the special property of muscular tissue. But muscular contraction is not an agent ; it is only used by an agent for a specific purpose. Steel, for instance, possesses the property of elasticity. A steel mast is elastic, and so also is a watch spring

made of the same material. But the mast and the watch spring are not the property of the steel, although elasticity is; so the property of muscular tissue does not produce the phenomena referred to any more than the elasticity in the steel makes the mast and the watch spring. Moreover, contraction is the property of living muscular tissue, and the presence of life in the tissue has therefore first to be accounted for; next the fact that muscular tissue contracts in a particular manner, and always exactly in the manner required; and, lastly, the contraction theory stops short of explaining the adaptation of means to ends, as exhibited in the phenomena referred to.

The Theory of Natural Selection

The third hypothesis, the theory of natural selection, is supposed to have solved the problem of organic modifications for all time. Starting from the principle of Malthus that there are more beings brought into the world than can possibly survive, and assuming indefinite variability among those which exist, Darwin attempts to show that the operation of these two principles secures the survival of the fittest, and

produces all the varieties of animal and vegetable life that now exist, or that ever existed, on the earth. For an organism to survive in the struggle for existence, it is necessary, however, that it should have some advantage over other organisms, and the possession of what Darwin calls "profitable" variations is the *sine quâ non* to success, as natural selection is supposed to select or preserve such profitable variations and no others. But the supply of profitable variations is admittedly irregular and altogether uncertain, and the laws which regulate them are "unknown or but dimly understood."[1] Generally speaking, variations are due to "the nature of the organism," and to "the nature of the conditions," as "size from the amount of food, colour from the nature of the food, thickness of the skin and hair from the climate"[2]—all effects, it will be observed, of physical laws. But what are we to understand by "the nature of the organism"? How does the organism influence variations? Darwin gives us no explanation, but I will supply the omission. Only in one way can the organism influence variations, and that is by a

[1] *Origin of Species*, p. 9. [2] *Ibid.* p. 6.

struggle or an effort on its part to bring about a desired and purposed end. This view is of course contrary to the hypothesis we are considering, for, as we have seen, Darwin contends that natural selection is the result of physical and physiological laws, and of these alone, for it is evident that, once admit that desires, purposes and efforts are factors in organic modification, the whole fabric of natural selection falls to the ground. But natural selection, he tells us, takes no part in the production of variations.[1] Nevertheless, it cannot operate without them; they are in fact the material on which it works.[2] We are also told that variations are of no use for natural selection unless they are inherited.[3] So that heredity does the very thing that natural selection is supposed to accomplish, namely, select or preserve profitable variations. All through, Nature, or natural selection,[4]

[1] "Some have imagined that natural selection induces variability, whereas it implies only the preservation of such variations as arise and are beneficial to the being under its conditions of life."—*Origin of Species*, p. 58.

[2] "Unless such occur, natural selection can do nothing."—*Ibid.* p. 59.

[3] "Any variation which is not inherited is unimportant."—*Ibid.* p. 9.

[4] "Nature, if I may be allowed to personify the natural preservation of the survival of the fittest."—*Ibid.* p. 60.

having no aims, no purposes, takes no steps to provide those profitable variations so essential to the well being of the organisms in their struggle for existence; at the same time we are assured that natural selection is not idle; that it is constantly on the alert; that it is in fact preternaturally active; that it is "daily and hourly scrutinising, throughout the world, the slightest variations"; that it is "silently and insensibly working, *whenever and wherever opportunity offers*, at the improvement of each organic being in relation to its organic and inorganic conditions of life."[1]

This fussy activity provokes suspicion; it raises the question as to the work done, or capable of being done, by natural selection. Consider for a moment what a variation is in this connection. Darwin seems to regard variations as so many atoms which natural selection sorts out, putting the profitable on one side and the unprofitable on the other. But an organic variation is something quite different from an atom of inorganic matter, and cannot be disposed of in this fashion. An organic variation is already an actual modification of the organism,

[1] *Origin of Species*, p. 61. The italics are Darwin's.

and such a modification, if profitable and inherited, is already a going concern, and needs no help from natural selection. The variations are provided for, but not by natural selection; the profitable variations are preserved, not by natural selection, but by heredity, and they are preserved because they are profitable, so that the whole process, from first to last, is carried on without the smallest assistance from natural selection. When Darwin says that he sees no difficulty in natural selection preserving and continually accumulating variations to any extent that is profitable,[1] he seems to have forgotten that he had assumed that they were already profitable and already preserved. He assumes that to begin with; and then he naïvely gives natural selection the credit of it. He puts in a claim for work and labour done by natural selection, in which it had no share, and which, according to his own statement of accounts, had been performed by others.

We have seen what becomes of the profitable variations; they have been preserved because they were serviceable to the organism, and they were serviceable because they adapted the

[1] *Origin of Species*, p. 192.

organism to the conditions of existence, adaptation alone ensuring their preservation. But what becomes of the unprofitable variations? These are of no service to the organism, but they exist nevertheless, even as failures, and while they exist they are not only useless, but they may even be injurious. There is, however, no provision made by natural selection for their removal. What, then, becomes of them? Variations, "neither useful nor injurious, would not," we are told, "be affected by natural selection." Useless and non-injurious variations are thus put aside as not worthy of consideration, they are left "either as a fluctuating element," or they may "ultimately become fixed," "owing," he adds, "to the nature of the organism and the nature of the condition."[1] My readers must make the most they can of this not very luminous explanation. "Fluctuating element" is ingenious, so also is the "ultimately fixed," while the reason assigned for either alternative is not far behind in ingenuity. Assuming that those harmless variations ceased to be a "fluctuating element" and ultimately became fixed, what fixes them? But

[1] *Origin of Species*, p. 58.

there are other variations besides these ; there are variations which are positively injurious. What becomes of these ? Are they also a "fluctuating element," or do they become "ultimately fixed," and if so, by what process ? Bear in mind that of the infinite number of purposeless variations produced only an infinitesimal proportion of these is profitable—say 1 in 1,000,000. Imagine then what would become of an organism loaded up with 999,000 useless or injurious modifications. How would Evolution be possible under such conditions ?[1]

No wonder Darwin insists over and over again that organic evolution proceeds solely by preserving and accumulating slight variations ; that he attempts to show that nature makes no great or sudden leaps ; that natural selection acts "by short and slow steps," and "solely by accumulating slight, successive variations."[2] I venture to say that Darwin has here taken up a wholly untenable position. There is no evidence to show that nature operates solely in the manner described. I grant that the evidence in favour of this view would be difficult to supply, as we cannot deal with infinitesimals ;

[1] Appendix H. [2] *Origin of Species*, p. 388.

but all that we do know favours the opposite view. Witness the metamorphosis of insects, the conversion of gill-breathing animals into lung-breathing animals, the appearance of an extra digit in the human hand, and the sudden seasonal changes in the colour and covering of certain animals, which show that organic modifications are neither slight nor slow. But it is among domesticated animals that such changes are most marked, and it is with these that we are most familiar, and we can therefore speak of them from positive knowledge. One need only refer to the horn-less cattle of Paraguay, the solid hoofed pigs of Texas, the black shouldered peacocks, all of which appeared suddenly and have proved to be hereditary ; and the multitudinous changes in the various breeds of our domestic cattle, fowls, pigeons and dogs ; indeed, it may be said that it would be impossible to find in a litter of rabbits, dogs or pigs any two of them exactly alike in size, form, colour or disposition. Darwin probably saw that an immense accumulation of useless and injurious modifications would be a serious objection to his theory unless he could get rid of them by some means ;

and as this was impossible, he has attempted to get over the difficulty by minimising them. But in thus attempting to escape one difficulty he has only encountered another equally serious ; for if useless and injurious variations could be easily disposed of because they were slight, so would slightly profitable variations be proportionately valueless. Variations to be profitable must be effective, not prospectively, but presently effective. On the other hand, as Darwin again insists, that it is by the accumulation of "numerous, slight, yet profitable" modifications that natural selection operates,[1] this implies that slight individual modifications are, by themselves, valueless ; and as such could not be presently profitable ; while the wholesale accumulation of them for future use would imply intelligence, foresight and purpose, all of which Darwinism vehemently repudiates.

We do not say that nature never works by the accumulation of slight changes, but may fairly maintain that she does not operate invariably, or even chiefly, by such means. I also hold that all organic changes whatsoever proceed from within ; that they are mental in their

[1] *Origin of Species*, p. 193.

origin, the result of desire and effort, and not, except indirectly, the product of physical and physiological laws. As in the Social community it is the persistent desire and the constant efforts to secure the leisure, comforts and luxuries of life that are the factors of social evolution, so also are these the factors in organic modifications. Animals and men alike have desires, and make efforts to satisfy them ; and what is true of the individual man or animal holds equally true of the units which comprise the individual, the cell community. It is here we have to look for the origin of organic modifications.

It is obvious that profitable variations are preserved because they are adapted to the conditions of existence, because they supply a want, otherwise they would not be profitable. I conceive all variations to be due to efforts on the part of the cells to adapt themselves to the conditions of existence, internally and externally. I believe that variations will occur when and where they are wanted, and at no other time or place. That they have been produced by the slow accumulation of numerous slight changes, as insisted on by Darwin, seems

to me in the highest degree improbable. It will not be disputed that what is profitable is that which is useful to the animal for the time being, and not for some future period, or for some possible remote descendant. It is presently, not prospectively, profitable variations that are required. All variations not presently profitable would be useless, and would, therefore, not be preserved. That which takes place in the biological world is precisely what occurs in the economic. The individual who makes no effort to adjust himself to his surroundings, who does not move with the times, who is content to jog along in the old ruts, will assuredly come to grief sooner or later, for the world does not stand still if he does. In order to survive in the economic struggle for existence the tradesman must find new customers, the merchant new markets, the manufacturer new appliances when the old ones fail him, or more energetic men of business will take his place. And as it is with individuals so it is with nations. No people can live on their past reputation. Animals, like men, have to adapt themselves to their environment. When food is scarce in one

locality they must migrate to another where it is more plentiful; when their enemies become numerous and troublesome they must be more on the alert, more intelligent and more active, or they will inevitably perish.

Throughout the whole discussion, Darwin fails to understand (1) that the accumulation of numerous slight prospective variations would be utterly useless, as they would not be immediately profitable, yet, according to his own showing, they must be profitable before they can be preserved; and (2) he does not perceive that the probable causes of variations which he enumerates, namely, the nature of the organism and the nature of the environment, are only the conditions, not the causes of organic modifications. A living organism is moved by impulses and feelings, not by physical forces like a machine. It must feel a want or experience a desire before it will make an effort to gratify that desire. It is only when the conditions of existence are felt to be irksome, disagreeable or painful, that an endeavour will be made by the cells to adapt themselves to those conditions, and they may make many trials and produce many variations before

they succeed in hitting upon one that is useful or profitable on which to base a modification of structure. Conditions are not causes; they are not even co-operating causes. Conditions do not co-operate, but they are the necessary antecedents to the operating causes. An organism must be in a sensitive condition before it can react or respond, but the response is not the act of the condition, although the condition is necessary to the response. The response in every instance is a psychical act, and every psychical act requires a motive for its cause.

The Origin of Modifications

There is everywhere in nature a marked correspondence between physical structure and mental capacity. As the animal rises in the scale mentally, so also it rises structurally, and conversely, as it rises structurally, so also it rises mentally. Any one familiar with more than one language occasionally finds himself thinking in one or the other of them. As Hegel says, "We think in words." Every forward movement in language is determined

by an antecedent movement in thought. Words are embodied thoughts; the thoughts originate the words, and the mind makes use of words as it uses the body which it creates. We can find no better illustration of the relationship of mind to matter than that of thought to words; words stand in the same relation to thoughts as the body stands in relation to mind. Words are not only necessary to the expression of our thoughts, but they are also essential to clear conception. An efficient organic structure increases mental capacity, and mental capacity in its turn improves organic structure. The physical and the psychical act and react the one on the other. Keen eyesight sharpens the intellect. An animal which sees little perceives little. Intelligence improves the mechanism, and the mechanism in turn enlarges the intellect. As Abelard remarked, intellect gives birth to language, and language to intellect. Language, oral, written or gesticular, is an instrument of the mind. A cry may embody the feelings of an animal; a few hundred words are sufficient to express the thoughts of a savage, but an extensive vocabulary is requisite for an educated intellect, and the man who has

words at his command in which he can formulate his ideas at the same time enriches and expands his mind. This correspondence is not a psycho-physical parallelism; it is action and reaction. The mind acts on the organism, and the organism reacts on the mind. There is no parallelism, but a causal connection.[1]

This correspondence between physical structure and mental capacity is manifested in all living organisms. A simple structure indicates a low, and a complicated structure a high, mental standard. As a rule a unicellular organism will have a less capacity than a multicellular organism, and a highly complicated multicellular organism will have a greater capacity than a less complicated one. Each structure exhibits method, order and intelligence. The simplest multicellular organism is not a mere agglomeration of cells or tissue, or an aggregation of similar parts, but

[1] Sir Charles Lyell's luminous comparison of the process of natural selection with the formation of language was greatly approved by Darwin. "No praise can be too strong," he says in a letter to Sir Charles, "for the inimitable chapter on language in comparison with species." But can it be alleged that language is modified by mechanical processes like natural selection? From first to last the acquisition and modification of language is a purely mental process.

it consists of a number of dissimilar organs, each of which performs different functions. Everywhere we may find proofs of adaptation, or the adjustment of means to ends, and everywhere the ends are attained by some mechanical contrivance more or less efficient, and as we ascend in the scale the evidences of intelligence and design become more and more pronounced.

I conceive organic modifications to be the result of a constant struggle on the part of the organism to adapt itself to the conditions of existence; more specifically, to the striving of the tissue units, in every part of the organism, to adjust themselves the one to the other, and all to the conditions of life. For all life is in the cell;[1] all growth is cellular; all variations take place through the intervention of the cells; all organisms are what the cells make them. This struggle for existence extends to the remotest cell in the organism. Outwardly, its effects may be witnessed in the thickened skin of the palms of the hands and of the soles of the feet, and in any other portion of the organism exposed to friction, the effect of which the

[1] "The cell is not merely the vessel of life, it is itself the only living part."—Virchow, *Vier Reden*, p. 54.

cellular action counteracts. We see the same process in the increased quantity of hair, fur and feathers of animals in winter, and in the reduction of the same in summer, when such protection is less necessary. The difference in the colour of the inhabitants of temperate and tropical climates is to be accounted for in a similar manner. It may be said that these changes are due to the action of climate and of light on the surface of the body ; but it would be absurd to suppose that cold or heat, light or shade, could directly produce such effects without the intervention of the organism. If the external conditions affect the external cells adversely, desires are incited, and these desires provoke responsive efforts to adapt themselves to these conditions. The internal cells respond in a similar manner. Experiments have been made which show that the coats of the stomach change with any alteration in the character of the food. John Hunter describes the results of experiments he made with a gull (*Larus tridactylus*), showing that the tissue of the stomach changed from time to time according as it was supplied with an animal or a vegetable diet. Dr. Edmonstone experimented with

another gull (*Larus argentatus*), which changed the structure of its stomach twice a year according to the food supplied to it, which consisted of grain during one part of the year and of fish during the other; and Holmgren's experiments show that the gizzard of a pigeon may be converted into a carnivorous stomach if exclusively supplied with animal food. But cellular action is most strikingly manifested when an injury takes place in any part of the body. Immediately this happens a marked increase in the number and activity of the cells in the immediate vicinity of the injury may be observed, and these gradually extend themselves round the edges of the wound till they meet and so close it up.[1]

The blacksmith's arms, the navvy's hands,

[1] Professor Conn says :—"When certain amphibia are deprived of the lens of the eye they will develop a new one in a short time. But in this case it has been found that the new lens has been produced in a manner entirely different from the first lens. Originally the lens is developed from the octoderm, or outer skin, while the new lens develops from the edge of the iris, which is a part of the mesoderm, an entirely different part of the body. Here we are seemingly forced to abandon Weissmann's view of the germ plasm differentiation, and to insist that there is some agency superior to the germ plasm that controls the results. The parts of the eye act almost as if they were intelligent."—*The Method of Evolution.*

the hog's snout, the pedestrian's legs are instances of cell growth. When, in answer to a demand, a great supply of blood is drawn towards any particular part of the organism, a physiological process will be set up; there will be an increased production of cells in that part, and these cells will form themselves into masses, which will in due course be provided with nerves, cartilage, bone, and cuticle tissue or carapace. When the spider replaces a lost limb, the crab a lost claw, or the lizard a lost tail, we do not suppose the renewal is due to Divine interposition, the operation of physical laws, or even to natural selection; but we may conceive that the deprivation being purely local, the local cells would feel the loss and make an attempt to repair it, just as when a lesion takes place in a muscle the local cells come to the rescue and make good the damage. In the social community it is not the head of the State that organises industry, establishes manufactories, builds villages, towns and cities, and in a thousand ways changes the face of the land; it is the individual units in the several localities that start these enterprises, which supply the capital, the labour and the supervision necessary

for their establishment and success. And so it is with the organic community. Local wants are provided for by local agencies. When there is a demand or a strain on any particular organ or part of an organ, the forces on the spot may be relied upon to provide the required relief. In this way I believe all organic variations have arisen.

But although I maintain that organic structures have been modified by, and not for, organic beings, by tentative processes, which show evidence of intelligence and purpose, I nevertheless recognise another series of facts which indicate design, and design of a higher order than that which we have been considering. I refer to the facts relating to organic existence. Have we any evidence to show that the creation of organic beings was an unintentional or purposeless act? I am not unmindful of what has been said about the barrenness and futility of inquiries into what are ineptly called Final Causes, nor of the supercilious attitude assumed by modern science towards questions of this sort; but it is necessary that this question should be answered. I venture to say that there is no such evidence. On the other hand,

there are certain facts which would lead one to an opposite conclusion. Living beings have not been cast upon the world without proper provision having been made for them. They have been endowed with the power to resist the physical forces of nature, and even to make use of those forces for their own purposes. They have intelligence and volition, so that they can discriminate and determine. They have also been provided with an organising capacity, so that they can adjust their structures to the varying conditions of life. Above all, they have been endowed with certain instincts which come into use before their intellectual powers are fully developed, and consequently before they could have gained any experience. I refer more particularly to what may be called the Primitive instincts—the Alimentary, Self-preserving, Self-perpetuating and Maternal instincts. These instincts have not been developed ; they are innate and primordial endowments, which take the place of reason till reason is ready to undertake its proper functions. Such instincts are in their nature purposive. They are obviously provisional. They minister to the immediate necessities of life

before reason can take control. If we find that provision has been made for the production of certain definite results which we cannot ascribe to organic action or to the operation of physical laws ; then we are justified in concluding that in these primordial endowments we have evidence of design anterior to that manifested by the organisms in their struggle for existence, and which we are warranted in ascribing to a Higher Power.

The Seat of the Soul

As to the question of the seat of the mind, or soul, the reader will already have anticipated my conclusions. As the germ cell propagates by division, and as each division of the cell is exactly alike, and as this equality of division of parts is carried on throughout the whole building up process, it is evident that the soul cannot be said to exist in any particular part of the organism. When a cell is about to bisect itself, its nucleus undergoes a transformation ; small bodies develop in the nucleus substance, usually in a thread-like form, which are called chromosomes. These chromosomes

vary in number in the cells of different species, but their number is always the same in a given species, and whatever their number the chromosomes are always bisected before the cell divides, and exactly one-half of them apportioned to each half of the divided cell. Professor Weissmann believed that the apportionment of this nuclear substance, though quantitatively divided, was qualitatively different, thus producing two different kinds of cells, the one containing what he called the "body plasm," and the other the "germ plasm"; but the observations of recent investigators have not confirmed his conclusions. The equality of the cell divisions, both as to quality and quantity, therefore forbids the making of any fundamental distinction between the cells which compose the organism, always recognising, however, the difference between the cell proper and nerve cell, which latter has higher functions to perform. Leibnitz, whose theory of monads really anticipated the cellular theory, held that there was an infinity of degrees among monads, but over and above them all was a central monad, a soul, existing in the body. Descartes believed that the soul

resided in the pineal gland. Some physiologists hold that its seat is in the spinal bulb, or medulla oblongata, called by Flourens the vital knot, because if any injury occurs to that portion of the brain death immediately ensues. But the extreme importance of this organ is now understood to be due to the fact that it is the centre of the nerves that preside over the functions of the heart. Dr. L. Beale held that the bioplasts in the brain were directly concerned in mental actions, and the relation of these bioplasts to the organic mechanism he compares to that which "subsists between the intelligent workman and the highly complex machinery which he directs, stops, and sets going." The general opinion of those who believe in its existence is that the soul is in the brain, though they avoid specifying any part of it. Analogy would lead one to believe that the Aristotelian aphorism is not wide of the mark which affirms that the soul is not confined to any particular locality, but is present in the whole and in every part of the body.[1]

There is no reason for placing the soul exclusively in the brain. It is admitted that a

[1] *De Anima*, I. 5. 31.

close relationship exists between the soul and the nervous system, however we may explain that relationship; and we know that the nervous system is not confined to the brain, but that it is ramified throughout the body. We cannot, therefore, assert that the soul operates through the brain without admitting at the same time that it also operates throughout the whole nervous system. It is the nervous system as a whole that is operated upon, and not that part of it only that is localised in the encephalon, for the nerves at the periphery are as much a part of the nervous system as the brain itself and subject to the same general laws.[1]

Those who hold that sensation exists exclusively in the brain will no doubt regard these views as erroneous. It must not be forgotten, however, that the organism is an aggregation of cells, just as the social body is a commonwealth of individuals; and although a large aggregation of units will constitute a centre, there is no need to suppose such a centre is the exclusive seat of sensation in the one case or of social feeling in the other.

[1] See Appendix I.

The centre, whether organic or social, is, in fact, a mere outgrowth, and exists for the benefit of the general community. Nor is a nervous centre by any means necessary. In the lower organism there is no such centre, the nerve cells occurring in singles, pairs or groups distributed throughout the body, and in the higher organisms there is an immense mass of nerve cells, called the sympathetic system, which are only remotely connected with the cerebral system and act independently of the latter. We assume that the soul is present whenever sensation is present; and that sensation is present in other parts of the organism as well as in the brain is proved by the localisation of sensations in these parts, and the localisation of sensation is the direct declaration of consciousness.[1]

[1] Against this view it has been alleged that instances have occurred which show that pain has occasionally been felt in a limb for months, and even for years, after its removal by amputation. The phenomenon is a peculiar one, and requires further investigation. As an argument against the veracity of consciousness, however, it proves too much, for if all sensation is in the brain it is the brain that is at fault in these instances. Possibly the phenomena may be explained by supposing the associations connected with the limb before or at the time of amputation are not forgotten, but continue to recur time after time, as severe nervous shocks are apt to do; in other words, that in such cases the sensation is due to an act of memory.

CHAPTER VI

ON INSTINCT

Various definitions of instinct—Darwin's views on—Primary and secondary instincts—On the absence of the maternal instinct in the cuckoo—Special instincts—The spex—Mimicry of other species, and of environment—Instinct defined.

EVERY organic action has its origin in one or the other of two motor powers. These two powers are Instinct and Reason. Descartes held that animals were automata ; the physiologist believes reflex actions are automatic ; while the physicist maintains that mechanical and chemical forces are the sole factors concerned in organic action. I hold, on the contrary, that every organic action, from the movement of a muscle to the highest mental abstraction, is due either to instinct or to reason. True, mechanical and chemical processes play an important part in all organic movements, but the part they play is always subordinate to the one or to

the other of the two powers referred to. Instinct is action in obedience to impulse or direction; reason, on the other hand, is a logical process, which demands that the consequences of every action should be weighed before performance. Instinct is also purposive, and, as such, is psychical in its nature. Instinct is the earliest form of mental activity. It precedes reason, in order of time, and it survives even when reason has become the predominating power, as in the higher organisms, for it originated in what are now only ganglia or sub-centres, and these sub-centres and ganglia are still operative, notwithstanding their present subordinate position in the organism.

The term "instinct" is often used in a vague sense by popular writers and theologians, and even by others who have given the subject special study. Mr. Rutgers Marshall speaks of the ethical instinct, the patriotic instinct, and even of benevolent, artistic and religious instincts.[1] These are mere sentiments, acquired or inherited, and are outside the province of instinct altogether. If we are to classify dispositions or habits as instincts, we might as

[1] *Instinct and Reason*, pp. 90–92.

well include every variety of permanent habit of every species, genus, family, order and class, which are to be numbered by the million, in the same category. Paley defines instinct as "a propensity prior to experience." Spence says, "the instincts of animals are those faculties implanted in them by the Creator, by which, independent of instruction, observation or experience, and without knowledge of the end in view, they are all alike impelled to the performance of certain actions tending to the well-being of the individual and the preservation of the species."[1] Instinct, according to Wundt, is due to "lapsed intelligence," and is, therefore, voluntary, at least in the first instance. "Movements," he says, "which originally followed upon simple or compound voluntary acts, but which have become mechanicised in the course of individual life, or of generic evolution, we term instinctive actions."[2] Romanes, Mr. Herbert Spencer and others have adopted this view in a form more or less modified. But if instinct is prior to, or independent of, experience, which I assume to be beyond dispute,

[1] *Kirby and Spence's Introduction to Entomology*, 7th ed., p. 537.
[2] *Lectures on Human and Animal Physiology*, p. 338.

how can it be the result of "lapsed intelligence"? If it were due to "lapsed intelligence," it would be the result of, and would therefore be subsequent to, experience. Instinct is also supposed to have originated in habit; but how can such instincts as are performed only once in a lifetime, or that have to be put to immediate use, have arisen in this manner before the habit has been acquired?

Darwin's views on the origin of instinct are well known. "It is at least possible," he says, "that slight variations might be profitable to a species, and if it can be shown these instincts vary ever so little, then I can see no difficulty in natural selection preserving and continually accumulating variations of instincts to any extent that was profitable. It is thus, as I believe, that all the complex and wonderful instincts have originated."[1] All that Darwin demands is that variations, be they ever so little, should be profitable. Let us, however, clearly understand in what connection he uses the term "profitable," for the principle here laid down will not only apply to instinct, but to the whole question of natural selection. When he says

[1] *Origin of Species*, p. 192.

there can be no difficulty in natural selection preserving and continually accumulating variation of instinct "to any extent that was profitable," does he mean that natural selection preserved such variations as it deemed *might* be profitable; or that it only preserves such as have already proved profitable? The distinction is important. That he means the latter is made clear from a previous chapter of the same work, where he says that natural selection only preserves such variations as arise and are beneficial to the being;[1] and, again he says that unless such beneficial variations occur, natural selection can do nothing. This is all plain enough; the variations have already occurred, and have already been proved profitable; they have already been preserved, so that natural selection has nothing left for it to do.

Darwin assures us that all the most complex and wonderful instincts have "originated" by the slow and gradual accumulation of numerous slight, yet profitable, variations, and that natural selection has preserved these accumulations. But how can natural selection, which he admits only preserves, be said to "originate" these

[1] *Origin of Species*, p. 58.

variations? How can a process which only preserves and does not create, originate anything? How, for instance, can the preservation of variations of the reproductive instinct originate that instinct? To preserve is to keep something which already exists; but Darwin claims that natural selection originates something which, according to his own account, must have already existed.[1]

Classification of Instincts

Instincts may be divided into two classes, the primitive and the acquired. The primitive instincts are original, the acquired are modifications of the primitive. The primitive instincts

[1] Darwin makes a singular mistake when, following Mr. Herbert Spencer, he defines natural selection as "the survival of the fittest." Natural selection he describes as the cause of the origin of species, as the full title of the *Origin of Species* indicates; * but "the survival of the fittest" is not a *cause*, but a result, although his followers have unquestionably believed it to be the former and not the latter. This is evidently a mistake, for Darwin admits that unless favourable variations occur "natural selection can do nothing"—that is to say, that the real cause of the origin of species is the occurrence of profitable variations; and when he states that natural selection is "the survival of the fittest," he substitutes the result for the cause, thus leaving the origin of species unaccounted for.

* The title is *The Origin of Species by Means of Natural Selection.*

are limited as to number, and they are solely concerned with the preservation of the individual and the maintenance of the race. We may describe them as the Alimentary, the Self-preservative, the Reproductive and the Maternal Instincts.

(1.) The first primitive instinct is the Self-Preservative. The will to live is common to all organic beings, hence the universal struggle for existence. But for this instinct we should never move out of the way of danger, never raise a hand to avert a blow, never resent an injury, never provide overselves with the means of subsistence. The instinct is innate in animals and man alike. An infant expresses alarm when it hears an unusual noise ; when an unfamiliar object is presented to it it struggles to get away from that object ; it screams and throws out its arms to protect itself when anticipating a fall. And the instinct of the infant survives in the adult. He, too, acts from impulse, much to his own surprise sometimes. The would-be suicide who throws himself into the stream will struggle violently to save himself from his own deliberate act. In this fashion the primitive nature of the instinct of self-preservation asserts

itself. If the self-preservative instinct were absent, and we were guided entirely by the preponderance of pleasure or pain, suicide would inevitably be resorted to whenever pain predominated over pleasure. If the individual had to wait till experience taught him the necessity of self-subsistence and of self-protection, experience would arrive too late to be of any use. The instinct of self-preservation anticipates experience.

(2.) The second in order of time is the Alimentary Instinct. For an organism to live it must be nourished, and it is instinct that impels it to provide itself with nourishment. The impelling force is a certain uneasy feeling, the sensation of hunger, which, like feeling generally is psychical in its nature. This nourishment the organism draws from the surrounding medium ; but it is not everything in the surrounding medium that is capable of affording nourishment, and a selection from the materials must therefore be made. Here, again, the psychical factor presents itself in the shape of choice or discrimination. The Alimentary Instinct is the simplest of all psychical actions ; a want is felt, and an impulse guides the organism

to the supplying of that want. The Alimentary instinct is not a growth or development; it is a primordial impulse, without which there could have been no growth, and the organism would have come to a premature end.

(3.) Reproduction is also a primitive instinct. Next in importance to the preservation of the individual is the maintenance of the race. It appears first as cell division. The sexual instinct manifests itself prior to puberty and before the organism is fully developed. The female child displays her incipient maternal love by the way she fondles her dolls, her love of young children (to whom boys of the same age have often an actual antipathy), and by various feminine traits and dainty ways, all of which are conspicuously absent in the male child. Laura Bridgman, who had lost all her senses except that of touch when two years old, had nevertheless the sexual instinct clearly developed at an early age. Although no member of the opposite sex ever approached her except Dr. Howe, the director of the institution in which she resided, she was very curious about her fellow inmate of the opposite sex, who was also a blind and deaf mute, and when she kissed

him on their first meeting, she instantly drew back as if she had done something improper. One day, before putting her doll to bed, she went round the room to ascertain if any one were present, and finding Dr. Howe there she waited till he had left the room before she undressed it. Lucy Reed, also blind and deaf at an early age, recoiled from the touch of a male, although she gladly responded to caresses from persons of her own sex even when strangers to her. These cases do not corroborate the views of the physicists, who hold that instinct is the result of organisation, for the instinct displayed itself long before the organism had reached maturity.

(4.) There is next what we term the maternal instinct. This instinct is also, like the last, necessary for the preservation of the race. Except in the case of the cuckoo, the ostrich and a few other families, the duty of rearing the young devolves on the female alone. The broody hen is led by an overmastering impulse to sit on her eggs, or on eggs that are not hers, or on anything resembling eggs (for she is not very discriminating in this respect), her mental faculties being inferior to her instincts, and she

will sit on till the appointed time for hatching arrives, which she seems to know by the same means that impel her to sit, when she leaves her nest whether she has hatched the eggs or not. But so persistent is this instinct that even when she has not been allowed to sit, she will resort to various devices in order to induce the chicks belonging to another hen to follow her, and only after repeated failures will she abandon her seductive efforts. A remarkable feature about this instinct is that the same mother that is so careful with her chicks when young will show no sympathy for them when they are able to look after themselves, but will even peck at them when ill, after the manner of fowls.

When the maternal instinct is absent, as in the case of the cuckoo (*Molothrus*), the order of nature seems to be entirely disarranged. The cuckoo does not hatch her own eggs, or rear her own young, but she saves the situation by making use of the maternal instinct of the birds of other species in whose nests she lays her eggs and leaves them to their fate. This bird, or at any rate, the European and Australian species, lays a number of eggs, which are small in

proportion to her own size, at intervals of six or seven days, or sometimes less, and it is surmised that this fact accounts for her not hatching her own eggs, as if she attempted to do so there would be too long an interval between the hatching of each egg, which would involve the wasting of a number of them, and too long a time occupied in the hatching, which would be a great strain on the bird. It appears that both the European and Australian species are parasitic, but that the American species is not. As Darwin has pointed out, there seems to be a gradation in this particular habit, some species building a nest of their own, or seizing one belonging to another bird, and others laying their eggs in the nests of strangers. The latter never sit on their own eggs, and, curiously enough, never place more than a single egg in one nest. It seems probable, therefore, as Darwin suggests, that this peculiarity of laying her eggs in the nests of other birds has been acquired by the female bird.

But the origin of this peculiarity is perhaps not so much due to the long interval between the laying of the eggs as to the extraordinary aberrant character of the female. The female

ostrich has the habit of laying her eggs at intervals of two or three days, and she and the male between them manage to hatch and rear their young ; but, as we have stated, the parasitic cuckoo does neither. The sexes of this species appear to live promiscuously. They have no sexual, maternal or paternal ties whatever, and rear no families. The female leaves the hatching of her eggs to other birds, just as a certain class of women leave their babies at other people's doors. Both sexes have an evil reputation, but the female has the worst, and with the worst results. She leads a more dissolute life than the male. She is not true to her mate, and is ever gadding about, making fresh conquests and creating domestic discords. This demoralisation of the female is probably due to the absence of the maternal instinct, and but for the fact that she makes use of the maternal instinct of other birds, the parasitic species would most probably have become extinct.[1] The absence of the maternal instinct in the female cuckoo is also attended with extraordinary results to her progeny. The young cuckoo hatched in the nest of her foster mother, and fed

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and tended solely by her, displays an utter absence of filial feeling and an almost demoniacal malignity towards its foster brothers. It never rests till it has turned them out of their nest. Almost as soon as it is hatched, and before it has the use of its eyes, it commences its struggle to eject them, and never ceases its efforts till it has attained its object, every failure only making it the more determined ; and if the young birds are put back into the nest again after being turned out, it will eject them again and again, displaying thoughout the struggle the most violent muscular contractions for so young a bird.

Darwin states that if it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate his theory, for such could not have been produced by natural selection.[1] And again, "As in the case of corporeal structure, and conformably to my theory, the instinct of such species is good for itself, but has never, so far as we can judge, been produced for the exclusive benefit of others."[2] This is a bold challenge. What,

[1] *Origin of Species*, p. 152. [2] *Ibid.* p. 193.

then, of the maternal instinct? Surely this instinct exists "for the exclusive benefit of others," for the mother in no sense benefits by the care and affection she bestows on her child. It is true Darwin here speaks of "species" and not of individuals; but what holds good of the one holds equally good of the other, and Darwin's whole theory is based on the assumption that it is the individual that benefits by the preservation of variations, for in no other way is it possible for natural selection to operate at all. Purely selfish aims are absolutely negatived in both cases, and yet unmitigated selfishness is the corner stone of his theory.

So much for the primitive instincts. The other instincts we have termed acquired or secondary, as they are mere modifications of the primary. These secondary instincts are infinite in variety, but they may be classified under three heads, namely, those which have originated (1) in experience, (2) in habit, and (3) in severe nervous shock, which has affected the constitution.

(1.) To the first belong the tricks of hares and rabbits in dodging from side to side when

hunted, which are modifications of the instinct of self-preservation acquired from experience; so also the habit of the lapwing after being shot at, when she pretends to be wounded, and flutters away in a direction opposite to where her chicks are running in order to divert attention from them; so that of the woodlice and speckled weevil, who when disturbed roll themselves up into a ball and sham death; so that of foxes, when caught and placed in confinement, feigning death or disablement in the hope of taking their custodian unawares and so escaping. Experience has also taught the mallee hen (*Megapodidæ*) that she may raise her chickens without sitting on her eggs by simply placing them under a heap of dead leaves or other rubbish that can produce the necessary amount of heat,[1] just as some birds in Northern Europe have discovered that by building their nests in hothouses they may escape the trouble of sitting on their eggs. This shows that they realise the end to be achieved, but that they dislike the ordinary process of hatching.

(2.) To that class of instincts which has been modified by habit belong the migratory instincts.

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Many animals resort at certain seasons to remote places in search of food and for breeding purposes, till the habit has become hereditary. Darwin mentions that in some parts of Spain the sheep have to be taken long journeys every season to find pasture, and that as the time comes round when they have been accustomed to commence this journey they become restless, and will start of their own accord in the usual direction if not driven by those in charge of them. Birds, also, of almost every species, migrate on a large scale from the temperate and tropical regions to the tundras of Siberia, where they find food in abundance when the snow melts, and where they rear their young.

(3.) The last class of instincts have originated in a different way. Animals which have been bred in regions where there are no beasts of prey, or have been long domesticated, nevertheless evince the utmost terror when they approach the vicinity of their ancestral enemies. Horses passing the old lion house in Berlin are said to have been terror stricken on scenting its occupants; chickens reared artificially, and hooded on the day they are hatched, are greatly alarmed on hearing for the first time the cry of

an owl. So also may we suppose the modified instinct of the domesticated cow to have originated. In Australia, where there are no wild animals to prey upon her progeny, she nevertheless when in a paddock hides her newly born calf under a bush or among long tussocks, and immediately moves to a distance lest her presence should attract attention to it ; while the calf lies perfectly still, even when closely approached by the herdsman, as if it understood the game that was being played by its dam. One explanation of these cases is that some remote ancestor had been attacked by a beast of prey, leaving an impression on its nervous system from the shock, and that this impression had been transmitted to its posterity. A mild stimulus on the nervous system may pass unnoticed or produce a sensation that is soon forgotten ; a violent shock might possibly produce a nervous disturbance that will permanently modify the organism, and this modification may become hereditary. Darwin mentions the case of a bull slut which had a violent antipathy to her owner, a butcher, who had once flogged her severely, and the progeny afterwards exhibited a similar dislike to the whole tribe of butchers. A

contributor to a scientific journal [1] mentions that he observed during a number of years that a flock of geese always exhibited great alarm on arriving at a certain place at which a murderous attack had been made on them by dogs ten years before. As the older members of the flock had been killed off every year, it would appear as if this event had made a lasting impression on the nervous organism of the victims of the attack, which had been transmitted to their progeny. These may be taken as instances of incipient instinct. Numerous other cases of a similar character are recorded in works on pathology, where women who have been the subject of a violent nervous shock have left traces of it on their children.

There are some modified instincts which will, however, require to be considered at greater length, owing to the mystery that has been thrown around them by certain writers. The instinct of the Spex has been often referred to. The female of this species (*Sphegidae*) makes a burrow in the earth in which she deposits her eggs, and then proceeds to provide a store of

[1] *Revue Scientifique*, May, 1889.

crickets or caterpillars for the forthcoming larvæ. It is alleged that she stings her prey in their chief nerve centres, and nowhere else, and in a manner so as not to kill them outright, in order that they may not go bad before they are required for use. Romanes gives a minute account of the whole process. If a cricket is seized, he says, "it is stung successively in three nerve centres; first in the one behind the neck, next in the one behind the prothorax, and lastly in the one behind it."[1] How the Spex came to know where the chief centres of the crickets and caterpillars were situated is regarded as very mysterious. It is, however, now well understood that she possesses no such knowledge of the anatomy of her victims as is here supposed, as she stings them in any soft place she can find, which is anywhere in the caterpillar, and in the cricket in the only vulnerable places available, which are of course those between the hard casings of the shell. This is obviously a case of acquired instinct.

[1] *Mental Evolution*, p. 300. See also J. H. Fake in *Souvenirs Entomologies*, 1879 and 1883.

Mimicry

There are other phenomena manifested by various species of animals which are really not instincts at all, although usually classed as such. I refer to what is described as mimicry. When an animal belonging to one species is said to copy the colour or form of another species, that is called a mimicry; but I think I shall be able to show that no such transformation takes place. This so-called mimicry is said to occur chiefly among insects, and especially among butterflies. Darwin tells us that the Ithomia, which is abundant in certain localities, and another species of butterfly, the Leptalis, are often mingled in the same flock, and the latter, which is supposed to imitate the Ithomia, can scarcely be distinguished from the latter, "which it resembles in every shade of colour, and even in the shape of its wings," and the mimicker and the mimicked, he says, are often not only of distinct species, but sometimes even of distinct genera.[1] Darwin accepts Bates's explanation of the phenomenon, which is to the effect that

[1] *Origin of Species*, p. 352.

the mimicker, by assuming the form and colour of the mimicked, escapes from danger, as the latter are probably distasteful to insectivorous birds, which the former are not, and are therefore liable to be attacked when by themselves. Because two species of butterflies resembling each other happen occasionally to associate together, are we to assume that one of them actually had the faculty of changing at will its form and colour to imitate the other? Bates furnishes no explanation as to how the transformation is effected, and Darwin not only accepts the statement as fact without inquiry, but claims it as another triumph for natural selection.[1]

This is a very sorry attempt to make a mystery out of a very simple thing. Animals, when in danger from an attack by their foes, will, if strong and properly armed, show fight; if weak and unarmed, they will, if swift of foot or wing, make for the open country; if slow in their movements, they will seek cover, or they will feign death, like the weevil, discharge a quantity of inky matter, in which they envelope themselves, like the cuttle fish, or a

[1] *Origin of Species*, p. 354.

fetid liquid, like the skunk. They may even, if unable to escape, assume a virtue if they have it not, and make hideous faces or assume attitudes that surprise or terrify, like an Australian lizard (*Chlamydosaurus Kingi*), which is really a harmless animal, but possesses a huge crenated throat-frill, and when brought to bay, it expands this extraordinary frill, rises on its hind legs, opens its mouth wide, displaying serried rows of white teeth, and, by scuttling its enormous tail about, generally succeeds in driving away its enemy. It is among butterflies that this so-called mimicry mostly prevails; these being slow in their movements and conspicuously coloured, flying to cover would not enable them to escape observation, so they alight on some object, a leaf or the bark of a tree, coloured like their own bodies, and by remaining perfectly still thus escape detection. They do not mimic, copy or imitate anything; they do not transform themselves by changing either their shape or colour; they do not even disguise themselves; they simply fly for shelter to the most likely object to afford it. So keenly observant are some animals that they have noticed the white droppings from birds

on leaves and stones, and there are well-known cases in which animals of a white colour, like the Javanese spider (*Ornithoscadoides decipiens*), openly expose themselves on these objects, and by lying perfectly still manage to escape observation. Henry Drummond met with another insect of similar habits in his travels in Africa, and gives an amusing and naïve description of the manner of its discovery :—

I had lain a whole week without stirring from one spot . . . a canopy of leaves arched overhead, the home of many birds, and the granite boulders of the dry stream bed, and all along the banks, were marked with their white droppings. One day I was startled to see one of these droppings move. It was a mere white splash upon a stone, and when I approached I saw I must be mistaken ; the thing was impossible ; and now it was perfectly motionless. But I certainly saw it move, so I bent down and touched it. It was an animal. Of course it was as dead as a stone the moment I touched it. . . . Here was a bird dropping suddenly become alive and moving over a rock ; and now it was a bird dropping again ; and yet, like Galileo, I protest that it moved. . . . Lying upon all the stones about are the genuine droppings of birds ; and when one sees the two together it is difficult to say whether one is the most struck with the originality of the idea, or the extraordinary audacity with which the *rôle* is carried out.

When we consider that the droppings around were probably the excreta of the natural enemies of the poor insect the irony of the whole affair is amusing enough.[1]

Mimicry of Environment

We have read many travellers' tales about the mimicry of environment, which are so carefully treasured up by Darwinists, old and new. Because the frogs of the Engadine are speckled like the granite rocks of that region ; because in the same locality there exists a grasshopper with red hind legs, which happens to resemble the reddish brown of the Jurassic clay ; because there are other grasshoppers with light upper wings on adjacent patches of sandstone, from which they are sometimes undistinguishable ; because some insects, lizards and other small

[1] Lady Broome, speaking of the cockroach nuisance in Trinidad, asks, "Who can deal with creatures who fly in at the window and run literally like greased lightning ? How they will dart to a knot of exactly their own colour in the polished wooden floor, and lie still as death under your eyes !" * When the ugly cockroach behaves with such intelligence, may we not allow the gay butterfly to have some appreciation of its own bright colouring, and a slight modicum of sense along with it ?

* *Cornhill Magazine*, Oct. 1899.

creatures frequent limestone rocks or gravelly spots of ground, and even moss-grown stone walls and sandy beaches, or have their habitat amongst leaves of various stages of growth or decay, which they more or less resemble in colour if in nothing else; because of these coincidences we are gravely asked to believe that the animals frequenting these localities, often mere plots of ground of a few yards square, have modified their organism to suit each particular patch of their environment. Why attempt to make mysteries out of such simple facts? Surely we may credit animals with sufficient intelligence to enable them to avoid needlessly exposing themselves to the attacks of their natural enemies. If they possess intelligence enough to procure their food, we may presume they have sense enough to keep out of danger without endowing them with supernormal powers of transformation for such a purpose.

Instinct is usually described as blind, automatic and unconscious. That it is either blind or automatic I cannot admit; that it is unconscious can only be affirmed of it as regards its ultimate, not as its proximate, end. It is not to be supposed, *e.g.*, that an animal is conscious that the sexual

instinct exists for the propagation and perpetuation of the species, which is its ultimate end, its proximate end being self-gratification. I cannot imagine how instinct can operate without at least a limited extent of knowledge. How is it that the newly born foal, as soon as it is able to stand, makes straight for the teats of its dam ; or that the newly born calf, when it has several kinds of milk presented to it, unhesitatingly chooses the milk from a dam of its own species ? Spalding's experiments, which have been confirmed and extended by other investigators, took newly hatched chickens and closed their ears with wax, and covered their eyes with a hood as soon as, and even before, they were removed from the shell, and he found that a bird, not quite three days old, ten minutes after being unhooded, made a dart at a fly, and seized and swallowed it at first stroke ; ten minutes later, when placed within sight and call of a hen, with a brood of its own age, it displayed as much perception of its relation to the outer world as it was ever likely to learn in the whole course of its life, for it rushed towards the hen some distance off, never knocked its head against a stone,

leaped over small obstacles which lay in its path, and went round large ones, reaching the mother as nearly as possible in a straight line. The effect of hearing a hawk's voice for the first time was nearly as striking. A young turkey, which had been taken out of its shell and kept secluded till the tenth day of its life, was being fed when a young hawk in a cage near by uttered a cry. Instantly the turkey shot across to the far end of the room, and stood there motionless and dumb with terror, and every time it heard this to it alarming cry there was the same manifestation of fear. It is well known that it is the invariable habit of old turkeys, when they see a fly settled on an object, to steal on to the insect with slow steps till within an inch or two of their prey, which they seize by a sudden dart, and Spalding witnessed his young turkey slowly moving and pointing its beak at a fly when not a day and a half old.

Can we doubt that the chicken knew that the fly was within reach of its beak, and why it made a sudden dart in order to capture it; that it knew that it could jump over small obstacles, but had to go round large ones, on

its way to the hen as well as if it had repeatedly traversed the same ground? Can we doubt that the chicken knew that the cluck of the broody hen was the call of a friend, or that the turkey knew that the cry of the hawk was that of a foe? Such experiments prove that certain animals have, as soon as they are born, and before they have had time or opportunity for observation or instruction (1) a knowledge of the meaning of certain sounds, (2) a knowledge of the nature of certain objects, (3) a knowledge of the nature of other animals seen or heard for the first time, and (4) a knowledge of their own muscular powers, and generally of their relations to the new world as soon as they are ushered into it. It is obvious, therefore, that if these actions are founded on knowledge, we cannot describe instinct as blind, automatic or unconscious.

Then why this instinctive knowledge was necessary is also obvious: Special provisionary arrangements had to be made for helpless beings suddenly thrust upon a strange world before they had time to acquire knowledge by the normal process of experience. And in this provisionary arrangement I conceive there is

evidence of Creative design. The How this instinctive knowledge is acquired is more difficult to explain. But two alternatives present themselves. Either we must believe that this knowledge is innate, or that animals are temporarily endowed at birth with supernormally acute senses and extraordinary powers of observation and perception to enable them to instantaneously understand what their senses convey to them. The first alternative I dismiss as unworthy of consideration ; the second must therefore be accepted as the least objectionable. And there is much to be said in favour of this view. Many organs are temporarily provided for a special purpose, and when that purpose has been served they are immediately dispensed with, as for instance the hammer on the head of the unhatched chick for breaking its shell disappears as soon as the chick is liberated. There are also many well authenticated cases on record of instantaneous insight—calculating prodigies, for instance, that can almost in an instant give the cube root of a set of figures which it would take hours to work out by the ordinary process. It is also a singular circumstance that such prodigies are invariably

inexperienced youths, as when they grow older they lose the calculating faculty. It has also been noted that young children belonging to uncivilised races are often bright and intelligent, and show great aptitude in acquiring knowledge, while later in life they become dull and stupid like their parents, which may possibly be accounted for by the fact that youth is generally more sensitive than old age. But this is a subject one cannot venture to dogmatise upon.[1]

To conclude, instinct is not the result of experience, for instinct precedes all experience. It is not due to "lapsed intelligence," for intelligence comes in at a subsequent stage, and then it can only modify, but not originate, instinct. It is not the product of habit, for it sometimes appears where habit is impossible, as when it occurs only once in a lifetime. It is not caused by natural selection, as this process postulates immense periods of time for its operation, and instinct is necessary at the very beginning of life and at every stage of it.

There are three degrees or stages of mental

[1] Appendix L.

development in organic beings. The first and lowest is the vital, the second is the instinctive, the third and highest is the purely mental. Vital action has its seat in the tissue cells, instinctive action in the ganglia, and purely mental action in the hemispheres. These three stages are conditioned by the structural development of the organism. Instinct is not a function of the brain. The cerebral hemispheres are supposed to be the organ of consciousness, but instinct may operate in the absence of the cerebral hemispheres. This has been proved by numerous experiments. Goltz decapitated a male frog in the pairing season, and he observed that it could discriminate between a male and a female, and that it sought, grasped and embraced the latter and rejected the former. In vain Goltz tried to deceive the brainless animal, but it would only hold the female in his embrace, and no matter how often a male was presented it could at once tell the difference between the two. Here, then, is evidence of the existence of discrimination and volition, as well as instinct, in a brainless animal. Leyden removed both the hemispheres and the ganglia at their base from a hen, yet it moved about

and clucked. Meissner extirpated the whole brain of a pigeon, and it continued to utter its coo. Voit removed the hemispheres from some pigeons, and some months afterwards they showed signs of sexual feeling by repeated coo-ings, though quite unable to gratify their desires. This latter fact confirms the opinion of Rolando and Renzi that decapitated animals do not lose their instincts, but only the directive power which executes them. Unzer also observed that decapitated female crickets lured males to sexual congress, and that decapitated male butterflies attempted sexual congress with females. I am aware that Flourens's experiments with decapitated fowls and pigeons led him to a different conclusion, as he held that brainless animals lost both their intelligence and their instincts. Of course the removal of the supreme nerve centre of an animal will disturb the mechanical connections of the whole organism, and will more or less paralyse its functions, especially among the higher vertebrates where the connections are most complicated, so that we could not reasonably expect that instincts would invariably survive this severe ordeal without serious organic disturbance. Even among animals of a lower

scale, the removal of the brain creates so great a disturbance that only under special circumstances would instinct manifest itself, as, for example, in sexual feelings only in the pairing season. But enough evidence has been produced to show that in certain animals, under certain conditions, instinct may be operative in the absence of the cerebrum.

An instinct may therefore be defined as a primordial, purposive, and conscious action, which is necessary to the preservation of the individual and the perpetuation of the race. It may be described as an impulse or an imperative desire to perform certain actions. Instinct stands in an inverse ratio to reason, and the stronger the instinct the weaker the intellect ; the stronger the intellect the weaker the instinct. Kant calls instinct "the voice of God."[1] Hume held that it is implanted by nature and is infallible in its operations ; is independent of all the laboured deductions of the understanding, and manifests itself at the first appearance of life and thought—a description that can hardly be improved upon at the present day.[2]

[1] *Werke*, vii. p. 567. [2] Appendix M.

If in the innumerable and intricate adjustments of means to ends we have unmistakable evidence of design, of a higher or lower order, the product, as I believe, of organic intelligence, on the other hand we have in instinct a manifestation of Divine wisdom. It is true that my theory credits organic mind with large powers of adaptability, but notwithstanding this, I cannot conceive that reason, acting as it does on experience, can ever take the place of instinct, as the latter operates under conditions where the former is powerless.

CHAPTER VII

TRANSFORMATION

Mind in the concrete and in the abstract—Spencer's views on transformation—The conservation of matter, energy and mind—Our ignorance of mind and of matter—The prevalence of the belief in a future state of existence—Arguments from instinct, from the persistency of memory and from the organising power of mind.

It will be objected that the views set forth in the preceding pages as to the extension of mind are incompatible with the doctrine of the soul's immateriality, the doctrine of the soul's immortality being based on its assumed immateriality, and its immateriality again on its supposed non-extension. The superstructure is without a foundation to rest upon. Non-extension, as we have said, cannot possibly be predicated of the soul; a non-extended soul has literally no *locus standi*. We cannot even form a conception of it except as an occupant in space.[1] Immateriality,

[1] Philo has some subtle remarks about space in relation to deity. He argues that God is everywhere, comprehends everything, and

again, is supposed to be that quality which does not inhere in matter. If we knew anything about matter we might be able to predicate its negative ; but we do not know what it really is, and we know just as little of force. Matter and force, or energy, are associated together ; they interact the one on the other, and they exhibit the same kind of relationship that we have seen exists between the mind and organic matter, and that is about all we know about them. Shall we say, with Tait, that matter is "the vehicle or receptacle" of energy, or—I venture to put it in this way—that matter is the product of energy, or that energy is the product of matter? The answer is *ignoramus*, probably *ignorabimus ;* we do not know, probably never shall know. Perhaps all we may venture to say is that the repellent and attractive forces are the cause of all existing forms of material substances ; and we may affirm of mind that it is the cause of all existing forms of organised matter. Beyond this we cannot go. To assert that mind is immaterial is a bald and

is comprehended in nothing ; therefore he is not in space, but he is space. There is some analogy for this. We personify deity as the Eternal because there is no limit to his existence, as the Omnipotent, because there is no limit to his power. Why not personify him as the Infinitely Extended, seeing that he is everywhere present? See *De Somniis*, p. 575.

a meaningless negative. For all we know, mind may be a subtle form of matter, and matter may be a crude form of mind. Plato and the early Christian Fathers could not conceive of an immaterial soul; to them it was simply an attenuated or ethereal kind of matter.[1] In the Upanishads there is a similar distinction drawn between the coarse and the fine body, the visible and the invisible body. The latter was believed to exist after death, while the former was dissolved into its material elements. Both the visible and the invisible bodies were considered as material; but it is the latter that is supposed to migrate after death.

The question of an after life may, however, be supported on other grounds. So far, we have

[1] It is curious to observe that the term Matter had originally exactly the opposite signification to what it now has. The Platonists described matter (ὕλη) as non-existent (μὴ ὀν), because it was supposed to possess neither form nor magnitude (extension), whereas nowadays matter is supposed to be extended, and mind non-extended. The matter was non-existent, according to Platonic ideas, because the term matter was used in an abstract sense. It was as a mental concept that they regarded it, to which nothing outside the mind corresponded. Nor was the term "incorporeal" (ἀσωμάτος) used in its modern sense as immaterial, or unextended, for Plato ascribed extension to the soul, and the Christian Fathers who were Platonists, as Clement and Origen, describe the soul as invested with a body; but, of course, this body was supposed to be of a subtle or ethereal nature.

treated of Mind in the concrete ; we may for a moment regard it in the abstract, namely, as a conception denoting the properties, qualities or attributes of the thinking substance, just as Matter, another abstract term, is used to express the properties, qualities or attributes of physical substances. In this latter sense, however, mind is not a real thing, or a substance, but only a conception of a substance. We have already shown that mind and matter have no attributes in common except the necessary one of extension, and that the attributes of the one are so different from the attributes of the other, and are apparently so irreconcilable, that our conceptions of them are also necessarily different and irreconcilable, so much so, indeed, that we cannot conceive how the one can be transformed into the other.

Mr. Herbert Spencer seems, however, to be of a different opinion. He distinctly asserts that motion may be transformed into feeling and thought, and, conversely, that feeling and thought may be converted into motion. "Those modes of the Unknowable," he says, "which we call heat, light, chemical affinity, etc., are alike transformable into each other,

and into those modes of the Unknowable which we distinguish as Sensation, Emotion and Thought, these, in their turn, being directly or indirectly retransformable into the original shapes."[1] Again, he says it is "a necessary deduction from the law of correlation that what exists in consciousness under the form of feeling is transformable into an equivalent of mechanical motion";[2] and in another place he says, "if we are compelled to choose between translating mental phenomena into physical phenomena, or of translating physical phenomena into mental phenomena, the latter alternative would seem the more acceptable."[3] These statements are explicit enough, and they are also in accordance with Mr. Spencer's well-known views on habit, when he argues that when psychical actions are often repeated they become organised and automatic, and so lose their psychical character altogether. "Just as any set of psychical changes, originally displaying Memory, Reason and Feeling, cease to be conscious, rational and emotional as fast as they, by repetition, grow closely organised, so do they at the same time

[1] *First Principles*, 2nd ed., p. 217. [2] *Ibid.* p. 558.
[3] *Psychology*, vol. i. p. 63.

pass beyond the sphere of Volition. Memory, Reason, Feeling and Will disappear in proportion as psychical changes become automatic."[1] Lewes strongly, and, as I think, properly, dissents from this view. He observes that, while we call those psychical changes automatic which have lost their special qualities, termed conscious, they are really not so, but remain from first to last psychical changes. "To suppose that they pass from the psychical to the physical by frequent repetition would," he says, "lead to the monstrous conclusion that when a naturalist has by laborious study become so familiarised with the specific marks of an animal or plant, that he can recognise at a glance a particular species, or recognise from a single character the nature of the rest, the rapidity and certainty of this judgment proves it to be a mechanical, and not a mental, act."[2] It would amount to this, that the more familiar one becomes with a subject the less one would know about it. More than this. If changes originally displaying memory, reason and feeling cease to be conscious, rational and emotional by repetition, physical changes will gradually take the place

[1] *Psychology*, vol. i. p. 499. [2] *Physical Basis of Mind*, pp. 378–9.

of the psychical, and Mind will eventually disappear altogether.

It is impossible to follow Mr. Herbert Spencer in this direction. We must recognise a fundamental difference between mind and energy, as we do between mind and matter. In matter the same weight of substance persists in different forms. Matter, whether solid, liquid, fused, frozen or gaseous, may be changed qualitively, but never quantitively, as quantity remains ever constant. This we may call the transformation of matter. So with energy. Energy may be transformed, but its quantity can never be diminished. Impeded motion is transformed into heat, light, electricity, magnetism, sound and chemical action ; but the total amount is constant. This transformation is called the Conservation of Energy. But mind does not come within the circle of transformation either of matter or of energy. We know no instance of the conversion of mind into matter or energy, or of matter or energy into mind. We know, on the contrary, that, so far as regards matter and energy, the transformation of each within its own circle is complete, nothing is unaccounted for, and nothing

has been passed over to the mind. The mind has its own independent circle of transformation; Sensation is transformed into Perception, Perception into Desire, Desire into Volition, and all these qualities are gathered into Memory ready for redistribution or new transformations. If, then, matter never diminishes in quantity, and if energy is invariable in amount, should not the same hold good of mind? Why should it be supposed that mind alone disappears, while matter and energy remain for ever constant? Why should the energy which is liberated when I draw the trigger of a loaded gun be converted into another form, while my Will vanishes into nothingness? If no atom of matter is ever destroyed, if no unit of energy is ever wasted, why should it be assumed that mind will be annihilated?

The Testimony of Instinct

The doctrine of a future state of existence may be defended on other than metaphysical grounds. Kant had to abandon the attempt to prove the immortality of the soul from the metaphysical standpoint, and so has almost

everyone who has profoundly studied the subject. In his *Critique of Pure Reason* he examined the whole subject from this point of view, and arrived at the conclusion that there was no proof either for or against it. In his *Critique of Practical Reason* he re-discusses the subject from the moral standpoint, and sees much in favour of it. In this latter work he takes his stand on the veracity of nature. Is nature honest, or is she a cheat and a trickster? The strivings of mankind towards the realisation of a moral ideal have, in his opinion, a real significance, since there can be nothing unmeaning or unintelligible in nature, there being order, purpose and harmony in every part of it. In taking this view he is in strict accordance with modern science, which proceeds on the same assumption.

Reason has not much to say in favour of a future state of existence, but Instinct has. Our religious sentiments, like everything else belonging to us, it must not be forgotten, are the product of the Cosmos, a perfectly natural and inevitable product. There are no people so low in the scale of intelligence amongst whom there does not exist a desire for, and a belief

in, a future life.[1] This desire and belief is as universal as is the instinct of self-preservation itself. Granted that there are savages who have very hazy notions on the subject; but the fact will not invalidate our statement, as we might as well argue that the instinct of self-preservation is not universal because there have been suicides. This desire and belief exist among all peoples, and appear to have been prevalent at all times, and under every condition of existence. It has persistently obtruded itself at every stage of life, from the cradle to the grave, in customs, ceremonial and religious rites. Large numbers in every community devote their lives to pious contemplation, religious exercises and self-sacrificing deeds, the latter resembling true instinct, whose chief characteristic is a disregard for conventionalities. So absorbing, indeed, is this belief that with some a great portion of the present

[1] The conclusion of Dr. Tylor on this question is that "from the immense mass of accessible evidence, we have to admit that the belief in spiritual beings appears among all low races with whom we have attained to thoroughly intimate acquaintance; whereas the assertion of the absence of such belief must apply either to ancient tribes, or to more or less imperfectly described modern ones."—*Primitive Culture*, vol. i. p. 425.

life is spent in preparation for a supposititious future life.

How are we to account for the prevalence of this belief? Custom or priestcraft will not explain it, for these also have to be accounted for. No one has ever seen a spirit from the other world. There is nothing in the closing scenes of life that would lead one to believe that death is but a prelude to another state of existence. On the contrary, to all appearance death is a sleep from which there is no awakening. In old age there is a gradual decay, mentally as well as physically, and after death there are no signs of any spiritual residuum; there is only visible the material elements of which the body is composed in process of decomposition. If the dying make no sign, if we receive no message from the dead, how are we to account for the universal prevalence of this belief?

Much has happened since primitive man seized hold of the idea of a future life. His modern civilised successors know infinitely more about themselves and about the world around them than he had the smallest conception of, but they are to-day as ignorant as

he was as to their ultimate destiny. The history of religious thought on this question is indeed a pathetic one. For thousands of generations the race has been searching for some positive evidence of a future life, but so far it has been labour in vain; with all our searching we know just about as much as our poor ancestors did. The marvel is that the belief maintains its hold on the human race; and the fact that it does maintain its hold seems to me to afford some evidence that the belief is due to instinct and not to reason.

We are told that this belief had its origin in ignorance; that the primitive man, like his representative the modern savage, seeing in his dreams the ghosts of his departed relatives, imagined them to be still living in another state of existence. It is therefore concluded that as this belief is based on a false foundation the superstructure built upon it is also false. The theory is a plausible one, but even if it were correct it does not in the least invalidate the fact of the universality of the belief; on the contrary, it only proves that the belief is co-extensive with dreaming, and, of course, the dreaming propensity is universal. Moreover,

the dreamer often finds himself in impossible situations, and the most absurd events are represented as happening, which the dreamer when awake knows never occurred and never could occur. Apparitions of living as well as of dead persons are also presented to the dreamer, which must bring home to even the most credulous savage the unreliability of this mode of presentation. It appears to me that the universality of this belief is due to the fact that the idea of annihilation, like that of suicide, is repugnant to the human mind. We are too apt to forget that Nature has her own ways of securing her ends, and that her ways are not always our ways. She sometimes allures to action by motives the real purpose of which are unknown to her creatures. We often think we are gratifying our own desires when we are really serving the purposes of Nature. In the pursuit of wealth the individual may be influenced by the most sordid motives, but in benefiting himself he is indirectly and unintentionally benefiting the community at large, as the possession of wealth, however acquired, is an undoubted advantage to any State. The sexual instinct, we assume, exists for the

purpose of perpetuating the race, but no one imagines that in pairing animals have that end in view.

We are inclined to the opinion that the universality of the belief in a future life is due to the operation of instinct, which, as Hume held, is independent of all the laboured deductions of the understanding. The instinct of self-preservation is the Will to live, and is limitless as regards time. It projects itself beyond the present life into a new world. And the instinct survives in spite of the apparently overwhelming evidence against it. It is stronger than reason, more powerful than the evidences of sense; it withstands ridicule, contumely and persecution, because it is rooted in the innermost nature of our being.

If the fear of death, which is common to all living creatures, is an instinct, then the desire to prolong that life is also instinctive; and that the fear of death is instinctive is proved by the fact that it is the anticipation of an event about which an animal could have no knowledge, the apprehension of a result of which it had no experience. If this belief in a future state be in truth instinctive, it is not

without its significance. Reason may flounder, but instinct is unerring in its aim. If the directive power of instinct impel the beetle to dig a hole for itself twice the size of its present requirements before going into the chrysalis state ; if the same power impel the caterpillar to prepare for itself a cocoon from which in due course it will emerge a butterfly, may not instinct be as trustworthy a guide to man as it has proved itself to be to the beetle and the caterpillar ?[1]

[1] In his argument in favour of a future state Dr. Martineau refrains from appealing to the widespread hope and belief in a future life, as he thinks that "it is hardly warrantable to argue from the mere prevalence of a belief to its truth, unless," he adds, "it can be classed with the primary assumptions that are the conditions of all reference" (*A Study of Religion*, vol. ii. p. 381). If the belief be instinctive, as I believe it is, the assumption is undoubtedly warrantable, in view of the position here claimed for instinct as a primordial impulse. Mill (*Essays on Religion*, p. 205) contests the validity of the argument from instinct, and says we might as well argue that because one has a desire for food therefore one should always have as much of it as one wants for all time. But Mill does not put the case quite fairly. He should have said because one had a desire for food, food must be necessary to the satisfaction of that desire. Whenever we find an organ we assume that it has a function ; and, on the assumption that nature is veracious, the existence of an instinct implies the possibility of the attainment of the object that will satisfy that instinct.

Evidence from Memory

Or we may take another view. If the soul formed the body, it is not impossible that it may form another body different from, and it may be, superior to, the present one. We may conceive that the experiences of the present life may be preserved and accumulated and become the germ of a new spiritual life. This would not be more wonderful that the fact that an organism appropriates to itself its ancestral experience ; or, more improbable than that, that a complicated structure like the human body should be evolved from a minute germ-cell ; or a more incredible or unscientific hypothesis than that of Pangenesis (now somewhat discredited since Weissmann's theory of heredity came into vogue), according to which every unit or cell in every multicellular animal throws off gemmules, which become the germ of the future organism.

Moreover, we have in Memory a power, called by Plato the conservative faculty (*σωτηρία αἰσθήσιως*), whose special function it is to preserve and accumulate experiences. Of all the

mental powers Memory is the most persistent. It was the first to make its appearance ; it came with the germ cell, and brought with it the ancestral type after which the new organism was formed. It is the last to disappear. Memory outlasts consciousness, as in cases of fever, when the patient's mind is wandering and he fails to recognise the most familiar faces and voices, and we only learn that it persists from his unconscious utterances. In such cases there is no recollection, for recollection involves consciousness ; but there is registration and there is also reproduction. The memory remains active when all the other powers have decayed or perished. On the approach of death it is often as clear and as vigorous as at any period during life. Numerous cases are recorded of persons who have remembered long-forgotten languages on their deathbeds. Dr. Rush, of Philadelphia (quoted by Hamilton), mentions that a Lutheran clergyman informed him that Germans and Swedes, of whom he had a considerable number in his congregation, when near death prayed in their native languages, though some of them, he was confident, had not spoken these languages for fifty or sixty

years. Other well-authenticated cases are recorded of ignorant peasants, when in delirium, repeating correctly portions of books in a foreign language which they had casually overheard years before. In Goethe's *Conversations with Eckermann*, a case is related where an old man of the lower classes on his deathbed was heard to recite several passages in the most elegant Greek, and it was afterwards discovered that in his boyhood he was compelled to commit to memory Greek passages, and not until, at the point of death, fifty years afterwards, had these to him meaningless words been repeated.[1] Coleridge mentions a similar case. An attempt has been made to discredit Coleridge's narrative, because it is unauthenticated. But there are numbers of well-supported cases of a similar kind. Dr. Abercrombie mentions several, and one case in particular is worthy of notice. It was that of a servant girl, whom he describes as very dull, difficult to instruct, and quite uneducated ; nevertheless, when in the somnambulic state she could play elaborate pieces

[1] See also Macnish's *Philosophy of Sleep*, p. 55 ; *Annales Medico-Psychologiques*, serie vi., p. 443 ; Mayo's *Truths in Popular Superstitions*, for numerous similar cases.

of music, descant with fluency and correctness on the questions of the day, could conjugate Latin and repeat French sentences correctly. Abercrombie gives us to understand that she picked up her information on these subjects from hearsay, without in the least understanding what she heard. It was a case of unconscious registration and reproduction of ideas without recollection of them, and there are hundreds of such cases on record.[1] Admiral Beaufort, in a letter to the Rev. Dr. Wollaston, gives an account of his feelings when on the verge of death by drowning, and of the extraordinary vividness of his memory. After all exertion on his part had ceased, the result of complete suffocation, and he had abandoned all hope of surviving, he states that "a calm feeling of the most perfect tranquillity superseded the previous tumultuous sensations."

"The whole period of my existence," he says, "seemed to be placed before me in a kind of panoramic review, and each act of it seemed to be accompanied by a consciousness of right and wrong, or by some reflections on its cause or its consequences; indeed, many trifling events, which had long been forgotten, then crowded my imagination, and with

[1] *Intellectual Powers*, pp. 234–5.

the character of recent familiarity. . . . The length of time that was occupied with this deluge of ideas, or rather the shortness of time into which they were condensed, I cannot now state with precision; yet certainly two minutes could not have elapsed from the moment of suffocation to the time of my being hauled up."

De Quincey mentions that a near relative of his having in her childhood fallen into a river and being on the very verge of death, told him that "she saw in a moment her whole life arrayed before her as in a mirror, not successively, but simultaneously; and she had a faculty developed as suddenly for comprehending the whole and every part." [1]

Not less extraordinary are De Quincey's own experiences. He relates that when under the influence of opium—

"The minutest incidents of my childhood, or forgotten scenes of later years, were often revived. I could not be said to recollect them; for if I had been told of these when waking, I should not have been able to acknowledge them as part of my experience. But placed as they were before me in dreams like intuitions, and clothed in all the evanescent circumstances and accompanying feelings, I recognised them instantly. Of this, at least, I feel assured, that there

[1] *Confessions of an Opium-Eater*, p. 258.

is no such thing as ultimate forgetting; traces once impressed upon the mind are indestructible." [1]

A sensation or a perception may sometimes be so slight as to altogether elude consciousness. A passing glance at an object of which we take no notice at the moment, may nevertheless be registered in memory and be afterwards recalled in dreams. Carpenter mentions that the following case was related to him by an eminent judge :—

"Having been retained, before his elevation to the bench, in a case which was to be tried in the North of England, he slept in the house of one of the parties to it, and dreamed through the night that lizards were crawling over him. He could not imagine what had suggested such an idea to his mind, until, on going into the apartment in which he had passed the evening, he noticed a mantlepiece clock on the base of which were figures of crawling lizards. This he must have *seen* without noticing it, and the sight must have left a 'trace' in his brain, though it left no record in his conscious memory." [2]

Count Lavalette [3] relates :—

"One night, asleep in prison, I was awakened by the palace clock striking 12 o'clock. I heard a sound as of the grating being opened and the guard relieved. I

[1] *Confessions*, p. 261.
[2] *Mental Physiology*, p. 587.
[3] *Memoirs et Souvenirs du Count Lavalette*, p. 28.

fell asleep again and had a dream." Here the narrator gives an account of a frightful dream which, according to his account, must have occupied several hours. "Suddenly the grating close again with great violence, the noise of which awakened me. I made my watch strike: it was still 12 o'clock, so that this fearful fabric of imagination could only have lasted two or three minutes, the time necessary for the relief of the guard and the opening and shutting of the grating. It was very cold, and therefore the relief was very quick; moreover, the gaoler next morning confirmed my reckoning. And yet I can recall no event in my life, the duration of which I could assert with greater certainty, of which the particulars were better impressed on my memory, and of which I was more completely conscious."

A still more striking case is recorded by Maury.[1] He was ill in bed, and dreamed of the French Revolution. He spoke with Robespierre, Marat and other members of the Convention, was dragged before the tribunal, condemned to death, and carried through a crowd of people bound to a plank. The guillotine severed his head from his shoulders. He awoke in terror to find that a rail over his bed had got unfastened and had fallen upon his neck like a guillotine, as his mother, who was

[1] *Le Sommeil et les Reves*, p. 161, quoted by Du Prel.

sitting by his bedside, declared, at that very moment.

Lord Holland relates that on one occasion, when much fatigued listening to a friend reading aloud, he fell asleep and had a dream, the particulars of which would have occupied a quarter of an hour or longer in writing. After he awoke he found that he had remembered the beginning of a sentence before he fell asleep and heard the latter part of the same sentence after he was awake, so that probably the whole time he had slept did not occupy more than a few seconds.

In memory time and space are annihilated. We can transport ourselves from period to period, and from region to region in an instant of time. This is especially observable in dreams. As with matter and energy nothing is ever lost, so it may be with our mental experiences. Moreover, memory is often in a state of exaltation when the mind is weakest and the body in a state of decay. May we not conceive that this life is, as it were, a period of spiritual gestation, that as the germ cell produces in the future organism the qualities of the parent, so may memory gather up the manifold experiences

of life and reproduce them in a new and spiritual form, the character and fate of each individual being, according to the Karma of the Upanishads, the results of his acts in a former state of existence ?

The flower is the crown and glory of the plant, and its perfume the soul or essence of the flower. And this essence is, under certain conditions, indestructible. Distillation does not affect it, and it withstands the extremest cold. A jar of colourless liquid scent undergoes a mysterious change in spring time. At any other season of the year its fragrance is of a uniform strength, but on the approach of spring the liquid becomes turbid, the strength of its fragrance perceptibly increases, and it reaches its highest pitch during the flowering season of the plant from which it has been extracted, and then subsides to its old standard. This seasonal response indicates a mysterious relationship between the plant and its essence. The plant may have been dead for years, but its essence lives on indefinitely. May we not say that the plant still lives in its essence ; and that the volume of its life bears some proportion to its efforts during its brief existence in gathering

from soil and sun materials for the perfecting of its flower ?

Memory may be said to stand in somewhat similar relation to the soul that the perfume does to the flower. To understand how important a factor memory is in mental operations, we have only to conceive what the mind would be without it. Without memory there could be no past, only a perpetual present, therefore no possibility of comparing past states with present. There could be no perception, because perception is the cognition of relations, and there could be no relations between present and past. The mind would be a blank ; it would be incapable of action, as it would have no material on which to operate. It would be the subject of a series of sensations and of nothing more. But with memory perception is possible ; we recognise the relations between one sensation and another ; we can form ideas ; we can think and feel. As Hamilton says, the very notion of the Ego or self arises from the recognised permanency of the thinking subject as contrasted with the succession of states ; and this recognition is only possible through memory. Memory is therefore a necessary condition of personal

identity; it is, in fact, as Hume puts it, only another name for consciousness. If this be so, the continuity of consciousness in another state of existence is not an impossibility. Memory, therefore, and not thought, as Descartes maintained, may be said to be the Essence of Mind, as it is the basis of all thought, feeling and experience.

Mind Independent of Organic Structure

We may take still another view. If it can be shown that the mind can operate, and be operated upon, without the intermediation of the organs of sense (or at least of such senses as we have any knowledge of), that would go to show that it is not dependent upon those, or upon any other organs, that, in fact, it may exist apart from organic structure altogether. We have traced the organic structure back to the cell, which is our *Ultima Thule*, at least for the present, and there we have found mind, which we assume is the initiatory motive power, the *prima mobile*, which creates and controls the organism. It is not necessary for our present purpose to go into the unknown

regions beyond the cell, as we conceive the cell to be endowed with all the powers necessary to form its future body, to maintain it in existence and to modify it from time to time as the exigencies of life demand. If, therefore, mind existed before the present structure was formed we are justified in believing that it is not dependent on that structure. This view will not recommend itself to those who maintain that mind is the function of brain, or the expression of the collective powers or faculties of the organism ; but it is quite consistent with the theory put forth in these pages, where I have endeavoured to show that it is the mind that organises and actuates the body, and not the body that organises and actuates the mind. This organising power of the mind is manifested in organic modifications generally, more especially in the reparative processes previously described. It is quite conceivable, therefore, that the mind may act, and be acted upon, directly without the intervention of the bodily structure. This is not an altogether improbable hypothesis. The monad can see without eyes, hear without ears, feel without nerves ; why, then, may it seem absurd to suppose that a higher organism than

the monad may acquire the means of more direct communication with the outer world than through the five senses? It may be said that this would be reversing the order of development, which is from the general to the special. True, but are we then to have no new development? If we are, can we affirm precisely what form it will take, or can we assert that direct communication of mind with mind would be either impossible or disadvantageous?[1]

We understand the human mind to be still in course of development. The high standard of education now reached, the intense competition now prevailing in every walk of life, the freedom from the restraint of religious dogmas and class domination, the social upheaval of the masses, are all new factors in the history of the human race, which must tend to develop a keener sensibility, a deeper insight, a wider appreciation of, and a more intense longing for, a higher life. And if the intellectual needs of the present day are more pressing than formerly, and the same evolutionary processes that have been in operation from the dawn of life are still in operation, we might expect new wants to arise, and

[1] Appendix N.

provision to be made to satisfy those wants. If we assume that there is a relation between biological wants and biological modifications, we may also assume that in an age of intellectual wants these would call forth their appropriate satisfaction.

But whether or not the instinct of self-preservation, the permanency of memory, or the independence of the mind on organic structure, be guides that we can rely upon with implicit confidence, this much, at all events, we hope we have brought some evidence to prove, namely, that the physicist has failed to explain the phenomena of organic life. What he puts forth as the causes of these phenomena are only the effects of an antecedent and unacknowledged cause. He evades the conclusion to which the facts inevitably lead, that behind the brain, ganglia, germ cell and protoplasm, there must be a force of some kind, a primordial cause of all organic movement. This primordial cause we may call the Organising Power. It is this which builds up the body cell by cell, organ by organ, system by system, which actuates each to the discharge of its own peculiar

functions, which adjusts one to the other, and modifies all to the conditions of existence, which repairs waste, heals wounds, assails all that is inimical and fosters all that is friendly to its growth ; and in the absence of any evidence to the contrary we have no reason to believe that this Organising Power will perish with the body which is its handiwork.

APPENDIX A

(*Page* 5)

THERE is also a mode of existence which is termed life, which exhibits neither change, activity, nor sensitiveness. Seeds may be kept for long periods without germinating, and yet retain their vitality; animals—the Tardigrada, Rotifers, Anguillulidæ—have been revived after having been shrivelled up for years; frogs, worms and fishes have often been thawed alive out of hard ice. All these are said to possess life. But here we must distinguish between actual and latent or potential life. In this latter sense only can seeds, dried up or frozen animals, be said to possess life. There is all the difference between actual and potential life, as there is between a reservoir actually supplying motive power, and another reservoir which may be capable of supplying it, provided the proper connections were made for bringing it into use. The term Susceptibility might properly designate life in the latter sense. Potential life is, however, in reality, not life at all, any more than a steam engine is a power without the actuating steam.

APPENDIX B

(*Page* 23)

KERNER and Oliver thus describe the movements of the contents of a plant cell :—"These movements may be observed very clearly under the microscope in the case of large cells with thin and very transparent cell membranes, especially when the colourless, translucent and gelatinous substance of the protoplasm—not always sharply defined in contour—happen to be studded with minute dark granules; the so-called microsomata. These granules are driven backwards and forwards with the stream, like particles of mud in turbid water, and their motion reveals that of the protoplasm, wherein they are embedded. Seeing particles gliding in all directions through the cell cavity, arranged irregularly in chains, rows and clusters in the protoplasmic strands, we are justified in concluding that this motion takes place in the substance of the strands itself. The movement, moreover, is not confined to isolated strands, but occurs in all. Granular currents flow hither and hither, now uniting, now again dividing. They often run in opposite directions, even when only a trifling distance apart; sometimes two chains are drifted in this way, when actually close

together in the same band of protoplasm. The streams pour along the primordial utricle, and whilst there divide into a number of arms, meeting and stemming one another and forming little eddies; then they are gathered together again and turn into another strand of the more central protoplasm. The individual granules in the currents are seen to move with unequal rapidity, according to their sizes; the smaller particles progress faster than the larger, and the larger are often overtaken by the less, and when this happens the result often is that the centre stream stops. If so, however, the crowded particles are suddenly rolled forward again at a swifter pace, like bits of stone in the bed of a river, as it passes from a level valley into a gorge. The course of the streaming protoplasm remains throughout sharply marked off from the watery sap in the vacuoles, and none of the granules ever pass over into the cell sap from the protoplasm. Larger bodies, such as the round grains of green colouring matter or chlorophyll, are in many instances not carried forward, but remain stationary, the protoplasmic stream gliding over them without altering them in any way. Further, the outermost layer of the protoplast, contiguous with the cell membrane, is not in visible motion in most vegetable cells. On the other hand, occasionally the entire protoplast undoubtedly acquires a movement of rotation, and then the larger bodies embedded in its substance, *i.e.* chlorophyll corpuscles, are driven along like driftwood in a mountain torrent. On these occasions a wonderful circulation and undulation of the entire mass takes place; chlorophyll grains are whirled along one after the other at varying speeds, as if trying to overtake one another; and yet

another structure, the cell-nucleus, presently to be discussed, is dragged along, being unable to withstand the pressure, and following the various displacements of the network of protoplasmic strands, in which it is involved, is at one moment pulled alongside of the cell wall, at another again is taken in tow by a rope of central protoplasm and hauled transversely across the interior of the cell."

APPENDIX C

(*Page* 38)

Sir Michael Foster, referring to this experiment, says :—"This at first sight looks like an intelligent choice . . . but a frog deprived of its brain, so that the spinal cord only is left, makes no spontaneous movement at all. Such an entire absence of spontaneity is wholly inconsistent with intelligence. . . . We are, therefore, left to conclude that the phenomena must be explained in some other way than by being referred to the working of intelligence."—*Text Book of Physiology*, part iii. p. 909.

Haeckel similarly disposes of the facts by remarking that "we only admit the presence of consciousness in man and in the higher animals."—*Riddle of the Universe*, p. 118.

Wundt, on the other hand, interprets the phenomena in another fashion. "The decapitated frog," he remarks, "moves its leg against the pincers with which it is irritated, or wipes away with its foot the drop of acid applied to its skin. It sometimes tries to withdraw from a mechanical or electrical irritation by a leap. When brought into an unusual position, *e.g.* placed on its back, it perhaps returns to its previous posture. Here, then, the stimulus does not introduce merely a movement in general which spreads from the

initial part, with increasing intensity of the stimulus and growing irritability, but the movement is adapted to the external impression. In the one case it is a movement of difference; in the second it aims at getting rid of the stimulus; in a third at the removal of the body from the sphere of irritation; in a fourth, finally, at the restoration of the previous position," which means that the decapitated frog exhibits intelligence.

Referring to these experiments with brainless frogs, Lewes remarks :—"The evidence of sensation and volition is all the stronger, because the reactions produced by irritations are not uniform. If, when a decapitated animal were stimulated it always reacted in precisely the same way, and never chose new means on the failure of the old, it would be conceivable to attribute the results to simple reflex action, *i.e.* the mechanical transference of an impulse along a prescribed path . . . but I cannot conceive a machine suddenly striking out new methods when the old methods fail. I cannot conceive a machine thrown into disorder when its accustomed actions fail, and in this disorder suddenly lighting upon an action likely to succeed, and continuing that; but I can conceive this to be done by an organism, for my own experience and observation of animals assure me that this is always the way new lines of action are adopted. And this which is observed of the unmutilated animal I have just shown to be observed of the brainless animal; wherefore the conclusion is, that if ever the frog is sentient, if ever its actions are guided by sensation, they are so when its brain is removed."—*Physical Basis of Mind*, p. 430.

APPENDIX D

(*Page* 48)

Spinoza :—"The human body consists of several individuals of various nature, each of which is very complex."—*Ethics*, Th. 2, Prop. 7, Post. 1.

Hume says :—"I cannot compare the soul more properly to anything than a Republic or Commonwealth, in which the several members are united by reciprocal ties of government and subordination, and give rise to other persons who propagate the same republic in the incessant changes of its parts."—*Inquiry*, p. 331.

Maudsley says :—"So certain and intimate is the sympathy between the individual nerve cells in that well-organised commonwealth which the nervous system represents that a local disturbance is soon felt more or less distinctly throughout the whole State. When any serious degeneration of the ganglionic cells of the cord exists, there is not only an indisposition or inability to carry out as subordinate agents the commands which come from above, but there is a complaint sent upwards—a moan of discontent or pain reaches the supreme authority. That is the meaning

of the feelings of weariness, heaviness, aching of the limbs, and utter lassitude which accompany disorder of the spinal centres; and the convulsive spasms and the local contractions or paralysis of muscles are the first signs of a coming rebellion. If the warnings do not receive timely heed, a riot may easily become a rebellion; for when organic processes, which normally go on without consciousness, force themselves into consciousness, it is the certain mark of a vital degeneration. If the appeal is made in vain, then further degeneration ensues. Not only is there irregular revolutionary action of a subordinate, but there is *pro tanto* a weakening of the supreme authority; it is less able to control what is more difficult of control. When due subordination of parts exists, and the individual cell conforms to the laws of the system, then the authority of the head is strengthened. A foolish despot, forgetting in the pride of his power that the strength and worth of a Government flow from and rest upon the well-being of the governed, may fancy that he can safely disregard the cry of the suffering and the oppressed; but when he closes his ears to complaints, he closes his eyes to consequences, and finally wakes up to find his power slipped from him, and himself entered upon the way of destruction. So it is with the nervous system; the cells are the individuals, and, as in the State, so here there are individuals of higher dignity and of lower dignity; but the well-being and power of the higher individuals are entirely dependent upon the well-being and contentment of the humbler workers in the spinal cord, which do so great a part of the daily work of life. The form of government is

that of a constitutional monarchy, in which every interest is duly represented through adequate channels, and in which, consequently, there is a proper subordination, as well as co-ordination, of parts."—*Physiology of Mind.*

APPENDIX E

(*Page* 76)

REID's definition of mind is clear and concise :— "By the term mind we understand that which thinks, remembers, reasons, wills. The essence of both body and mind is unknown to us. We know certain properties of the first, and certain operations of the last, and by these only can we define or describe them. We define body to be that which is extended, solid, movable, divisible. In like manner we define mind to be that which thinks."—*Works*, Hamilton's Ed., p. 220.

APPENDIX F

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THE Scottish School of Philosophy adopted Descartes' views, and so has almost every English psychologist of any note.

Mansel says :—"We are compelled to believe that existence in space is an attribute of body and not of mind."—*Metaphysics*, p. 369.

Sully says :—"Mind is non-material, has no extension in place, as natural bodies have," and he adds somewhat enigmatically, "We cannot touch a thought or feeling, and one feeling does not lie outside of another feeling in space."—*Outlines of Psychology*, p. 3.

Wundt's remarks are to the same effect :—"Mental phenomena cannot be bodily as effects to cause, but there is a uniform co-ordination between mental processes and definite physical processes in the mind. The connection can only be as a parallelism of two causal series side by side, but never directly interfering with each other, in virtue of the incompatibility of their terms. It is a psychological parallelism." How the parallelism can be causal, and yet the series never directly interfere with each other, is a puzzle.

APPENDIX G

(*Page* 90)

THE necessity of an intermediary between mind and matter was held by Plotinus and the Alexandrian school, and also by many of the early Fathers. Even Augustine, who felt the difficulty of a union between extended body and unextended mind, was forced to resort to some form of intermediation. He believed that the soul did not act directly on the grosser parts of the body, but that it operated through the medium of a partially incorporeal substance. In modern times Gassendi and Le Clerk advocated a somewhat similar view, and Hartley conceived the existence of "an infinitely elementary body intermediate between the soul and the gross body." Even Sir William Hamilton was inclined in the same direction, as he regarded sensation, usually considered a property of mind, as "an affection neither of the body nor of the mind alone, but of the composite of which each is constituted."[1] But if we include feeling in sensation, and it seems to me an essential element, then sensation is certainly an attribute of mind. I have in the text referred to sensitiveness as a condition necessary to the interaction of mind and body, not a *tertium quid*, or a something intermediate between mind and matter. Sensitiveness I hold to be a condition of organic matter.

[1] Note on Reid's *Works*, p. 884.

APPENDIX H

(*Page* 122)

ROMANES, at one time a devout believer in Darwinism, ventured to explain how the brooding instinct originated. He supposed that "the incubating process began by warm-blooded animals showing that kind of attention to their eggs which we find is frequently shown by cold-blooded animals; . . . the imparting of heat promoted the process of hatching, those individuals which most constantly cuddled or brooded over their eggs would, other things being equal, have been most successful in rearing progeny." (Article on Instinct in the *Encyclopædia Britannica*, Ed. 1888.) What would become of the eggs pending the results of the hatching experiments he does not explain. Nor does he show why those brooding "individuals" should have eggs, or having eggs, should trouble themselves about them, unless they already possessed the maternal instinct. But it is sheer waste of time discussing such views.

Mr. Alfred W. Bennett also made a courageous attempt to compute the chance of a variation being preserved by natural selection. "Suppose," he says, "there are twenty different ways in which a Leptalis may vary, one only of these being in the direction

ultimately required. The chance of any individual producing a descendant which will take its place in the succeeding generation, varying in the required direction, is 1–20; the chance of this operation being repeated in the same direction in the second generation is $1–20^2$, equal to 1–400. The chance of this occurring for ten successive generations is $1–20^{10}$, or about one in ten billions. Now another factor comes into calculation, and that is, the number of individuals among which the chance is distributed. Mr. Bates and Mr. Wallace agree in stating that, both in South America and in the Malay Archipelago, the imitative species are always confined to a limited area, and always very scarce compared with the imitated species. We will assume that the number of individuals of the imitative Leptalis existing at any one time is one million. The chance of there being among these million a single individual approaching the Ithomia to the extent of one-hundredth is 100,000–10,000,000,000,000; or the chance against it is 10,000,000 to 1."—"Theory of Natural Selection from a Mathematical Point of View," *Nature*, Nov. 10, 1870.

APPENDIX I

(*Page* 140)

KANT thus explains the origin of the notion that the brain is the sole organ of the mind:—"The prevalent opinion, which assigns to the soul its seat in the brain, seems to originate mainly in the fact that we feel distinctly how, in deep meditation, the nerves of the brain are taxed. But if this conclusion is right it would prove also other abodes of the soul. In anxiety or joy the sensation seems to have its seat in the heart. Many affections—nay, most of them—manifest themselves most strongly in the diaphragm. Pity moves the intestines, and other instincts manifest their origin in other organs. The reason why the meditating soul seems to feel especially in the brain is, perhaps, the following:—All meditating requires the instrumentality of signs that ideas may be created, and that, accompanied and supported by these signs, the required amount of clearness may be attained. But the signs of our ideas are mainly such as have been received either by hearing or sight, both of which senses are stimulated by impressions in the brain, as their organs are also next to this part. Now if the production of these signs, which Cartesius calls *idées*

matèriales, is properly an irritation of the nerves such as to produce a movement similar to that which formerly caused the sensation ; then, in meditation, the tissue of the brain will be compelled to quiver as with the former impression, and it is chiefly the brain, therefore, that will become tired. But, if the thinking be accompanied by affections, we feel not only the brain to be taxed, but also those irritable parts which usually are in sympathy with the soul."—*Traume Geister-seher*, chap. i.

APPENDIX J

(*Page* 154)

"Any one who doubts the intense lustfulness of the cuckoo needs only to visit its sleeping-places repeatedly. To-day are heard the voice of the female, the soft wooing of the male; to-morrow only the cry of the latter; the former is then blessing a neighbour or a distant male. The female is the greatest rover. She roves throughout the whole summer, that is as long as the egg-laying period lasts, irregularly through the ranges of various males, attaches herself to none, but abandons herself to all who please her. Waits not to be sought, but starts of her own accord to seek adventures, and after her desire is satisfied pays no further attention to the male who has just shown her favour. A female which I watched near Berlin, which was recognisable through having a tail-feather shot away, visited, so far as I could discover, the stations of not fewer than five males, but probably extended her excursions still further. Every other female doubtless behaves in the same way, as other observations prove almost to a certainty."—*Thierleben*, iv. pp. 11–215, 2nd Ed.

Dr. Elliot Coues tells us that the cow-birds, an

American species of the cuckoo, "never mate; their most intimate relations are no sooner effected than forgotten; not even the decent restrictions of the seraglio are observed; it is a perfect community of free lovers."—*Birds of the North-West.*

The act of ejection of its foster brothers from the nest by the young cuckoo has been described too often by unimpeachable witnesses to admit of any question that this is the invariable practice of the juvenile parasite. Mrs. Hugh Blackburn has given a graphic description of the occurrence, of which the following are the leading points:—"The nest of the meadow pipit was found in June, containing one cuckoo's egg and two of the pipit's, on the declivity of a hillside in Scotland. Subsequently the pipits were found to be hatched, and the cuckoo 48 hours afterwards, when both the pipits were lying down the bank outside the nest, but alive. On being placed in the nest the cuckoo got its back under one, raised it to the edge of the nest, and toppled it over the side, pushing it with its naked wings and feeling about to make sure that the effort had been successful. The other pipit it served in the same way. The young pipits were replaced in the nest, but the next morning both were turned out and lay dead on the bank. The blind and naked young cuckoo had thus managed to get rid of two birds far more developed than himself." The writer concludes:—"The most singular thing of all was the direct purpose with which the blind little monster made for the open side of the nest, the only part where it could throw its burden down the bank. I think all the spectators felt the sort of horror and awe

at the apparent inadequacy of the creature's intelligence to its acts that one might have felt at seeing a toothless hag raise a ghost by an incantation. It was horribly 'uncanny' and 'gruesome.'"—*Zoological Notes*, p. 300.

APPENDIX K

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"SINGULAR as the Australian region is in the character of its fauna and flora, it contains nothing more remarkable than the group of birds known as the Megapodidæ, so called on account of their large feet, which are concerned in raising the mounds of earth and decaying vegetable matter wherein their eggs are deposited. They range throughout Australia proper to New Guinea, the Philippines, Moluccas, Borneo, Celebes, and probably other islands of that archipelago. Gould first described the habits of the large Australian species called the 'brush turkey,' a bird as large as the domestic turkey, and having a wattle on the throat. One of the mounds discovered by him was 15 feet high and 60 feet in circumference at the base, composed of rich vegetable mould, the result no doubt of the decomposition of the vegetable matter collected by the birds during many seasons. Several pairs appear, in some cases at all events, to resort to the mounds for the purpose of depositing their eggs, which are of enormous size. Upon old mounds, still in use, large trees are sometimes found growing. The construction of these 'incubators,' for such they really are, has no

parallel in bird life. The eggs are never incubated by either of the parents from the moment they are laid until the young chick springs forth, almost ready equipped for flight. The whole process has been exhibited for many years past in our Zoological Gardens, and it fully confirms Gould's observations and adds something to them. On being provided in their enclosure with abundance of suitable material—leaves, earth and grass—the Talegallas set to work, the male taking the initiative. He begins at the outside of the enclosure, grasping the materials in his large feet, and throwing them behind him towards a central spot, gradually contracting the circle as the work proceeds. A more or less conical heap is thus formed to a height of three or four feet, when both birds arrange it to their liking, and make an excavation in the centre. Here at intervals of several days the eggs are placed upright, one after another, in a circle round the apex of the mound, always with the smaller end downwards, and covered with earth, etc. Usually an opening is left in the middle of the circle of eggs, which may probably be of use in admitting air and preventing a too sudden increase in temperature, should rapid fermentation take place. The Australian natives told Gould that the birds attended the eggs and partially uncovered them from time to time during the day, probably with the object of regulating the temperature, and this has been fully confirmed by the habit of birds kept in confinement. The chief labour in this way devolves upon the male, who is constant in his attendance upon his charge. When the bird is released from the egg it remains in the mound from twelve to twenty-four hours, covered like the eggs,

and upon emerging into the light of day it runs with the utmost facility. At first each of the flight feathers is encased in a sheath, which soon bursts, and on the third day the chick is capable of flight. Towards evening it returns to the mound to be again covered by the male with the materials of the nest. On the third or fourth day it is able to fly strongly. In one instance a chick hatched in the Zoological Gardens, being suddenly frightened, flew with such violence against the netting as to force its way through. If, as seems most probable, the parent bird consciously regulates the temperature of the mound, this is surely one of the most astonishing instincts in nature."—*Zoological Notes*, Arthur Nicols, p. 287.

APPENDIX L

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The case of Zerah Colburn is a remarkable one. The son of an American peasant, he had the faculty of immediately answering arithmetical questions at a very early age, without having had any arithmetical education. At the age of eight years he was brought to London, and had his powers tested by several eminent mathematicians, among others, Francis Baily, who gives the following account :—"On being asked the square root of 106,929, he answered 327, before the original number could be written down. He was then required to find the cube root of 268,336,125, and with equal facility and promptness he replied 645. He was asked how many minutes there are in 48 years ; and before the question could be written down, he replied 25,228,800, and immediately afterwards he gave the correct number of seconds. On being requested to give the factors which would produce the number 247,483, he immediately named 941 and 263, which are the only two numbers from the multiplication of which it would result. On 171,395 being proposed, he named $5 \times 34{,}279$, $7 \times 24{,}485$, 59×2905, 83×2065, 35×4897, 295×581, and 413×415.

He was then asked to give the factors of 36,083, but he immediately replied that it had none, which is really the case, this being a prime number. Other numbers being proposed to him indiscriminately, he always succeeded in giving the correct factors, except in the case of prime numbers, which he generally discovered almost as soon as proposed. The number 4,294,967,297, which is $2^{32} + 1$, having been given him, he discovered (as Euler had previously done) that it is not the prime number which Fermat had supposed it to be, but that it is the product of the factors $6,700,417 \times 641$. The solution of this problem was only given after the lapse of some weeks; but the method he took to obtain it clearly showed that he had not derived his information from any extraneous source."

Zerah Colburn, as well as George Bidder, another youthful prodigy, lost this power in after-years. Baily remarked that Euler, the mathematician, had, in addition to an extraordinary memory for numbers, also a kind of "divining power," by which he perceived *almost at a glance* the factors of which his formulæ were composed, and promptly gave the result.

APPENDIX M

(*Page* 175)

SPEAKING of that faculty of the mind from which we infer like events from like causes, Hume says :— "It is more conformable to the ordinary wisdom of nature to secure so necessary an act of the mind by some instinct or mechanical tendency which may be infallible in its operations, may discover itself at the first appearance of life and thought, and may be independent of all laboured deductions of the understanding. As nature has taught us the use of our limbs, without giving us knowledge of muscles and nerves by which they are actuated, so has she implanted in us an instinct, which carries forward the thought in a correspondent course to that which she has established among external objects."—*Philosophic Works*, vol. iv. p. 20.

APPENDIX N

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That there is often direct communication between mind and mind at a distance is within the experience of almost every one who takes an intelligent interest in his own states of consciousness. How often in every-day life have we a mental presentation of the presence of an individual before we have either seen or heard him and had no expectation of meeting him? Such occurrences are common enough, but they are usually put down as mere coincidences. To the close observer, however, the explanation is not satisfactory, as the phenomenon occurs too often to be accounted for in this off-hand manner. Many a time I have been sitting in my room in my office, which is on the first floor, and my mind fully occupied with the work before me, when suddenly it flashed into my consciousness that a certain person was on his way upstairs to see me, and presently that identical person makes his appearance. I have no recollection of ever having been deceived by such premonitions, and therefore cannot believe in the coincidence theory. I had the same experience out-of-doors. I might be walking in the street, not looking at anybody, with my mind fully

occupied, and certainly not thinking of the individual who was first mentally and then physically to be presented to me. But it was only a few persons who foreshadowed their presence to me in this fashion. I had a distracting experience with one gentleman, an eminent judge. I do not think he ever failed to foreshadow his presence to me if I happened to be within a hundred yards of him. Occasionally I met him in the most out-of-the-way places and in unlooked-for situations, and always saw him in person immediately after the mental presentation of him. I had also a singular experience with another gentleman of my acquaintance. I had arrived at Rotterdam, an entire stranger to the place, on a certain evening after dark, and next morning I took a stroll along the street in which my hotel was situated, never expecting to see anybody that I knew, when suddenly I had a presentiment that my friend Mr. B—— was somewhere near. I was surprised, and also annoyed, not that I would not have been pleased to meet my friend, but because I thought that here at length was a case in which my presentiment was at fault, for I had said good-bye to Mr. B—— in Melbourne only a few weeks before, and he never hinted that he had any intention of going abroad. I stopped instantly and looked up and down the street, but could see no one like my friend, and was about to pass on when I saw a person on the opposite side of the street with his back towards me looking into a shop window. It was my friend, sure enough. He explained to me that after I left he had suddenly determined to take a holiday, and came to Rotterdam without knowing I was there. On another occasion, when in London,

I was myself the object of a similar presentiment. I had stepped into a shop in the Strand, where five years before I had purchased a certain article. The man in attendance was leaning over the counter reading a newspaper when I entered, and on seeing me expressed the utmost astonishment. He informed me that he had a moment before I entered been thinking of me. How he came to think of me he said he could not understand, but that he said he recollected me as having purchased the article referred to five years before.

I have no reason to believe that my experience in this respect differs from that of other people. On the contrary, I am of opinion that it is a very common kind of experience—so common, indeed, that it has been embodied in a proverb. When two persons begin to speak of a third person who is absent, but presently appears, we say, "Here is the man himself," "Speak of the devil, etc." There is a French proverb which embodies the same experience.

THE END

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