

MIND & LIFE from ATOM to MAN

DEMONSTRATING THAT MIND IS COEVAL WITH,
AND INSEPARABLE FROM, MATTER AND ENERGY.
WITH SPECIAL REFERENCE TO MATTER IN
HEREDITY, MENTAL THERAPEUTICS, THE IMME-
DIATE NATURE OF PSYCHIC PHENOMENA IN
SPIRITUALISM, AND TO A POSSIBLE PHYSICAL
LIMIT TO HUMAN INTELLIGENCE

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MIND AND LIFE FROM ATOM TO MAN

CHAPTER I

INTRODUCTION

1.—*Postulates.*

Our object in the following pages is to demonstrate the truth of the following postulates :—

1. Mind is universal, continuous, and coeval with matter and energy.
2. Mind is a mode of energy correlated with all other modes of energy, and is the dominant initiative of all movement in nature.
3. Mind, matter, and energy are fundamental and inseparable.

We recognise this to be a heavy task ; not from lack of evidence that our postulates are true ; but owing to the tenacious grip of so many centuries of erroneous conceptions and the apparently ineradicable influences of many forms of superstition.

2.—*Positive and negative values.*

We do not enter upon this task for purely academic reasons. Positive, and also negative, results of value must follow the establishment of the truth of our postulates. For, when it is fully recognised that mind is a mode of energy correlated with the ordinary physical energies ; that our conscious mind is continuous with organic mind (*97 et seq.*), and that these two phases of mind are constantly influencing each other in many wonderful and mysterious ways, the way is open to great possible advances in the mental and physical character of some portion, even if a small one, of the race. We have a broader light thrown upon problems in evolution, heredity, faith healing, psycho-analysis, auto-suggestion,

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hypnotism, regulation in physiology, and the occult happenings at so-called spiritualistic seances. We arrive at conclusions that throw a clearer light upon the deeper depths in natural activities, and see a wider field of possible intelligent control.

The extremely wide and varied volume of evidence we are able to adduce in support of our postulates will tend to release many scientific workers from futile efforts to attain the impossible. Investigators will never discover a material basis in heredity—hundreds of students have wasted years of effort in this futile attempt. We demonstrate that the dominant factor and basis in heredity is organic mind (110). Philosophers need no longer speculate upon the problem of the origin of life, for this problem is involved in the problem of a first cause, and must for ever be beyond the grasp of human mind (12).

There is no point or place in the processes of inorganic evolution where life begins to evolve ; but there is position in the scale of evolution where structures having sub-animate activities merge into more complex structures having those more complex activities which we arbitrarily term animate ; for all activities in evolution have been, and are of necessity, absolutely continuous. In our use of the term "evolution" the reader must distinctly understand that we refer to the evolution of any individual "thing" or "being," without reference to any theory of the evolution of *species*.

Those who are striving to achieve what is termed the "Spontaneous generation of Life" may cease their labours. Living substances—substances having living activities—have long been evolved artificially by chemists, who still, however, remain in ignorance of the deep significance of their achievements (64).

3.—*Empedocles, Anaxagoras, Democritus, Aristotle, Maxwell, Berkeley, Bonnet, Fechner, Trendelenburg, Schwann, Butler, James, Haeckel, Rutherford.*

There is a wide range of evidence that original minds in all ages have had a more or less distinct conception of the truth of our postulates ; and beyond this, we can scarcely read any modern scientific work on any subject which

does not offer in one direction or another some evidence of the truth that is in them.

More than two thousand years ago Empedocles stated that :—

" As man, animal and plant are composed of the same elements in different proportions, there is an identity of nature in them all—they have all sense and understanding."

The modern discovery of the protoplasmic cell as the beginning of all individual life, whether of plant, animal, or man, has caused a general recognition of the fact, as stated by Empedocles, that " there is an identity of nature in them all."

Anaxagoras taught that mind makes its first appearance as " motion." Further on the reader will find himself obliged to admit that mind cannot be differentiated from motion ; also that the first trace of mind activity that clearly presents itself in nature expresses itself as movement (17).

Anaxagoras also taught that no one thing in the world is ever abruptly separated from the rest of things. This in a manner anticipates the very decided tendency of facts in modern science towards the absolute continuity of all natural phenomena.

Democritus taught that atoms are the ultimate material of all things, including spirit ; that they have existed from eternity and are in eternal motion. His atomic theory of perception remarkably anticipates modern theories ; and his teaching, that sensation is the only source of knowledge, is practically the teaching of our next chapter—that a perception is the functional unit of mind.

Aristotle, in his enunciation of the doctrine of the " Association of Ideas," clearly expresses the conception that mind is conditioned by movements. He commences :—

" When, therefore, we accomplish an act of reminiscence we pass through a series of precursive movements, until we arrive at a movement on which the one we are in quest of is habitually consequent. . . ." (190).

We cannot do other than admit the truth of the statement made by Clerk Maxwell regarding the intellectual capacity of the ancients, in his notable article on the atom :—

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"The most ancient philosophers whose speculations are known to us seem to have discussed the ideas of number and of continued magnitudes, of time and space, of matter and motion, with a power of thought which has probably never been surpassed."

Down through the intervening ages men have continuously repeated the conceptions of the ancient sages, and leaders of modern thought to-day still hold practically similar views.

Bishop Berkeley, in the seventeenth century, conceived mind as "the deepest reality ; the prius in both thought and existence."

Bonnet, in the seventeenth century, said that "all knowledge originates in sensations ; and that all beings in nature form a graduated scale from the highest to the lowest."

In the nineteenth century we have a large number of authoritative writers who have made statements more or less directly supporting our three postulates.

Fechner, who was one of the pioneers in experimental psychology, accorded "consciousness to the entire universe and everything in it."

Sir John Herschell, in his work "On the Study of Natural Philosophy," 1830, says :—

"All bodies with which we are acquainted, when raised into the air and quietly abandoned, descend to the earth's surface in lines perpendicular to it. They are, therefore, urged thereto by a force or effort, the direct or indirect result of a consciousness and a will existing somewhere, though beyond our power to trace, which force we term gravity."

Beneke stated that "the formed or perfected mind with its defined faculties is a development from simple elements."

Trendelenburg taught that :—

"Motion is the fundamental fact common to being and thought ; the actual motion of the external world has its counterpart in the constructive motion which is involved in every instance of perception or thought."

Theodore Schwann, who, in 1839, introduced his epoch-making theory of cell structure, looked upon the individual cell as the seat of those biochemical movements which, en masse, constitute life. He was of the opinion that the

differences in the properties of the different tissues and organs of animals and plants depended upon differences of structure in cells and consequent differences in activity or movements. This is in full agreement with our conception of the immediate nature of mind (12).

Samuel Butler, in his "Unconscious Memory," affirms that there is—

"No mind without matter—No matter without mind."

Haeckel, in his "Wonders of Life," says: "I am convinced that sensation, like movement, is found in all matter"; and he formulates the three following propositions:

1. No matter without force and without sensation.
2. No force without sensation and without matter.
3. No sensation without matter and without force.

But sensation without mind to perceive the sensation is impossible; and if we substitute for the word "force" the more usual term "energy," the three propositions may be simplified into "*Mind, matter and energy are inseparable.*" This covers our third postulate that "Mind, matter and energy are fundamental and inseparable." Also our first, that "Mind is universal, continuous, and coeval with matter and energy."

William James, approaching the question of mind from the psychological point of view, in his "Varieties of Religious Experience," suggests that all mind—infrahuman, superhuman and human is ONE. He offers this suggestion as being a *necessary conception*, in order to bring the various subconscious and abnormal conditions of mind *within the grasp of a reasonable cause*. In his "Psychology" he tells us that:

"The immediate state of consciousness is an activity of some sort in the cerebral hemispheres. . . ."

"All states of mind, even mere thoughts and feelings, are motor in their consequences."

Rutherford, who is probably the greatest authority upon the nature of atoms, recently stated, that as an atom is naturally the most fundamental structure presented to us, "its properties must explain the properties of all more complicated structures, including matter in bulk." The

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profound significance of this remark will be appreciated as we proceed.

We have not, of course, exhausted the list of writers of credit who have come to conclusions that in some manner or other support our three postulates. We have quoted the above in order to show that we do not claim any originality in basic conception—except perhaps in our recognition of mind as a mode of energy correlated with the ordinary physical energies, expressing itself in the movements we term sub-animate equally with the movements we term animate or living.

4.—*Various paths to truth : Schopenhauer.*

It is inevitable that students striving to arrive at truths in nature should in places cross each other's paths, or even travel together a little way and then diverge. For there is a vast amount of knowledge common to all, upon which all can agree. The problem is—to where does this knowledge lead? When we perceive in nature an intelligence that is common to all things, we are on the same path with Schopenhauer. But when he refers this universal intelligence to a metaphysical will, he diverges and is utterly lost.

We can only arrive at truth by keeping upon the paths of the actual. Schopenhauer's claim, that the evidences he adduces in support of his "Will in Nature," from facts in physiology, pathology, comparative anatomy, physiology of plants, etc., prove the truth of his conception, is absolutely unfounded. They no more prove the existence of his metaphysical "Will" than they prove the existence of the man in the moon. No man can prove that a conclusion he has deduced from a given set of facts is a true conclusion by proving that the facts he bases his conclusion upon are true.

All the evidences he quotes can be more reasonably applied to proving that this universal intelligence is due to a physical factor, which man has been acquainted with as long as he has existed, but which, up to the present, has not been correctly co-ordinated with other presentations in nature. There is no necessity for the invention of a metaphysical mystery, whether it be termed "Will in Nature" or "Will-o'-the-Wisp."

5.—Futility of Metaphysics.

We totally repudiate the possibility that any rational or practical value can be attached to any metaphysical conception. The range of man's practical and rational conceptions ceases the moment he goes beyond the physical and actual. The baseless fabric of the teachings of metaphysics have, more than any other factor, discounted the efforts of practical and original minds in their attempts to discover the methods of nature in its most subtle activities. This is particularly evident in its effects upon popular conceptions regarding the immediate nature of mind and of living activities.

When we go beyond the physical and actual, we go far beyond the range of human reason ; for even the mere existence of a particle of dust presents a problem that is beyond human comprehension. Metaphysical speculations are therefore, at the best, valueless ; they only provide a field for interminable and useless controversy, and attempt to explain in words attempted conceptions that no language is competent to express, and no human brain to visualise. Century after century they have wrangled over the meaning that shall be given to the words "time" and "space" ; yet no man knows anything more about the matter to-day than did the first metaphysician that ever puzzled his brain about them. Any shilling dictionary will tell us what is meant by these terms ; and every man knows better than the dictionary can tell him—better even than he himself can express in words—the sense he gives to the words "time" and "space."

The above remarks are not affected by the theory of Relativity. The discovery of Jupiter's moons led to the discovery that it takes time for light to traverse space. If we look at the sun we are not looking exactly in the direction where the sun really is, but to where it was about eight minutes previously. But this does not alter in the slightest degree our innate and fundamental concepts of time and space. The theory has no practical value ; it is but a philosophic toy. The concept of curved space is a delusion ; and no human brain will ever form a rational concept of any limitation to the extent of the universe.

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The following fact has as much practical value as relativity : If a billiard table has a perfectly true plane and is set truly, then it will require a more powerful stroke of the cue to send a ball from the centre of the table to either end, than to send it from that end to the centre. This is an absolute truth theoretically, because it is "up hill" from the centre of the table to the ends, and "down hill" from the ends to the centre. But this fact has no practical value, because it is impossible to give the top of the table the exact and infinitesimal curve corresponding to the curvature of the earth. The theory of relativity has a similar value.

Mind is a physical fact, not a metaphysical conception ! All that is of value in human mind arises from, and is built up by, perceptions of the actual in nature, and we cannot apply reasoning to anything that goes beyond the range of those perceptions. All the knowledge that man possesses, or ever can possess, evolves, or is yet to evolve, from his five senses of perception. We make this quite clear in our next chapter. When man tries to get beyond these data, attempts to explain the physical by an imagined something beyond the physical, he attempts the impossible ; for there can be no definite or perceptible data there upon which the mind may reason and form rational conclusions.

Everything that is, is natural—it cannot be otherwise. Even the abnormal, however abnormal it may be, must yet be natural. Nothing either supernatural or metaphysical has any existence.

Nothing can be more incomprehensible than that which is incomprehensible. The term is absolute. We cannot comprehend a first cause. Metaphysicians, in their attempts to get deeper than is possible for human mind to penetrate, have introduced the expression "the thing in itself," which, while assuming it to indicate a something which is incomprehensible, yet is not a first cause, is really used in a manner that involves a first cause. "The thing in itself" is an expression used in the attempt to define a something beyond experience or conception, when the mind reaches depths it cannot fathom, and seeks to connect the known with the unknowable by attempting an abstract concept

which really amounts to an attempt to grasp a concept of a first cause. No man, however metaphysically gifted (?), can form any conception of any "thing in itself"; it is only a barren verbal invention that makes for confusion and leads students astray. There is no such "thing in itself" between what is possible for man to know and the ever unattainable first cause; and the expression should be discarded by all writers who attempt to widen the range of human knowledge.

There is a close analogy between superstition and metaphysics. In both we find man attempting to explain things that he cannot comprehend, by a reference to a supposed something that is supernatural. The ignorant savage leans on superstition—a form of metaphysics; the philosopher out of his depth leans on metaphysics—a form of superstition; more subtle and refined than that of the savage, it is true, but the same in essence.

We can point to no practical advance or betterment in human conditions that has arisen as a result of the great labours and ponderous volumes of metaphysicians.

The general impression of practical men of genius is, that they have done more harm than good. Newton, Clerk Maxwell, Helmholtz, and many others have spoken with more or less contempt of the value of metaphysical speculations.

6.—*Continuity: Mind, matter, or energy cannot be defined; Kelvin.*

The very decided tendency in modern thought towards the absolute continuity of all phenomena in nature results from the increasing and unmistakable evidences of it that have arisen of late in various branches of science.

Phenomena thought to be essentially different and unconnected have been proved to be but varying aspects or modes of manifestation of the same essential factor, and link after link has been united in forging an unbroken chain of continuity running through all phenomena in nature.

Increasing knowledge is still forming other links in the chain.

Since the declaration of the principle of the conservation of energy we recognise as a truth that every mode of energy

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is correlated, and therefore continuous. And it has but recently become evident that we must accept also as a truth the correlation and continuity between matter and energy. For matter has been tracked down to electrons. It is known that matter radiates into energy ; and in every chemical reaction it has long been known there are transformations of matter into energy or of energy into matter. So it follows that all forms of matter and all forms of energy are correlated and continuous.

From time to time, in the history of science, man has attempted to define matter, but no satisfactory definition has been formulated. Lord Kelvin's definition, which is generally esteemed as the most satisfactory, resolves matter into energy ! We have no knowledge of the existence of matter apart from energy and mind. It is a something beyond the range of definition or of comprehension. As a consequence we find as a natural result that man cannot define what matter is, and that he sees in a speck of dust an incomprehensible mystery.

For the same reasons it is impossible to clearly define either energy or mind.

7.—*Einstein ; matter and energy ; Planck's "quanta" particles.*

Einstein, in an attempt to arrive at the nature of the elementary formations that structure an atom, has formulated a mathematical equation showing that three-fourths of the energy constituting matter is to be ascribed to an electro-magnetic field, and one-fourth to a gravitational field. But all the energy in an atom cannot be purely electro-magnetic or gravitational. There must be another form of energy expended in the perceptions of nuclei and electrons by means of which they " behave " in relation to the movements, distances, and mass of each other. (See note p. 46). These perceptions indicate operations of mind energy which have not entered into Einstein's calculations (36).

The deeper we penetrate, the deeper the mystery of existences recedes away from us. We have tracked down matter until we have reached the positive nuclei and negative electrons which structure atoms, and we are at a loss to

determine what is matter and what is energy. In Planck's "quanta" particles, we reach in energy a something which is neither matter nor energy (52). But the "jumps" of these particles from one form or pattern of movement to another are not of necessity evidences of discontinuity—any more than the "jumps" in chemical actions from one form of existence or movement to another are evidences of discontinuity. We are simply unable to trace the connecting mechanism—that is all.

Quantity of matter is estimated by its mass, yet the velocity of a particle increases its measured mass!

The nucleus of an hydrogen atom has only the same amount of energy as the electron which revolves about it, yet it has a far greater mass—or weight! The atom of hydrogen is the simplest atomic structure that exists, and it has been studied with more satisfactory results than any other atom. But even here we see the insuperable difficulty of differentiating between matter and energy. For if matter is energy the heavy nucleus in the hydrogen atom must have far more energy than its one electron.

It is very evident that there is more than energy in the atom, and various considerations lead us to the conclusion that it must have matter which cannot be resolved into energy; and mind energy for perceptive functioning of its electrons.

Absolute continuity of all phenomena in nature appears to us as an inviolable truth. We cannot brush aside the fact that matter and energy are correlated; or the fact that mind is correlated with energy (76). And however much we may doubt the happenings at psychic séances which have been recorded by persons evidently as sane and reasonable as ourselves, we cannot *a priori* assert that such happenings could not possibly occur.

8.—*Continuity of phenomena between the earth and stellar systems.*

As must be the case, if our third postulate is a truth, we can see evidences of continuity in every direction. Even the activities in the sun are continuous with the activities of all animated nature, and even the sub-animate activities

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on the earth. All living things are animated by energy received from the sun—a few minutes, months, years, or millions of years ago. The warmth that all living things directly absorb from sunlight, warmth that increases chemical and molecular activities, and aids in growth and development, was energy in the sun less than nine minutes previously ! The energy we derive from the food we eat was energy in the sun months or years before, according to the time taken to grow it ; and when we warm ourselves before a coal fire, we are absorbing energy that left the sun millions of years ago. We receive a small amount of energy from the stars, and to that extent there is continuity between the stars in the depths of space and life upon the earth.

Unusual energy disturbances in the sun affect electric and magnetic conditions on earth. Statistics show that high temperatures increase crimes of passion and increased commitments to jail ; and that, conversely, a cool spell decreases them.

9.—*Co-ordination of facts : Clerk Maxwell.*

If man, in his attempts to construct a correct presentation of nature's activities, wrongly co-ordinates two facts, it becomes impossible to rightly place other related facts, and progress must be blocked until the wrongly placed facts are set in their correct position.

It appears quite clear to us that some facts have been wrongly placed, making it impossible to properly co-ordinate other facts. This may explain why it was possible for Clerk Maxwell to say, in his " Remarks on the Classification of the Physical Sciences," when speaking of the natural sciences as distinct from the exact :—

" Sciences of this kind are rich in facts, and will be well occupied for ages to come in the co-ordination of these facts."

It surely would not be possible for students of natural science to be occupied for ages to come in the co-ordination of known facts, if the facts already supposed to be co-ordinated are really co-ordinated correctly. There must be something misplaced. Yet, in spite of this apparent block, scientific investigators are more intent upon the discovery of new facts

than in the co-ordination of the host of facts lying about that we do not know what to do with.

10.—*Necessity for change in basic conceptions.*

The rapid accumulation of previously unrecognised but important facts in nature that has taken place in modern times in regard to the relations between the various modes of energy, and the relations between matter and energy, together with the increasing pressure of many obscure problems associated with animate organisms, demand some change in our conceptions, regarding the nature of, and the relations existing between the three fundamental and causative factors in nature. If we cannot find a satisfactory basis for the co-ordination of facts in nature, in two entities only, as attempted by those physicists, who recognise only two things in nature—matter and energy—and look upon mind as being metaphysical, why not use the three factors, mind, matter, and energy, as a basis for co-ordination? Evidence that mind is a physical factor is continuously available and exhibited in the daily activities of every human being.

Do not the facts that we have to eat in order to live, that the evolution of the highest faculties of mind in man is conditioned by the chemical action of a secretion from the thyroid gland, and that a deficient intelligence approaching to idiocy can be restored by the ingestion of thyroid glands from sheep, sufficiently indicate that mind is physical? Does not the fact that we are now able to artificially produce a substance—adrenalin—that has living properties demonstrate that man can even now evolve living substances (64); and that mind energy, which expresses itself in the activities we term living, must be included with matter and energy as a basic factor?

11.—*Mind and Life.*

The most notable error in co-ordination is the placing of mind as subsequent to life. This misplacement has for ages blocked the construction of the true picture we should see in natural phenomena. For life is not a "thing" or a fundamental entity. It is merely a term that we use as

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indicating the more complex and subtle activities in nature. The range of activities indicated by this term are of the same essential nature as all other activities of a lower and less complex order. The more complex movements we term "living" or "animate"; the less complex movements we herein term "*sub-animate*" or "*sub-organic*."

There is no life without mind; no mind without life. Life does not precede mind; mind does not precede life. Like mutual actions (67), mind and life are simultaneous and continuous phenomena coeval with the universe itself (26).

Mind is a fundamental factor, a physical fact—not a metaphysical conception. It did not, and cannot evolve from life; but all life was, and is to-day, simply the visible expression of the activities of the mind. Mind is the initiative and intelligent energy in the genesis of all movements in nature (173). The entire human race is only the expression of an infinitesimal fraction of universal mind. Mind never was given to man, or to any other living thing, for it is a fundamental factor that enters into all things in the very act of those things emerging from the incomprehensible first cause. Trying to conceive that mind was "given" to man is like trying to conceive that oxygen was "given" to water, because the existence of water depends upon oxygen as a factor in its structure. So it is with man; his existence depends upon mind as a factor in his structure.

The conception that life came to the earth at some definite but remote period in inorganic evolution, and that mind has gradually evolved from that life by processes of organic evolution, is utterly wrong. How could it have been possible for the first animate being to evolve from the sub-animate unless there had been an intelligence—a sub-animate intelligence at work determining the details of the structure?

12.—*The origin of life not a rational problem.*

The fact that the "origin of life" is regarded as a problem that may possibly be solved, and the many theories that have been formulated regarding the manner of that origin, evidences how far man is yet astray from a true conception of the actual in nature. It would be quite as profitable and

equally reasonable, to consider the origin of "flying," "walking," "swimming," or "eating," as reasonable problems.

The movements we term sub-animate—which are inviolably continuous with and evolve the animate—could not have originated on earth at some period subsequent to the earth, but must have evolved simultaneously with the earth, no matter how, when, or in whatever form the earth primarily evolved from the eternal mystery that lies beyond existences and beyond comprehension.

The origin of life is therefore not a rational problem. We are, of course, speaking of "life" in the broad philosophic sense in which the term should be used in this work.

The ordinary and restricted meaning of the term will, of course, still be retained in ordinary language, but, broadly speaking, "life" must be taken to embrace all activities, because they are the immediate functions of the same universal factor—mind. All activities in nature, from the movements in a brain cell that condition a thought to the movements in an atom, are absolutely continuous; there is no place where a line can be drawn across and we can say "here the animate ceases" (60); or, "here consciousness comes into existence."

13.—*Misleading terms: inorganic and inanimate.*

The term "inorganic" is misleading, because it implies a basic difference from that which we term "organic." The chemist cannot draw a line between "organic" and "inorganic." The terms are used in chemistry merely as a convenience, for purposes of classification. "Sub-organic" is a term that should be substituted for "inorganic"; it simply indicates a range of activities less complex than those we know as "organic." "Inorganic" means having no organisation in structure; this is equivalent to having no organisation in movement. But we know of nothing that has not some organisation of structure and movement. Every one of the atoms of the differing elements is a structure with a definite system of orderly movement that differs from the system of structure and movement in other atoms; and every differing substance is a differing complex organisa-

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tion of moving molecules. An assemblage of differing sub-organic substances gives us the complexity of structure and movement that we arbitrarily term "animate"; but all forms of activity in the animate must of necessity be the sum of the activities of the fundamental atoms and molecules of which it is structured. Here we begin to appreciate the profound significance of Rutherford's statement regarding the atom, quoted above (3), that "its properties must explain the properties of all more complicated structures, including matter in bulk."

The term "inanimate" means "without animation." But if we reduce "animation" to any simpler term, and try to convey its meaning, we are brought down to some form of movement that differs only in complexity from any other form of movement. In an atom, as we know it, there is an arena of remarkable energy of orderly animation; and to every structure of atoms the atoms carry with them their specific properties, endowing those structures with a more complex energy of animation. Animate life is, therefore—strictly speaking—but the sum of the activities of an aggregate of co-operating atoms; and "sub-animate" is a more suitable term than "inanimate" for indicating the activities of atoms, or groups of atoms, having less complex aggregates than those we arbitrarily term "animate."

14.—*Mind and life coeval with matter and energy.*

This quite reasonable conception gives us a sub-animate "life" and "mind" that must be coeval with matter and energy. For matter as we know it could not have existed before atoms; and there cannot be "life" without "mind," or "mind" without "life." Life, then, in a wide and properly generalised sense, must be coeval with matter and energy. And the emergence of the animate from the sub-animate marks the point in the continuously ascending scale of animation which is popularly supposed to give us the "origin of life."

But it is quite evident that there could be no "origin" at this point, any more than at any other place in the continuously growing complexity of structures and movements that must of necessity have accompanied the continuous

production of new substances conditioned by the progressive lowering of the energy environment on earth.

15.—Energy environment in relation to range of structures.

Ever since the earth appeared as a fire mist there has been a gradual lowering of energy environment, and a continuous succession of forms of matter have unceasingly been coming into existence, whose structures and properties were balanced by existing energy conditions.

Every new form of matter coming into existence gave an opportunity for the production of more complex structures, having increased range of properties and functions ; and in this manner the more complex activities of animate movement "grew" from the less complex activities of the sub-animate by continuous changes in the relations between the same three fundamental factors—mind, matter, and energy.

And as every form of movement, sub-animate and animate, is initiated by some mode of perception that involves an activity of mind (23), both mind and life are therefore coeval with matter and energy, and neither the origin of life nor the origin of mind are rational problems coming within the range of the mind of man, their solution necessitates a knowledge of a first cause.

It is easy to understand Clerk Maxwell's statement that science will be well occupied for "ages to come" in the co-ordination of known facts, if "mind" and "life" are not given their true relative positions in the "picture" of nature ; also to understand why there are so many facts in biology that we are unable to reasonably co-ordinate ; and why in psychic phenomena the inability to explain or co-ordinate leads to superstitious beliefs.

16.—Hobbes ; Anaxagoras ; Mind and movement.

When Hobbes, who may fairly be termed the most notable philosopher of the seventeenth century, heard the question "What is sense?" and, as he tells us, fell to thinking much over the problem, the truth suddenly occurred to him, that if bodies and their internal parts were at rest, or always in the same state of motion, there could be no distinction

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of anything, and consequently, no sense. The cause of all things must therefore, he considered, be sought in the diversity of movements.

Here Hobbes re-discovers the truth taught by Anaxagoras more than two thousand years before—that mind made its first appearance as motion. For if bodies and their internal parts “were at rest, or always in the same state of motion,” we should not be able to “sense” or perceive any motion.

It will help the reader to arrive at a comprehension of the truth that mind is inseparable from movement if we consider what happens when he places his body within the circuit of an electric current. When the circuit is made complete by contact, he receives a shock, and when contact is broken he receives a shock—caused by differences in movement—and he *perceives* these shocks the more violent the greater the difference in movement. And, as our perceptions are the functional units of mind (chap. II), he would have *no mind* in relation to this effect of electric energy, were it not for differences in movement. If the energy movements in an electric circuit were the same as the energy movements in the molecules of the body, he would not be able to perceive anything whatever when included in the circuit.

If he places his hand in water, and the temperature of the water is higher than that of the surface of his hand, he feels a sensation of warmth; if the water is colder he has a perception of cold; but if the water is the same temperature as the hand, he perceives neither heat nor cold.

Every alteration in the temperature of the water causes an alteration in the movements of its molecules; they move with more energy as temperature increases, with less energy as temperature decreases. This is a well-known physical fact. And, whether we have any “sense” of heat or cold depends upon whether the molecules of water are moving with greater or less energy than the molecules that structure the organs of perception in the skin of the hand. If the molecules of water are moving with greater energy, this greater energy of movement is communicated to the molecules of the sensory organs, and we perceive this greater energy of movement as warmth or heat; if the water is colder, the sensory organs perceive the reduction of energy

movement as "cold"; if the temperature of hand and water are equal, we perceive neither heat nor cold, for no alteration in movement takes place in the sensory organs.

The non-scientific reader must clearly understand that these movements of molecules are well-known and proven facts in science; they are for ever in most energetic and perpetual motion. Every element has molecules that differ from the molecules of all other elements in the velocity of their movements. The hydrogen molecule moves with a velocity of over one mile per second; all others move more slowly.

Every one of the infinite number of differing molecules of substances may differ, either in the number or the character of the molecules of the elements that structure them, the manner in which they arrange themselves, the velocity of their movements, or through the combined effect of these causes. Every different substance has a fashion or pattern of molecular movement different from that of every other substance.

17.—*Phosphorus and chloroform; structure and movement.*

It is this difference in character of molecular movement of different substances that gives them their distinctive properties and makes the molecules of the same element or elements either harmless or poisonous—as in the two differing movements in phosphorus, the yellow and the allotropic red. The movements of molecules of chloroform will check the movements in the brain that are transformed into thought and render a man unconscious; yet the elements that structure chloroform are present in abundance in the food we eat at every meal!

Thus it is plainly evident that a character of movement conditions animate activities, both physical and mental.

An animate being is a system of substances in constant movement.

A substance is a system of molecules in constant movement.

A molecule is a system of elements in constant movement.

An element is a system of atoms in constant movement.

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An atom is a system of particles or electrons in constant movement.

Evolution of individual being may be defined as a continuous building up of complexity in structure and movement from the atom to man—which is inseparable from a continuous breaking down or devolution from man to atom, in eternal cycles of existences.

At any point we may choose to make a division across this continuous process, that which is on one side of the line is of necessity continuous with that which is on the other. And in such division we cannot distinguish any difference in the presentation which appears on each side of the line of division. Both are the same.

18.—Differing mind impressions evolved by movements of the same three elements.

Facts in chemistry clearly indicate the inseparable relation between mind and movement. There are very many substances structured by the same elements which have very different properties, and which evolve differing perceptions when in mutual action with our sense organs. And as the properties of the elements are unalterable, these differing perceptions can only arise from the differing modes of movement established in the differing substances by differing modes of combination (51).

If we draw up into the mouth by means of a tube some oxygen or some hydrogen, or if we place a piece of carbon upon the tongue, we perceive no sensation of taste; for the differing electronic movements in these elements do not cause any difference in the movements normal to the compound molecules that structure the sense organs distributed over the surface of the tongue.

Now, if these three elements are united in the proportions that form sugar, the three differing movements of the elements are united, and a more complex form or "pattern" of movement results. If we now place the sugar upon the tongue, the particular form of molecular movement that it now possesses causes by contact a change in the molecular movements of the sense organs, that conditions a pleasant sensation in them. When this sensation has been trans-

mitted to the proper cerebral centres by means of the sensory nerves it is there transmuted into conscious mind as a sweet taste.

If we combine the same three elements in the proportions that form camphor, we get a differing pattern of molecular movement that causes a different movement in the sense organs that conditions the taste of camphor. And if we combine the same three elements in the proportions that form acetic acid, we get yet another differing pattern of movement that conditions our perception of acidity.

All perceptive senses are conditioned by movements. Visual perceptions are conditioned by light waves ; auditory perceptions by air waves ; perceptions tangible, olfactory, and gustatory by molecular movements.

As a perception is a function of mind, we thus see in the animate organism the transformation of the properties of atoms into perceptions—mind functions ; for the molecules of the elements are but associated atoms of the elements. And as the possible variations or patterns of movement in the molecules and the aggregates of molecules that may be structured from the atoms of the sixteen or more elements that build up the living body are practically infinite in number, man has that infinite variety of patterns of movement and combinations of patterns that condition the infinity of perceptions that constitute his mentality. Here again we see the profound significance of Rutherford's statement that "atoms must carry their properties with them into all more complicated structures" (3).

The transformation of molecular movements into perceptions of taste, as tentatively described above, is strictly analogous to the transformation of etheric movements into visual perceptions, and air movements into auditory perceptions. All the perceptions of animate beings are conditioned by movements, and differing perceptions arise from every differing form or pattern of movement. And, as every perception is a function of mind, and the entire range of mind in man is built up from perceptions (30), we can clearly see that energy of movement is in some manner transformed into energy of mind—just as energy of movement is transformed into electric energy, or the energy of the

movement of light is transformed into the energy of heat.

There is—as a matter of necessity—an analogy between the activities that condition our perceptive senses. Sensations of taste, sweet and acid, correspond to auditory sensations—discord and harmony. A tasteless substance corresponds to a neutral sound. Any single note struck upon a piano gives out a sound that is neutral between what is disagreeable and what is pleasant. We may strike three notes together, and the mutual actions between the differing air movements may give us a pleasant sensation of harmony, just as the mutual actions between the differing molecular movements of three elements upon the tongue give us a pleasant sensation of sweetness. Or we may strike three notes together whose differing movements have mutual actions that give us a disagreeable sense of discord ; just as the mutual actions between the differing movements of the three elements upon the tongue may give us a disagreeable sense of acidity. And so on with all variations in taste and sound.

19.—*All fundamental facts beyond human reason.*

It is impossible, of course, for man to comprehend HOW the transformation of movement into mind is effected ; just as it is impossible to comprehend how any form of energy is transformed into another form of energy. And of all the phases of knowledge that we have acquired, none is more mysteriously wonderful than the incomprehensible results of the chemical union of elements. We may know these things are so—that is all. Transformations of energy are incessantly taking place within us and about us, but the manner of these transformations is quite beyond the grasp of human mind.

Every natural fact is, fundamentally, beyond the grasp of human reason. Much knowledge has been acquired by experience regarding the conditions that are necessary to the phenomena of energy transformations, but we cannot grasp any rational idea as to why any particular conditions lead to the effects that follow. Man could never, by reason alone, have arrived at the knowledge that the union of two

gases would form water ; or that the union of nitrate of potash, sulphur and carbon would form a mixture that would explode with extreme violence ; and so on throughout the whole range of chemical actions. We did not get electricity, electrons, X-rays, radio activity, or gravitation, by reasoning ! Such facts have come to us by observation—by impressions upon our perceptive senses (251).

Crookes did not experiment with vacuum tubes in order to discover cathode rays, X-rays, or electrons ; his " radiant matter " came to him as a surprise. Röntgen discovered the X-rays by accident. Becquerel did not discover radiant activity by reasoning upon the phenomena of fluorescence in substances after exposure to sunlight. He accidentally came upon the fact by observing that a piece of uranium was photographed by a photographic plate in complete darkness. This discovery ultimately led to the extraction by M. and Mme. Curie of something less than a single grain of radium salts from a ton of uranium residues. The astounding properties of these radium salts came as a surprise to the Curies even as they did to the world of science.

Gravitation is a natural fact that required no effort of reason to discover. The primitive man who first threw a stone up in the air knew that it would come down again. But the correlation of that fact with the fall of the moon around the earth was a feat in human reason of that rare and widely comprehensive range we term genius. Still, even to-day we are quite ignorant as to the cause of gravitation.

The larger value of the achievements of genius lies in the rational co-ordination of the irrational in nature.

The fact of consciousness in man is quite irrational. Consciousness in the atom, as the unit in the evolution of consciousness in man, is equally irrational ; but if it can be established as a fact by reasonable co-ordination with other facts, we have no more reason for rejecting consciousness in the atom as a truth than we have for rejecting gravitation as a truth or consciousness in man as a truth. Each is equally incomprehensible.

If we perceive that certain immediate conditions are necessary to, and precede, any particular phenomenon,

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we may rationally conclude that those conditions are the immediate cause of the phenomenon.

20.—*Brownian movement ; animate and sub-animate movement ; sensory movement.*

When Robert Brown, in 1827, first noticed the unceasing and amazingly energetic movements of some very minute particles suspended in a drop of water we became aware that substances which had hitherto been considered as internally motionless were scenes of perpetual and most energetic animation—the Brownian Movement, so named in honour of its discoverer.

We are now aware that the pressure exerted upon the walls of vessels that contain gases is caused by the impact of the moving molecules of the gases ; that these molecules are moving perpetually with an almost incredible velocity, which has been determined both mathematically and by actual experiment in so many various ways that its actuality has become unquestionable.

Radio activity has revealed to us that an atom is a veritable system of orderly electrons, moving with a perpetual energy of activity, compared with which the visible animate movements of individual beings have negligible values.

How can we accept as truths the perpetual activities of the molecules in liquids and gases, the amazing energy of orderly movement we find in the structure of an atom, or the conception that mind, matter and energy are inseparable, and yet speak of anything either as "inanimate" or "inorganic"? For whether we conceive the atom or the electron as the fundamental unit of matter, that unit must still be a "structure" of mind, matter and energy, with some form of organised association in sub-animate movements.

The forms of movement that condition our perceptions of sound can be transformed mechanically into impressions upon the disc of a gramophone ; preserved for any length of time, and then transformed back again mechanically into the forms of movement that condition our perception of the voices that sang, or the music that entertained others, years before.

The forms of movement that condition our visual perceptions can be transformed chemically into a permanent material picture ; and this picture at any time we look at it transfers back again to our sense of visual perception the selfsame movements, and we see, exactly as the chemicals on the photo film saw, months or years before !

Such facts are of the most profound significance ; man has not yet grasped the depths to which they lead. The movements from both gramophone and photograph *become conscious mind* when they reach the proper cells in the brain.

The possession of our two senses of sight and hearing are absolutely essential to maintain man above the intellectual level of any lower animal (31), and here we see that these two senses are conditioned in essentially the same manner as forms of mechanical and chemical movement.

When one speaks of any movement as inanimate, or of any structure as inorganic, he assumes a knowledge that no man possesses. We avoid this by using the terms sub-animate and sub-organic ; but always with a clear understanding that the terms are purely arbitrary ; they can never be any more definite than the thick end and the thin end of an evenly tapering rod. You may cut it across anywhere and still have a thick end and a thin one ; and no matter where you cut it, the faces of the cut would be exactly alike—the face of one cut represents the face of the other cut. So it is if we cut across anywhere the phenomena of animate and sub-animate existences. Cut where we will, the faces are equal.

21.—“Inanimate” and “animate” are but relative terms.

We know of nothing that is really inanimate ; everything in the universe, from stellar systems to electrons, is animated by movement. Every man, in and upon his own person, has irrefutable evidences of the inviolable continuity of the essential activities that condition his mental and physical animation. The scarf skin which is constantly wearing away or falling off the surface of the body ; the hair upon the head ; the extremities of finger and toe nails ; the enamel upon the teeth ; are all sub-animate substances that are intimately connected and continuous with the animate cells that form, as it were, their roots. The same blood that

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flows through the capillaries of the brain and conditions the evolution of conscious mind also flows through the capillaries of the tissues that condition the evolution of skin, nails, hair and teeth. At every breath we draw into the lungs the sub-animate oxygen molecules in the air are presented to the capillaries surrounding the air spaces, and there they instantly exhibit those animate properties which are essential to our existence. Yet there has been no change in the oxygen molecules—they cannot change. The transition from sub-animate matter to animate matter is merely the result of change in environment. The molecules of oxygen would function with molecules of iron outside the human body when opportunity occurred ; and the same reasoning applies to the properties of every one of the sixteen or more elements that structure the animate body.

The necessary energy for every thought ; for the activities of every organ, and for every muscular movement, comes alike from the stream of ingested energy that is constantly flowing into the system from the digestive track. The energies there come from food, and the food comes from the energies of sub-organic matter in soil, air, water, and solar radiations. There is perfect continuity through it all.

Man is a complex structure of an infinite number of less complex individual beings, each with an individual life of its own, but all working together in co-operative and harmonious unison of movement ; these many millions of less complex individuals that structure man are themselves structured of a vast number of less complex individual molecules, and the molecules are structured of less complex atoms. As an individual, man has a finite existence that ends when the co-operation of his structural units ceases ; and, in ordinary language, we say that the man dies.

But death is only a relative term. Every movement, every thought, in a living animal is of necessity the cause of the "death" of some portion of the substance of the living body ; that portion is transformed from animate molecules into sub-animate molecules, and ejected from the body as waste matter. Every movement, mental or physical, causes a molecular movement in cells that unites carbon with oxy-

gen, and produces carbon dioxide, from which no further energy can be derived.

The individual man, animal, or plant ceases to exist or is "dead" in a somewhat similar sense to that in which an industrial company may be said to be "dead" when co-operative partnership ceases. The persons who formed the company are just as alive as ever, and simply turn their activities into other paths of enterprise. When the individual dies it is but the co-operative functions that cease; the fundamental activities of the molecules and atoms, whose co-operative functions conditioned the life of the individual, are just as much alive as ever; they cannot die; they simply change the scene of their activities to some other cycle of sub-animate or animate activity (21).

No living thing or being exists to-day which holds not in its structure, and is animated by, many atoms of matter that have served the same purpose in some of the inconceivably vast host of individual living things that have existed during the millions of years since the animate complex evolved from the less complex sub-animate.

The animation of any molecule of oxygen in the air we breathe, or of any molecule of carbon in the vegetation of the earth, must have often been a part of the co-operative animation in individual life during the millions of years that countless millions of living things have been successively passing through their ephemeral cycles of individual existence.

" And this delightful Herb whose tender Green
Fledges the River's Lip on which we lean—
Ah ! lean upon it lightly ! for who knows
From what once lovely Lip it springs unseen !

A molecule of carbon that animates us to-day and is exhaled as carbon dioxide, may be taken up by a plant in our garden, the plant eaten in a few days, and the selfsame molecule again do its part in further animating us—or someone else. The oxygen atoms set free by the absorption of the carbon from the dioxide by plants is also available to be breathed again, and its energy of mutual actions with iron and carbon again utilised by us as a living function. And thus it is with all the atoms or molecules of atoms and

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substances that enter into the structure of the food we eat ; they are all sooner or later expelled from the body, having given up their structural energy and become of no further immediate use in the body. They are then free to enter into the structure of plants that are growing ; there acquire structural energy ; and thus again become available for living functions in the more complex animal

The daily ingestion of structural energy supplies all the energy which is transformed within us into the living activities of conscious and organic mind—a continuous cycle of evolution and devolution within the individual, which constitutes animation.

NOTE (see page 28). Sir Ernest Rutherford recently stated that science had reached the point of view that the whole material world was a highly complicated collocation of positive and negative electrons. But it is not necessary to our purpose in this volume to go deeper than the atom.

CHAPTER II

PERCEPTIONS THE FUNCTIONAL UNITS OF MIND

I

22.—The confusing effect of too many terms for the one thing.

Between the apparently narrow meaning of the term "perception" and the broadly embracing sense of the term "mind" there are a large number of terms in use indicating various aspects of mind presentations; and it is very necessary to a lucid comprehension of our subject that the reader should clearly perceive that all these various terms cover the infinitely various modes of activity of but one ultimate factor—mind; also, that all these various terms must connote "perception," for mind can only be evidenced by perceptions. We cannot have mind unless we can perceive; we cannot perceive unless we have mind.

Mind is ONE; matter is ONE; energy is ONE—three inseparable, fundamental and continuous (69) factors. And as there is infinite variety in the modes of manifestation of matter and energy, so there must be infinite variety in the modes of manifestation of mind. Every possible variation in every thing or structure involves a variation of mind phenomena (158 *et seq.*).

23.—All terms indicating mind function connote perception.

The function "perception" is connoted by all the various terms now in use denoting activities of this one universal factor—mind. Sensation, consciousness, instinct, knowledge, intelligence, intellect, reason, subconscious mind, subliminal perception, unconscious mind, hope, fear, joy, anger, and so on. For every phase of mind, no matter by what term it is indicated, must involve perception; perception is the basic evidence of mind function. Psychologists attempt to show that a "sensation" is a something below

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the level of a "perception"; but no thing or being can have a sensation unless it perceives that sensation; every perception involves a sensation.

We cannot have consciousness unless we perceive something; if we perceive nothing we are unconscious. And so by a parity of reasoning we can include all terms indicating activities of mind and lead them to perceptions as the basic units.

24.—*Intelligence and reason synonymous. All animals reason.*

Intelligence and reason are really synonymous terms, although man attempts to differentiate between them in order to prop up the erroneous conception that there is a profound essential difference between his intelligence and the intelligence of lower animals—that man has reason and animals have not.

This is untrue; man has but a wider range of intelligence. When a child toddling about turns aside to avoid an obstacle in its path, or a fleeing animal swiftly turns aside to avoid an obstacle in its path which it cannot leap, they evidence an operation of reason. Both deduce from the conditions that present themselves that if they continue on their course without deviation trouble will follow. That is reasoning—or it is intelligence; you may term it as you please—for reason cannot be excluded from any act of intelligence. An unreasonable act cannot be an intelligent act; an intelligent act must be a reasonable one.

A child becomes accustomed to seeing lights and fires before it becomes acquainted with the physical effects of contact with them; and will, without fear, poke a finger of inquiry into the flame of a candle. It thus acquires a knowledge of the results of personal contact with flame, and will afterwards keep its fingers away from it. This knowledge—evolved by a perceptive sense—develops one of the most simple exercises of reason. The child has learnt not to touch a flame because of the unpleasant consequences. This constitutes reasoning; it is a rational connection of cause and effect, and this is the basis of all reasoning.

It is a most remarkable fact that persons speaking with professional authority, whilst admitting that animals have

intelligence, deny that they can reason. They get out of the difficulty by saying that such acts of intelligence are due to "instinct"—a term that really only covers ignorance. Any observant person—if his mind is not already warped by erroneous misconceptions—cannot watch a cow flicking flies off its body with its tail without perceiving that the tail is guided by intelligence; and this exercise of lowly intelligence must represent a modicum of reason.

We see in the London *Times* this morning—September 2nd, 1927—the following news item :

"An Alsatian dog was guarding the clothes of some children who were bathing at Gullane, near North Berwick, when one of the bathers—a girl—got into difficulties about fifty yards from the shore, and cried for help. The dog at once swam out, caught hold of the girl's costume and dragged her ashore. It then barked continuously to attract attention."

If that dog had been a man who swam out and rescued the girl, and then called out for assistance, every one would admit that it was an act of reason. Why should the same reason be denied to the dog? Thousands of instances of animals evidencing a limited faculty of reason could be cited. It is a matter of degree—not of kind—both in man and animal.

All animals must possess reasoning powers sufficient for the necessities and conditions of their manner of existence, otherwise they could not exist; and many of them in connection with these necessities exhibit an intelligence beyond the range of intelligence in man. How is it possible—with reason—to deny that ants, bees, beavers and other animals exercise a large measure of intelligence that necessitates rational co-ordinations of cause and effect? Some animals have modes of perception that are impossible to man, and in the direction of these perceptions have a wider range of perception, and therefore intelligence, than man himself. It is but reasonable to assume that the conscious mind of the honey bee has a genius for doing the wonderful things that are done in a beehive; that the mind in a crab has a genius for the reconstruction of a claw that has been torn off. The mind in a pumpkin seed has a genius for making pumpkin

vines, but no ability in music or mathematics ; the musical or mathematical genius has no ability whatever in the making of pumpkin vines.

25.—Modes of perception incomprehensible to man.

Man cannot comprehend the nature of the perception which enables moths to discover their mates when at a distance far beyond the range of human perceptions. He has no idea of the perception which enables animals to gain home from a distant place they have never seen before, under conditions proving that neither memory nor any of the senses such as are possessed by man can be of any service in determining the direction to be taken. Man cannot comprehend the nature of the perceptions which enables micro-organisms and elemental molecules to perceive the direction of an electric current ; a somnambulist to see without the use of the eyes ; a flower to perceive the position of the sun ; iron to perceive the direction of magnetic lines of force ; the many varying modes of perception exhibited by elementary molecules in chemistry and crystallisation ; the perception of light by selenium ; the perception of invisible light by a photo film ; the perception of infinitely weak electric currents by sensitive galvanometers ; the perception by Rutherford's floating magnets and their orderly responsive movements to varying energy of electric current ; or many other such-like evidences of perceptive function.

The possession of our five senses furnishes us with no clue whatever to the possible nature of other senses of perception ; nor do our five senses enable us to understand the ultimate nature of even our own perceptions. We do not know *how* we perceive, although we may know of the immediate conditions necessary to our perceptions ; and we certainly do not judge rationally if we limit intelligence in nature to the limited range possible to the experiences of man's five senses.

It is now becoming generally recognised that plants can perceive rays of energy that man cannot perceive. We have gained this knowledge from the " behaviour " of plants. To explain (?) this function of mind in plants by stating—as Sir Oliver Lodge does—that there is possibly a " vegetable

detector of invisible rays " seems to us a clear exhibition of man's undoubted unwillingness to recognise the truth that there is an intelligence in nature beyond the intelligence of man. For how can either man or vegetable " detect " anything whatever unless they perceive it ? This attitude is typical of the self-centred egotism that has so long delayed a knowledge of the truth that mind is universal, and extends its operations far beyond the capacity of our comprehension.

To perceive anything whatever, in however primitive or feeble a manner, involves at the least some faint knowledge of that which is perceived ; and from accretions of such knowledge gained by perceptions arise all values of intelligence up to the highest genius.

The eye perceives a certain range of etheric vibrations, but cannot perceive others ; the ear perceives the waves of a given range of air movements, but there are further waves that it cannot perceive. Other things and other forms of life have perceptions of movements in nature that cannot be perceived by man, and have therefore an intelligence regarding those movements not possessed by him.

We have but one course to follow in tracking down evidences of mind activity in nature—we must track down all evidences of perception, and wherever we find a sufficient evidence of perception there we may safely conclude is mind in operation.

26.—*Two particles of matter in the depths of space.*

Let us assume an area somewhere in the depths of space, in such a position that the forces of gravitation around that area balance each other. Into that area a particle of matter evolves from the ether. That particle will remain motionless.

If now, another particle of matter should evolve at some distance from the first one, the two particles would immediately commence to move towards each other in conformity with the laws of gravitation, with an energy proportionate to mass, and inversely as the square of the distance between them. And they would move towards each other in a *straight line*.

Now, there are an infinity of directions in which the two

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particles are free to move, and if energy alone was concerned in the movements, they would proceed in any one of that infinity of directions. But the fact that they move directly towards each other in a straight line must result from some mode of perception quite unknown to us that functions in each of the particles. Gravitation is only a *term* applied to the phenomena. The law of gravitation is not the cause of falling bodies, it is merely a statement of facts relating to the energy and velocity acquired by bodies moving under the influence of gravity. What we wish to arrive at is the *immediate cause* of that which we term gravitation.

When two particles of matter in a balanced gravitational field move directly towards each other in a straight line, although there are an infinity of other directions in which they are free to move, there is no other possible explanation of their direction of movement than that they, in some manner incomprehensible to us, *perceive each other*. The fact that we cannot conceive the nature of this perception is no bar whatever to our acceptance of the fact as a truth. The facts in nature that are incomprehensible to us are innumerable (19), and we have irrefutable evidence that many modes of perception are at work in nature that are beyond our comprehension.

The particles could not perceive each other, if mind, in some one of its infinite modes of manifestation, was not present to function that perception ; for perception without mind to perceive is unthinkable. A perception is an act of consciousness, and consciousness is a condition of mind.

The two particles could not move in any direction whatever unless energy was present to make movement possible ; so that the mere existence of matter involves the existence of both mind and energy. Neither matter nor energy possess any power of automatic guidance ; exact and definite movement, in one particular direction with evidence of purpose, can only be due to a function of mind.

Further, if there be any precedence to be accorded to either mind, matter or energy in the genesis of movements, that precedence must be given to mind. For the movement of any particles either by attraction or repulsion must of necessity be preceded by a perception of the exact position,

and at least of the mass of other particles ; and in all movements of matter in organic and sub-organic evolution perceptions—functions of mind—must have the dominant initiative. There cannot be perception without movement ; there cannot be movement without perception.

Mind is therefore universal, and the dominant initiative of all movement in nature ; for there is nothing that is not in perpetual movement, and every movement is initiated by some mode of perception.

27.—*Sir John Herschell ; Spinoza ; Schopenhauer.*

The interpretation we have here given to the phenomena of gravitation is strictly in accord with the statement made by Sir John Herschell (3) :—

“ All bodies with which we are acquainted, when raised into the air and quietly abandoned, descend to the earth’s surface in lines perpendicular to it. They are, therefore urged thereto by a force or effort, the direct or indirect result of a consciousness and a will existing somewhere, though beyond our power to trace, which force we term gravity.”

The italics are ours.

Consciousness and *will* connote perceptions ; and we may say that the primary unit of perception—that for mass only—expresses itself in the movements we attribute to gravity. Gravitation is universal ; mind is therefore universal (26).

The above statement by Herschell was considered by his critics as being illogical. But the true co-ordination of any fact may be considered illogical by anyone who cannot perceive the truth. The movements due to gravitation, to gyroscopic action (42), to electric, magnetic, heat, or any other mode of energy, can be co-ordinated with no other phenomena known to man other than functions of perceptions—which are functions of mind.

We may now properly appreciate the intellectual “ grip ” of the ancient philosophers of more than two thousand years ago, who taught that mind makes its first appearance as Motion.

Nothing whatever in the universe so far as man’s knowledge extends but is in a state of perpetual movement and

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transformation. Mind, matter and energy are eternally changing relations with each other in infinite variations of cyclic movements, determined by an infinite range of modes of perception, the sum of the three factors remaining eternally the same. What is physical energy associated with mind and matter one instant is mind energy the next, associated with physical energy and matter ; the next instant, that mind energy is again a physical energy (76).

All states of mind—thoughts and sensations—are “motor in their origin” and “motor in their consequences.” We can only define mind in terms of behaviour (41), and every form of behaviour is a movement of some sort. The molecular movements in the neurones of the human brain are immediately caused by the physical energies carried to them by the blood stream. The character of the molecular movements within the neurones determines the character of the mind activities, and the character of those activities determines the character of the motor consequences.

28.—Laws of physical movement must apply to animate movements.

As the three factors—mind, matter, and energy—are essential to all phenomena in nature, all physical laws of movement must apply equally to biologic movements. In all living things every activity must have mutual and equal movement between differing substances ; even as by the third law of motion the mutual actions between any two bodies are always equal. The energy of thought is a mutual action between energies in the brain neurones and energies in the blood stream. Movements of thought must have motor consequences of equal energy ; the more intense the thought, the more energy required to evolve it and the greater the energy of the motor consequences. Common experience of the effects of mental strain confirms this line of reasoning.

The movement in gravitation we have shown to be due to a mode of perception, and the energy of movement in that perception must be equal to the energy of gravity movement. We may thus say that the energy of the most simple phase of mind known to us—perception of mass only—is exactly

proportioned to the energy of gravitation. The new departure in science—relativity—demonstrates that the mass of a substance is a measure of its energy content ; and we may tentatively postulate that the energy exhibited by a body is a measure of its mind energy ; we cannot differentiate between movement and mind (17, 18, 39 *et seq.*).

The same reasoning applies to every form of perception, and must apply to all mind functions, for every phase of mental activity is a complex of perceptions.

29.—*Physical movements continuous with mind movements.*

The illuminating energy from a source of light varies inversely as the square of its distance. This is stated in textbooks as a physical law. But this law is based upon an activity of mind—visual perception—and might just as reasonably be termed a law of mental function, thus :—

“ The conscious mind energy in visual perception of illumination from a source of light is in inverse proportion to the square of the distance of the source of light from the organ of perception.”

We may even say it is more appropriate as a law of perception than as a physical law, for it is the energy of perception that is really measured—not the light. The intensity of a light remains the same, whether it be three inches, three yards, or three miles away from the eye. It is only its illuminating power upon a constant area that decreases with the square of the distance.

Sound is a term indicating perceptive energies of the auditory sense organs—a phenomenon of mind. The air waves that produce sound are physical phenomena. Here again we see physical movement continuous with mind movement. All vibrations of air within the range of our auditory perceptions are represented in the brain by movements which constitute a consciousness of their volume, character and intensity ; and the energy of that consciousness must be equal to the energy producing it.

Physical laws of movement must be continued into the animate ; for the recognition of any physical movement is itself an animate movement inviolably continuous with the

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physical movement ; and every animate movement is an expression of mind.

30.—*The evolution of conscious mind in man.*

We may easily grasp the conception of perceptions as the functional units of mind if we study the progress of the evolution of conscious mind in man.

The first time a child consciously perceives anything marks the commencement of the conscious life of that child as an individual. Repeated experiences of perceptions teach it to refer its perceptions to the immediate cause of them. Thus perceptions evolve knowledge ; and the knowledge thus gained increases with experiences, until it becomes intelligence—or reason.

The new-born child has no *conscious* mind ; it does not know that it exists. It only possesses *organic* mind (94 *et seq.*). It has its perceptions, but these at first are confined to perceptions of organic mind ; it does not know what they are or where they are, and it has no consciousness of anything external to itself. As the neurones that are evolving the cerebral centres of the child's five perceptive senses more definitely differentiate from surrounding tissues as a result of repeated stimuli received from its five external sense organs, the organic mind of the child's perceptions is gradually evolved into the conscious mind of the cerebral centres.

The moment that an organic perception is thus first transmuted into conscious mind marks the commencement of the conscious life of the individual.

It must be clearly understood that we do not *perceive* by the central neurones of the brain. All perceptions of the external have their origin in the external sense organs ; it is *organic mind that perceives*, and the nature of these perceptions is conditioned by movements external to the organism.

We see by vibrations of light ; we hear by vibrations of air ; we taste, smell and feel by molecular movements (18). The organic mind of our sensory organs perceives all the infinitely varied movements that give us a knowledge of conditions external to ourselves ; but we remain quite unconscious of these perceptions until the movements that

condition them are transmitted to the sensory centres in the brain, and there transmuted into conscious mind. This interval of the unconscious operation of organic mind is a measurable quantity that has been estimated experimentally. It requires a known fraction of a second for an organic perception to reach the brain and be transformed into a conscious perception.

A new-born child has all the complete organs of the five senses, and these organs must respond to stimuli and evolve organic mind perceptions ; but these perceptions are not recognised by the child as being due to anything external to itself. If it is pricked with a pin it feels the discomfort of it, but has no conscious knowledge of where the discomfort arises. The evolution of conscious mind is only commencing ; but these organic perceptions of its sense organs are just as truly operations of mind before a conscious knowledge of their local nature is evolved as they are after a long series of experiences has educated the child to recognise and locate its five distinctive senses.

The full sense of what is embraced in the term *organic mind* is given in our fifth chapter. We may here say that it is the intelligence within us that controls all the activities of which we remain unconscious.

It is impossible to say what length of time elapses after birth before a child becomes conscious of its own existence. No doubt the time varies with the innate mental possibilities in the child—just as the time varies before it can walk or talk. But a considerable time elapses before its conscious existence becomes what we may term a *permanent* part of its individual existance. Very few persons commence their *practical* individual existence until some years after birth, all that happens before a certain age is quite a blank to the future existence. We may have some faint recognition of a connection between ourselves of to-day and the child we were at three or four years of age in the form of a dim memory of a something that impressed itself upon our childish mind ; but on the average we may say that the first three years of our life are blotted out from our conscious individual existence. We see that perceptions have to be continually impressed upon the brain for about three years

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before we attain that permanence in consciousness that is our practical selves. This three years "apprenticeship" to perceptive influences in order to achieve a permanent consciousness is deeply suggestive.

All of human conscious mind is built upon or evolves from our five senses of perception. Simple perceptions give simple ideas; complex thoughts are built up from simple ideas. A geometrical problem involves form, magnitudes and direction in space; an astronomical problem involves movement, velocity of light, gravity, distances; and so on. Our perceptions furnish the data for the estimation of the value of all the elements in such problems; all the data available in all branches of science and learning are given to us by the experiences of our senses of perception. These experiences are constantly operating in the extension of knowledge, from the day we first attain conscious existence till we reach our maximum intellectual ability in mental maturity—a never ceasing influx of an infinity of sense impressions upon the retentive tablets of our brain cells.

31.—*Lack of perception involves lack of conscious mind.*

Within the personal knowledge of every person of average experience are instances showing actual curtailment of organic, and therefore of conscious, mind, through lack of one or more senses of perception. If a person is colour-blind, there is a lack of intelligence regarding colours. A person totally colour blind from birth could not be made to understand what was meant by *colour*; he would be quite mindless regarding colours.

The reader must fully appreciate the significance of such facts. To distinguish colours we must be able to perceive the differences in the vibrations of light that condition colours. And as there are an infinite number of vibrations below and above the range of vibrations that condition light, whose effects are unknown to man because he cannot perceive them, it is quite clear that there may be a great variety of modes of perception possible to other organisms, or even to abnormal man, of which normal man has neither knowledge nor possibility of conception.

32.—*An added perception largely increases intelligence.*

And only one added sense of perception would add vastly to the range of man's conscious intelligence—just as the addition of one to a number vastly increases possible permutations. The possible permutations in position of five different things number 120 ; add one more different thing and we get 720 permutations. Thus the curtailment or the increase of the number of modes of perceptions largely affect the possibilities of conscious mind.

This is made very evident to us by the great advances in knowledge that have followed the increased range of perceptions acquired by man by the use of instruments that enable us to perceive phenomena in nature that are imperceptible to us without their aid.

We can now *hear* the effects of vibrations that before were never perceived by human mind—as with the microphone and in wireless telegraphy—and *see* the effects of vibrations that were never before seen by human eye—as with the microscope, and in the photographic presentations of stars beyond the range of direct perception, even in the most powerful telescope.

But these, and all other means of adding to our knowledge, have value only by reason of our normal perceptive senses. *Such instruments could not have come into existence if man had not been able to see and hear.*

We know that it is possible for man to lack a normal sense of perception ; and is it not reasonable to suppose that some persons may have at times an added sense which gives them that which is termed an occult, or a "subliminal" perception ? The addition of one more mode or faculty of perception to the five we normally possess would add vastly—in some direction that we cannot anticipate—to the possibilities of knowledge. Does it not seem probable that under some temporary abnormal conditions of environment and circumstance man may for a time acquire an abnormal perceptive sense, giving results which, because of their incomprehensibility to normal persons, are deemed supernatural, or due to communication with spirits ?

There are persons who have *no head for figures* ; such

persons have a lack of mind of a higher type of intelligence than those who lack mind for colour. Perceptive functions in the aged often diminish in consequence of changes in cell structure to such an extent that they have scarcely more mind than a lower animal. In a child born deaf all phases of mind activity associated with sound are absent. No matter what amount of other knowledge the child may be able to acquire in later years, he can never have any conception of sound ; he cannot imagine what it is ; he possesses no mind regarding sound.

The difference in intellectual capacity between children born deaf and normal children, when compared before schooling commences, is very evident. It clearly shows how the lack of even one perceptive sense lessens the possibilities in the evolution of conscious mind. Schopenhauer, in his *Four Fold Root*, speaking of deaf mutes *before* they have been taught and acquired intelligence from others who possess their normal five senses, says : "they are almost as unreasonable as animals." Teachers of deaf mutes have assured us that this statement is true.

A child born blind, no matter how long it lives or what knowledge it may acquire, can never have any conception of what vision means ; it can never possess any *mind* regarding vision.

33.—*Mental condition of deaf and blind children. Helen Keller.*

Some are born both deaf and blind ; and only those who have attempted the task know the extreme difficulty of building up an average intelligence in such cases.

Think of the apparently hopeless task of trying to impart to one who lives always in absolute silence and absolute darkness—mindless regarding sound and vision—whose only connection with conscious existence is limited to the senses of touch, taste and smell, what is meant by such abstract ideas as faith, hope, courage, ambition !

Yet such work has been accomplished by an almost incredible patience and intuition on the part of the teacher. Tuition is comparatively easy, so long as it is confined to the tangible ; but when abstract conceptions are reached the

difficulties are very great indeed ; and nothing more clearly indicates that the highest faculties of mind are evolved from and are dependent upon the operations of the perceptive senses.

The reader must not overlook the fact that the cultivation of the mind in such deaf and blind children is only made possible by the aid of the senses of sight and hearing possessed by others ; and that without such aid their intelligence could never reach the level of even an intelligent dog.

Nothing that we could say would more clearly demonstrate the dependence of man's intelligence upon his perceptions than the following words by Helen Keller in her wonderful book, *The World I Live in* :

" Before my teacher came to me I did not know that I am. I lived in a world that was no world. I cannot hope to describe accurately that unconscious, yet conscious time of nothingness. I did not know that I knew aught, or that I lived, or acted, or desired. I had neither will nor intellect. . . . My inner life then was a blank without a past, present, or future, without hope or anticipation, without wonder, or joy, or faith."

Such would be the lifelong condition of all children born deaf and blind, did not the senses of sight and hearing possessed by others come to their aid.

If all human beings had been born with the two senses of sight and hearing absent, and by some means or other had managed to survive in the struggle for existence, the human race to-day would not have so much mind or intelligence as any one of the lower animals having its five senses of perception. The universe would have no existence to such a race of human beings. There would be no night or day ; no sun, moon, stars, or heavens above them. They would feel the alternations of warmth and cold, with alternations of day and night and changing seasons, but could have no conception regarding the causes of changing temperatures. There would be no language, no books, no science or arts, or industries ; no structures we could call buildings ; nothing whatever that pertains to what we call civilization could exist ; and the general condition of such a race of human beings would be much lower than that of brute animals

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having their five perceptive senses. The entire human race now existing would quickly fall to that inferior condition below the status of any animal that can see and hear, if from to-day all children were born deaf and blind.

All the facts in connection with the intelligence and the education of children having less than the normal five perceptive senses give us irrefutable evidence that perceptions are the functional units of mind, and that man's conscious mind and intelligence is built up from his perceptions.

A child born with all its five senses of perception absent could never have any conscious mind more than a tree or a cabbage ; we could not impart any knowledge to it, and it could only be kept alive by forced feeding. Even a newly born child with the structures of its five perceptive organs fully developed does not—as we have already pointed out—possess any conscious mind ; it does not know that it exists ; it cannot consciously either see, hear, feel, taste or smell.

34.—*Slow development of conscious mind.*

The first indication of a child's dawning consciousness is when we see it move its eyes to follow the changing positions of a light. It is only by continued repetitions of the stimulation of its organic perceptive senses by external impressions that the child slowly develops a consciousness of its ability to perceive anything. And how the fond mother watches this developing power of consciousness in her child ! How she exults in it ! Note the thrill of joy when she says : “ See ! he notices ! ”

But this infantile consciousness does not appear to be part of the mature consciousness of the adult. For if a child has its normal perceptive faculties up to two or three years of age and then by accident or disease loses the sense of sight or hearing, the effects of those early impressions upon conscious mind rapidly fade out, and all conceptions regarding the nature of light or of sound are as completely blotted out as if they had never existed. There is no mind left regarding sound or regarding vision.

The development of any permanent value of conscious mind from the experience of the five senses must therefore

be a comparatively slow process, and perceptions must be repeated again and again for a considerable time before they succeed in building up that *habit* of associated and sequential movements in the neurones of the brain that condition normal consciousness and the memory functions necessary to association of concepts. On an average we may say that three years elapse before sensory impressions or character of molecular movements in the cell centres of the cortex attains a permanence of habit that continues through adult life, and can be reproduced by organic mind as memory. The conscious mind mechanism in the growing child develops by being fed with perceptions ; much in the same way as its body develops by being fed with food.

35.—All concepts of subjective presentations have a basis in objective perceptions.

That perceptions are the functional units of mind is also indicated by the fact that we cannot form any mental concept or subjective presentation, either when awake or when dreaming in sleep, however weird, fantastic or physically impossible, but that every element in the structure of that concept is a something within the experience of our senses of perception. We may dream that pigs have wings and can fly ; that the sun is made of ice cream ; that a shark came along that turned into a cow that ate up the plough, or any kind of absurdity ; but we find that all the elements of such dreams are concepts within the experience of the human senses of perception. We have seen pigs, we have seen the sun, and ice cream, sharks, cows, and ploughs ; we have seen things flying. All the spirits, demons, or gods of savage or pagan imagination are but magnifications or contortions of animal or human attributes, all within the range of human perceptive senses. We may form a mental concept, or dream of a wheelbarrow constructed of potatoes, but we can form no mental concept, nor can we dream of a wheelbarrow constructed of time or space ; for by no one of our perceptive senses can we perceive either time or space. They are neither tangible, visible, nor audible ; we can neither taste nor smell them.

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36.—*Perception common to all things down to the atom.*

If our postulate that mind, matter and energy are inseparable be a truth, perception as a primary evidence of mind must in some form be common to all things. We should therefore be able to detect evidence of the activities of perceptions, not only in all animate things, but also in all forms and combinations of matter and energy down to the lowest fundamental trace of matter and energy possible for man to detect. The fact that we cannot conceive the nature of any other than our own five senses of perception lends itself easily to the erroneous tendency in popular thought to conclude that there are no other perceptions in nature from which we may reasonably deduce evidences of the presence and activity of mind. But our five senses, and all the knowledge we derive from them, are inadequate to furnish us any possible data or comprehension of the nature of any other possible modes of perception ; and it is really absurd to suppose that our five animal senses of perception are all the modes of perception that exist and are necessary in the vast, infinitely varied and complex operations of sub-organic and organic evolution.

This narrow view, born of ignorance, superstition and egotism, is flatly contradicted by a weight of evidence that cannot by reason be rejected or negatived. Movement, as we have before stated (16), cannot be separated from mind. There must be something to move—matter. There must be something to cause movement—energy ; and there must be something to determine the infinite variety and extent of purposive movement—mind. We find the primal evidence of the association of mind and movement in the phenomena of gravitation (26), for gravity is undoubtedly the immediate result of some mode of perception. And from this primal manifestation of mind we can trace mind upwards by means of its functional units—perceptions—in perfect continuity, right up to the highest intellectual development in man.

Man acquires a deeper knowledge of nature's activities, and goes forward in his achievements by the aid of perceptions that go beyond the range and powers of his own five senses. He has instruments that perceive and record movements that he cannot see and sounds that he cannot hear.

Photo electric cells and wireless valves have perceptions that go far beyond the capacity of our human senses of perception. The wonders of wireless communication have been achieved by the aid of such instruments.

Sir Oliver Lodge has pointed out that the eye is a receiving instrument that detects radio waves, and that it may be regarded as the living ancestor of the wireless valve. This is true enough ; but it is also true that by reason of modes of perception that go beyond the range of man's perceptions wireless mechanisms achieve results that are impossible to man's unaided physical structures. For, not only below and above the movements in the ether that are perceptible to man, but also between the lowest and the highest there are an infinite number of rates of vibration available to condition yet unknown phenomena.

Weight of evidence has forced man to accept as truths many things that are incomprehensible to human mind, and weight of evidence will yet drive home the truth that atoms have perceptions, and therefore mind. The full significance of Rutherford's statement (3) that the properties of the atom " must explain the properties of all more complicated structures " here comes home to us. For as atoms are unalterable in their properties, the properties of all more complex structures must be the balanced sum of the properties of all the atoms that enter into the structures.

37.—Physical movements and living movements must have some common basic relation.

We have seen that the same three elements combined in differing proportions give us differing perceptions (18) ; that these perceptions are reactions between the molecular movements of the compound and the molecular movements in the structures of elementary molecules that form the sensory organs of taste. These movements must have some relation in essential nature. Mutual actions must be equal. Yet in the chemical mutual action we term the action molecular movement ; in sense organ movement, which is essentially the same, we call it " perception "—an activity of organic mind.

We cannot of course explain *how* movement is thus trans-

muted into mind. We have already pointed out that all basic facts are incomprehensible (19). We only know that it is so ; just as we know that movement may be, and is, constantly being transmuted into electric energy, and electric energy into light in economic enterprises, although no man knows HOW such transmutations are effected—we only know the conditions under which they occur.

38.—*Perceptions of plants ; Marcus Hartog ; Sir I. T. Bose, F.R.S.*

Man and the higher animals possess very evident sense organs for the transmutation of movements into perceptions ; but as we go down in the scale of complexity in animate structures these distinctive organs gradually disappear, and we find living organisms that show most decided evidences of perception, yet have no organs of perception that can be discovered. So it is evident that a perceptive sense may be present in that which has no evident mechanism by which a perception may be functioned ; and that we cannot deny the evidence of a perceptive sense in anything whatever, simply because we are unable to understand how it does perceive without having some evident mechanism for the purpose.

Plants, as Marcus Hartog tells us :—

" are able to do many things that can only be accounted for by ascribing them to a ' psyche ' ; and these co-ordinated enough to satisfy their needs, and yet they possess no central organ comparable to the brain ; no highly specialised nervous system for intercommunication."

Plants have perceptions ; therefore plants have mind of a value proportionate to the range and intensity of their perceptions.

The delicate tips of the root of a plant will perceive and grow towards a patch of greater nourishment in the soil some distance away. The purposive movements of these tips of plant roots is so evident that some observers have called them the " brains " of the plant. The tendrils of a vine will perceive and grow towards a projection that will furnish it the support it desires. The leaf of a carnivorous

plant perceives the insect that rests upon it, folds up, encloses and digests the insect. If we touch ever so lightly a leaf of the sensitive plant, the plant perceives the touch, and immediately folds up all the leaves on the branch touched. Some flowers evidence their perception of light by closing when darkness comes and opening in the morning ; some evidence their perception of sunlight by turning their heads so as to follow the direction of the sun. Evidences of perception in plants that have been observed and commented upon by the many observers who have investigated the activities of plant life are sufficient to fill a large volume ; and we may rest assured by the weight of incontrovertible evidence that plants have perceptions, less complex certainly, but of the same essential nature as those possessed by animals and man. The movement of a root towards a patch of nourishment and its absorption for the good of the tree organism is a humble but exact parallel to the reaching out of a hand for food and its ingestion for the good of the human organism.

Sir I. T. Bose, F.R.S., in his *Life Movements in Plants* tells us how, by means of his "crescograph," which magnifies a minute movement ten million times, he has demonstrated a wonderfully close analogy between the response of plants and animals to their perceptions. With his instrument he has shown that all plants are sensitive plants ; only different in degree of irritability from that commonly so named ; that they respond to the slightest change in light, heat and other physical influences ; that they have a nervous impulse travelling with a finite velocity, which can be influenced by anaesthetics and poisons, and which gives a prompt response to rough treatment or wounds. A piece of cabbage on being scalded to death is thrown into violent convulsions ; and, in Bose's own words, "the ludicrously unsteady character of the response of the plant under alcohol could be effectively exploited in a temperance lecture." He has also demonstrated that plants have in one direction an intelligence not possessed by animals or man ; they perceive and respond to "wireless" waves, which, so far as is known, have no effect upon animals or man.

39.—*Perceptions of atoms and molecules.*

When we get down to the sub-organic or sub-animate position in the continuous cycles of evolution (126), we are still surrounded by evidences of perception, and consequent evidences of mind. If we drop a piece of silver into some nitric acid—a compound of hydrogen, oxygen and nitrogen—the oxygen and nitrogen perceive the silver, and immediately proceed to release the hydrogen and embrace the silver ; the nitric acid thus being transformed into nitrate of silver.

The affinities and repulsions between elementary molecules are analogous to the affinities and repulsions in living beings. They are initiated by the same basic influences—perceptions—and are simply less complex functions than those which occur in such a complex structure as man.

If we dissolve some silver nitrate and some sodium chloride together in water the silver nitrate couple are divorced and become—say :

Mr. Silver and Mrs. Nitrogen.

The sodium chloride couple are divorced and become
Mr. Sodium and Mrs. Chlorine.

Then Mr. Silver marries Mrs. Chlorine
and Mr. Sodium marries Mrs. Nitrogen, and
we then have Silver Chloride and Sodium Nitride—
a mutual divorce and a mutual re-marriage with changed
partners.

We may very reasonably conclude that the cumulative effect of the molecular differences in the sexes conditions the powerful influence of sex (149).

This kind of perceptive movement for an evidently definite purpose occurs in every chemical action. The properties of atoms and molecules that in chemistry are termed "affinities" are really expressions of perceptions.

Why elements will leave each other and unite with other elements can only be explained on the basis of some operations of perceptions inconceivable to man. "Affinity" and "attraction" in chemistry are terms that merely indicate the phenomena—they do not explain.

The molecules of a salt in solution must have some perception of the nature of their surroundings as they arrange themselves in the exact positions necessary to form a crystal,

with its structure symmetrically arranged about a common axis.

An infinite number of similar phenomena could be cited from lowly sub-organic activities that are essentially evolved in the same manner as activities in the animate—perceptions of surrounding conditions denoting intelligence, and purposeful movements to meet those conditions. And these movements cannot be reasonably accounted for, other than by concluding that the perceptions that condition them are dim and faint expressions of primal mind that operate in all sub-organic movement ; its operations becoming of necessity more complex in the rising scale of structural complexity, till it reaches its maximum in the conscious mind of man, by the media of the most complex structure that nature has achieved—the human brain.

40.—Molecules and animals behaving alike under similar conditions : Max Verworn.

If, under the same conditions of environment, we see that a living animal and a material molecule perceive the same influence and act in the same manner as a consequence of that perception, we have sufficient reason to conclude that the animal and the molecule, having perceptions in common, must also have some basic phase of mind in common.

Max Verworn has shown that many of the protozoa—the lowest forms of animal life—are very sensitive to electric currents and to temperature. In his work on *Irritability* he says :

" When I place a drop of Paramecium culture on a slide and allow a constant current of about two milliamperes to flow through, it will be seen that the infusoria at room temperature will move toward the negative pole at a rate averaging 1—1.4 millimetre per second. If I increase the temperature, the movement is increased."

If, through a drop of water in which are a number of the ciliata Paramecium and the flagellata Polytoma swimming about in all directions, we send a weak electric current, and watch the effect under the microscope, we see the micro-organisms immediately alter the direction of their movement and swim in an orderly manner in opposite directions ;

the ciliata to the positive pole, and the flagellata to the negative pole, and they cluster about the poles like a crowd about a theatre waiting for the door to open. If we reverse the current, both crowds immediately leave their positions, turn about, swim in the opposite direction, pass each other in the centre and attach themselves to the other pole.

Here we have a mode of perception that is beyond the range of our five senses, giving to some of the most lowly of animate creatures an intelligence of a nature impossible to man. For no person swimming in a vessel of water could detect any direction in a current of electricity sent through it or perceive any difference in negative and positive poles.

In solutions of sub-organic salts the sub-animate molecules are moving about in all directions, just as the ciliata and the flagellata were in the drop of water before the electric current was sent through it. If we send a current of electricity through the solution, the molecules of the sub-organic salts separate and move in an orderly manner ; one kind of molecule to one pole, another kind to the opposite pole. And we reverse this movement by reversing the direction of the electric current, just as with the ciliata and the flagellata. This reversal of movement is the basic fact in the action of electric energy accumulators, which are so largely used for various purposes.

In an electrolytic solution of common salt, which is structured of an equal number of the atoms of sodium and chlorine, the ions of sodium will move to the negative pole and the ions of chlorine to the positive pole. Thus the material atoms of sodium behave exactly as do the living ciliata ; and the material atoms of chlorine behave exactly as do the living flagellata under exactly similar conditions. All are freely moving in water ; an electric current is sent through it, all perceive the negative or the positive of the current and its direction, and all exhibit purposive movement by immediately moving definitely to one of the two poles.

We cannot deny that the living micro-organisms, in some manner incomprehensible to us, must perceive the difference between the negative and positive phases of the electric current and the exact direction from which they impinge

upon their environment. And admitting this as evidence of perception in the organisms, it would be unreasonable to deny perception to the molecules of matter, seeing that we have exactly the same evidence of perception in both cases. Both *behave* in exactly the same way, and psychologists tell us that we can only define mind in terms of behaviour (41).

41.—*Wm. McDougall; definition of mind; billiard ball and guinea-pig.*

Professor W. McDougall, in his work, *Psychology* (Williams & Norgate, London, 1918), p. 31, says :

" No one can point to a mind and say : ' That is what I mean the word mind shall denote.' And, if it is proposed to define mind in terms of consciousness, we are in no better case, but rather worse. For each of us, the consciousness of any other organism than himself is an inference ; and it is one which is more speculative and uncertain, the greater the unlikeness of the other organism to himself.

" Further, there is abundant evidence that the behaviour of each of us expresses activities of a nature essentially similar to our conscious activities, of which we nevertheless remain unconscious. If, then, we cannot be content to define mind in terms of consciousness, the only alternative is to define it in terms of behaviour."

This is precisely the view we take. We do not define mind in terms of consciousness, simply because it is impossible to do so. Mind extends infinitely beyond the range of man's consciousness ; consciousness extends infinitely beyond the range of man's comprehension. It is impossible to define mind *per se*, even as it is impossible to define matter or energy. What we can define with more or less success are the conditions that evidence expressions of mind ; these conditions we find in behaviour—every manifestation of a perception exhibits itself as behaviour. We cannot define the nature of a perception but we can recognise evidences of its operation. If you are out hunting with a dog, and are watching that dog, you know when he *perceives* game ; you can determine the act of perception by the dog's " behaviour." If one watches a hen with chickens, and is too far

away to hear her clucking, one can determine the instant the chicks perceive the mother's call by their " behaviour." Outside of our personal perceptions we can only determine perceptions in other people or things by their " behaviour."

The " behaviour " of man and animals upon which McDougall attempts to base his definition of mind are purposive activities that must arise from, and are based upon, perceptions. For nothing can have a purpose and act in a definite manner to achieve that purpose unless it perceives it.

On page 20 McDougall compares the mechanical movement of a billiard ball with the movements of a guinea-pig when taken from its nest and placed upon a grass plot, as clearly indicating a basic difference between " mechanical " process and behaviour. But such a comparison is not by any means a fair one ; for it is difficult to perceive that two presentations are of the same essential nature, when they are far apart on the line that connects the highest with the lowest manifestation of any one of the three ultimate factors (43). The point of nearest approach to each other of apparently different things is the place for investigation and comparison ; for it is there that we may with most certainty detect any evidence that the apparently dissimilar may be essentially the same.

The mechanical movements of the molecules of a chemical salt as they arrange themselves to form a crystal is a form of movement coming much closer to living movement than the movement of a billiard ball. The movements of the ions in an electrolytic solution come nearer still ; but we will deal with McDougall's comparison as it stands.

He tells us that if we take a billiard ball out of the pocket and place it upon the table " it remains at rest " ; and would continue to remain so for an indefinitely long time if no force were applied to it. Push it in any direction, and its movement in that direction persists only until the momentum is exhausted.

The guinea-pig when placed on the green plot will try to get back to its nest ; if you push it in any other direction with your hand it will resume its direction towards its nest.

But he has omitted some important factors in his com-

parison ; and he has made some misstatements that make his deductions unreliable. In the first place, the billiard ball when placed on the table is not "at rest" ; although it appears motionless, it is only *relatively* at rest. We know of nothing in the universe that is at rest ; everything is perpetually moving, and movement involves activities of energy. The ball when apparently at rest upon the table is unceasingly pushing with an energy proportionate to its unceasing effort to go in the direction in which it is pushing. If the energy of gravity ceased all things not attached securely enough to the earth's surface would float away into space—there would be no activity of the energy attaching them to it, and the billiard ball therefore would leave the earth at a tangent and float away into space.

If the billiard ball is to be considered at rest because it does not move in relation to the table that supports it, then anything that does not move in relation to that which supports it may be said to be at rest. If McDougall takes any considerable weight—say a 56lb. dumb-bell—in each hand, lifts them up and holds them motionless in his hands, those dumb-bells should be at rest. But he will soon find they are exerting such an energy to reach the earth that his living energies can no longer support them, and he is obliged to drop them—let them have their own way. Every instant of time man or any other animate being is exerting energy to balance the energy of gravity. We lie down when we are tired in order to lessen local intensity of opposing energy—by distributing it over a larger area.

McDougall tells us that "The manifestation of a purpose or the striving to achieve an end is the mark of behaviour—and behaviour is the characteristic of living things." The billiard ball strives to achieve its end by pressing constantly upon the billiard table, even when apparently at rest. The amount of this pressure is the sum of the efforts of the earth and the ball to approach each other closer than contact will admit : it is the manifestation of a purpose and the striving to achieve an end. Thus, according to McDougall's own definition of behaviour, the billiard ball acts as a living thing !

If the table below the billiard ball was removed, and a

sufficient depth cleared of obstructions, the ball would travel about 4,000 miles to get to its "nest"; and, like the guinea-pig, if you kept repeatedly stopping it, it would continue its journey towards its objective when the obstruction was removed. If you stopped the ball after travelling some distance and did not remove the obstruction for twelve hours, it would, when the obstruction was removed, travel in a directly opposite direction in space! For the relative positions of the ball and the "nest" have in those twelve hours been reversed—there is no "up" or "down" in the universe. How could the ball have knowledge of this reversed direction and act upon that knowledge by changing its course and moving in an opposite direction unless—in some manner incomprehensible to us—it perceived that reversal in direction?

Both guinea-pig and ball perceive a something in a certain direction; both strive to get there, and both will get there if no obstruction prevents them. Both "behave" in the same way; both evidence an activity due to the same basic cause—an activity due to perception.

42.—The gyroscope; Andrew Grey.

When we study the movements of the gyroscope we are faced with phenomena that offer no other possible explanation of their immediate nature than that mind and movement are inseparable in their presentations; and that the perpetually changing movement of everything in the universe is but the expression of the perpetually changing perceptions of universal mind.

When this mysterious machine is relatively at rest it does not exhibit any perception as a whole other than that for mass, and it presses upon that which supports it with an energy that is proportionate to its mass. But if we cause it to revolve rapidly it instantly acquires a perception for direction in space.

If we give the rim a push out of its plane of rotation, it comes back to that plane. If we have pushed to the right, it comes back to the left; if we have pushed to the left, it comes back to the right. It perceives the direction of its

plane of rotation, and comes back to it after being temporarily diverted by a force external to itself.

If, by any means of applying energy in order to keep the gyroscope rapidly revolving for a length of time, yet leaving it perfectly free, so that its plane of rotation may take any direction in space, in no matter what direction its plane of rotation may be when we start it revolving, its axis will slowly change its direction till it becomes parallel with the earth's axis and its direction of rotation coincides with the direction of the earth's rotation !

To achieve this result it is necessary that one particular end or pole of the axis of the gyroscope shall point to a given celestial pole. If the other pole of the gyroscope pointed to that celestial pole, the rotation of the gyroscope would be in the *reverse direction* to that of the earth.

So that by imparting energy of motion to a few pieces of metal the "mere mechanical" movement of them evolves three modes of perception that are expressed in three modes of "behaviour" that go beyond the range of the capacities of a guinea-pig and even exceed the powers of man's conscious mind.

1st—perception of direction in space.

2nd— „ „ „ the direction of the earth's rotation.

3rd— „ „ „ the direction of the earth's axis.

It is true that mathematicians have co-ordinated these gyroscopic perceptions and behaviour with mathematical formulas, but, like the mathematics of gravitation, they throw no light upon the essential nature of the phenomena.

Prof. Andrew Grey in his work on "Gyrostatics," says :

" If an electrically driven gyrostat, with its axis vertical or nearly so, is mounted on a portable frame and carried round in azimuth in the direction of the spin, nothing happens. If, however, it be carried round the other way, the gyrostat immediately turns upside down on its trunnions ; and then it is turning the same way that it is being carried. If the bearer turns about again, and walks the other way, the gyrostat responds by jumping over again so as to turn the other way. The gyrostat *behaves* as if it possessed volition—a very decided will of its own. It cannot bear to be carried around in the direction con-

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trary to its rotation, and accommodates itself to circumstances by turning upside down, so that the two turning motions are made to agree in direction."

The " behaviour " of the gyrostat proves that a machine may have perceptions, and consequent mind. It appears that we must accept universal mind as a fact, however incomprehensible and strange it may seem to us at present.

43.—*Extremes of the continuous.*

The difficulty in the way of grasping the truth that the so-called " affinities " of the molecules of the elements are perceptions, or feeble expressions of the same basic factor—mind—that conditions human intelligence is but the difficulty we experience in many directions when we compare the extremes of that which reason tells us must be of the same essential nature.

Any one of the ultimate factors in the inseparable trinity that conditions all existences may reach such values in opposite direction—high and low—that we can scarcely grasp the conception that they are really the same thing. The movement of rain water running down the gutter, or the trivial falling of leaves to the ground, are caused by the same intelligence that guides the sublime and orderly movements of all the systems, stars and worlds in the unfathomable depths of space. All result from the energy of gravitation—that primal and most simple manifestation of mind, perception for mass only.

The most fiery heat of furnace or of glowing star is quite the same essential thing as the heat in an iceberg! Reckoning from absolute zero, ice at freezing point has 270° Cent. of heat. A kettle containing liquid carbonic acid will *boil* when placed upon a block of ice, exactly as a kettle of water will boil when set upon a hot stove. The ice is so much hotter than the acid.

The structural energies in that which living beings ingest or absorb as food, in order that they may transform it into the energies of mind, which expresses itself in living movements, are phases of physical energy that are absolutely continuous, from the most intense energy of the stars in

space to a faintness that is below the direct perception of our senses, long before it reaches down to the theoretic absolute zero—an absence of energy that has never yet been attained by any genius in experimental science.

The extremely feeble, harmless, and easily controlled energy that causes the delicate leaves of an electroscope to diverge is essentially the same as the terrific lightning flash that tears to pieces a large tree and scatters its fragments in all directions, or brings sudden death to any living thing it strikes.

The energy acting within a large gun, causing it to throw a projectile weighing half-a-ton for ten or twenty miles; the energy that has caused so many earthquake catastrophes and volcanic devastations, is essentially the same as that which conditions the nutrition of our bodies—the energy of chemical mutual actions.

And so it is practically with all the extremes of inter-action between the three basic factors—mind, matter and energy.

It is difficult to conceive that the activities of two atoms of iron functioning with three atoms of oxygen in the production of iron rust are phenomena of mind activity essentially the same as that which is necessary to the living activities of organic mind in our red blood cells; or that the molecular activity in any chemical reaction is essentially the same as the molecular activity necessary to the evolution of a thought.

A drop of water and the mighty oceans of the earth. What a difference! But they are the same thing—just water. The mind of an atom and the mind of a Shakespeare. What a difference! But they are the same thing--just mind.

Enough drops of water, and you have the potentials of an ocean. Enough of the little minds of atoms, and the larger minds of the many millions of differing molecules and aggregates of molecules into which the atoms may be structured, and you may have the potentials of a Shakespeare.

There is no greater gulf between the expression of a minimum and a maximum of mind energy than there is between the expression of a minimum and a maximum of heat or of electric energy. And this could have been deduced *a priori* from the fact that mind is a mode of energy (73).

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The highest and lowest expressions of mind are no further apart than a half grain of a monatomic element and the half grain of radium bromide that will keep Strutt's radium "clock" in unceasing movement for more than two thousand years (138).

A radio-active element may be regarded as a genius from the view point of atomic intelligence ; and, like genius usually in man, it runs in a groove from which we cannot move it. The monatomic elements are the "stupids." Further on we shall see that the elements that enter into animate structures are the most *versatile* and *energetic* of the elements.

CHAPTER III

MUTUAL ACTION

I

44.—All movements in nature are mutual actions ; Verworn ; Hume.

Throughout all nature mutual actions are perpetually at work evolving those successive changes which are recognised as action and reaction and cause and effect.

But we cannot grasp a true conception of the conditions leading up to the development of immediate mind in nature unless we discard the idea of the sequence in time implied in the statement of those two terms. The idea of a time interval between "action and reaction" and "cause and effect" leads us astray in regard to the *immediate* nature of all phenomena.

For all movements in nature are mutual actions ; equal, simultaneous and continuous, although they occupy time. It is the continuity of mutual action which gives us sequence in time ; gravitation is simultaneous and continuous mutual action. There are really no such phenomena in nature as action and reaction, or cause and effect, in the sense that "action" or "cause" is one phase of movement, and "reaction" or "effect" another phase of the same movement.

If at any instant of time all movements are reactions which may be said to have followed actions ; yet, at the very same instant all movements in nature may be said to be actions which will cause subsequent reactions, what can be "action" and what "reaction" ? At the same instant of time all movement is both of them ! How can we rationally differentiate between the two, as if one was "cause" and the other "effect" ?

This difficulty in dealing with action and reaction becomes very evident when we attempt to reach the immediate nature

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of biologic movements. Max Verworn met it in his investigations (40), and remarks :—

"The interpretation of the unity of being and happenings in accordance with natural law, which is widely accepted in the scientific world as the only exact one, implies the assumption of a "causation" according to which things are explained by the law of cause and effect. I have already on various occasions taken the opportunity to criticise this view and to show the error and confusion to which it leads."

Hume drew attention to the fact that

"No copula had yet been detected *between cause and effect* in physics or in thought."

We find it of some assistance to fill the gap by "mutual action," although just what occurs in mutual action is probably for ever beyond human comprehension. No movement, process, or any kind of phenomenon is possible to any one factor alone ; every presentation in nature must be due to mutual action between two or more differing things or states of existence.

45.—*Error in considering mind and body apart.*

The misleading conceptions that arise from the idea that there are "actions" and "reactions" combined with the misconception of soul and body or mind and body as separate existences have led to an intricate tangle of futile controversy and theories ; and we have a redundancy of ponderous terms that ought never to have come into existence. What with animism, materialism, automatism, realistic monism, psychical monism, and other *isms* which we cannot for the moment remember, the problem of the relations between mind and body has got into such a hopeless tangle of theories and words that it becomes quite evident there is basic error somewhere.

There is error in the very expression—"the relations between mind and body," for it implies that mind is one thing and body another ; and this implication leads to further error.

Each individual living thing is *one* ; not two. Like every other presentation in nature, a "living thing" is an ever

varying expression of the ceaseless mutual actions between the inseparable factors we represent by the arbitrary symbols—mind, matter and energy. Man has no mind that is distinct from body or from energy ; nor has he any body that is distinct from mind and energy. Every smallest particle of every living thing is inviolably associated with mind and with energy. And all the phenomena possible to it as a living unit, are expressed by the ever-changing mutual relations between mind, matter and energy.

The mutual actions of the immediate complex molecules that structure the brain neurones with the immediate complex molecules in the nutrient fluids surrounding them give us the "motor origin" of a thought (3). The perpetually changing nutrient molecules in processes of anabolism and katabolism give us our unceasing activities of mind and body.

The attempt of psychologists to arrive at a deeper knowledge of the immediate nature of mind by considering mind as apart from body in so definite a manner as is implied by the mere title of such books as *The Effect of the Mind upon the Body* must lead to more or less confusion. For the mind cannot act upon the body unless the body acts equally upon the mind. There cannot be other than simultaneous, equal, and mutual action, either mechanically, physiologically or psychologically.

46.—*Action and reaction ; Newton ; cause and effect.*

If we strike a billiard ball that is at rest, relatively to the table which supports it, the movement of the cue which strikes the ball is supposed to be the "action" and the resulting movement of the ball the "re-action," and we certainly perceive a sequence in these events. But what is considered the "action" in this case—the movement of the cue—is a reaction from the movement of the arm, so that the action of the cue is both reaction and action.

The ball that is struck cannot move without instantly causing reaction in the air through which it passes, in the material upon which it moves, and the cushions or anything else it may strike ; thus the reaction of the ball simultaneously becomes an action.

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The action of the arm which moves the cue is a reaction from the nutrient elements that animate the arm—and so on continuously till we reach the first cause, of which we know nothing.

Thus, as every action is also a reaction, and every reaction is also an action, we cannot rationally differentiate movement into two such differing phases with a sense of time interval between them. Sequence in time is evident in the continuity of mutual action.

The expression "action and reaction" is therefore mischievously misleading, and should be discarded.

If we put some salt into a glass of water, mutual, equal and simultaneous actions at once commence; and if the water is not stirred, this mutual action continues for a long time, but is nevertheless constantly simultaneous and equal.

And what is "cause" and what is "effect"—or what is "action" or what is "reaction" in the result? Is the salt the cause, or the action, that evolves as a result the salty water; or is water the cause, or the action, that evolves as a result the watery salt?

There are unending sequences to all mutual actions. The infinite variety of mutual actions which condition all existing phenomena at the present moment are continuous sequences from mutual actions which extend back to all preceding phenomena; and they must be continuous with and constitute the cause of the unending sequences of mutual actions which will condition all future phenomena. The instant salt and water enter into mutual action with each other there is a simultaneous alteration in the temperature of the resulting salty water—it becomes colder. Then there is mutual action between molecules of water which differ in temperature; between the colder water and the glass which contains it; and between the whole and the warmer air which surrounds them. And so on till we reach effects which are untraceable but still continuous.

When we light a candle, mutual action, equal, simultaneous and continuous, takes place between the material of the candle and oxygen in the air, evolving heat and light. This continues till the candle is consumed. But though the mutual action between the candle and oxygen is finished

other mutual action continuous with it is traversing space, associated with radiation of light. For all mutual action is an expression of energy; energy cannot be destroyed; whatever amount of energy is represented in mutual action, it must continue indefinitely in succeeding mutual actions. The sum of that which constitutes the universe must remain constant.

The third law of motion as formulated by Newton states that :—

"To every action there is always an equal and contrary reaction; or, the mutual actions of any two bodies are always equal and oppositely directed."

The two different ways of stating this law are given as alternative ways of saying the same thing, but serious objections to both may be perceived by the reader. For instance, we know of no such thing in nature as "action" *per se*; there is nothing but mutual action. All mutual action is not only equal, it is simultaneous and continuous also. But "oppositely directed," goes beyond our knowledge and beyond the necessities of the statement as a universal law. This applies also to "contrary reaction." For in all mutual actions heat movements are factors, and we cannot say that the movements of heat are oppositely directed or are "contrary reactions." Any universal law of motion must apply to any form of movement in nature; for all movements arise from interactions between the same three basic factors—mind, matter and energy. Even in mere mechanical movements there are transmutations of the factors which we cannot conceive as either "contrary" or "opposite."

If all action had an equal and "*contrary*" reaction, or if all mutual action was "*oppositely directed*," all movement in the universe would instantly cease. For all forces would be equal and opposing each other; nothing could happen—all would be motionless because all would be balanced.

In no chemical movement can we differentiate between action and reaction, although the terms "chemical action" and "reaction" are universally in use. When two elements unite chemically there can only be mutual, equal and simultaneous action between them. The chemist will

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speak of the "action" of an acid upon a metal, but it is equally an action of the metal upon the acid. He speaks of the movement caused when acids and alkalies come into contact as a "reaction"; but it is the mutual, equal and simultaneous action between the two substances; also the simultaneous formation of a neutral salt. The third law of motion does not cover the important fact that no mutual action can occur without the simultaneous evolution of other and differing presentations. These other presentations *then* instantly enter into other mutual actions with their environment, and so on continuously. Thus mutual action is eternally continuous.

In physics, to separate movements into parts such as "action"—with a sense of cause; and "reaction"—with a sense of effect—is misleading and untrue to nature. If we simultaneously strike two notes upon a piano with a given interval apart we produce a harmony in sound, but we cannot reasonably say that one of those two notes represents the "action" and the other note the "reaction," in the mutual and simultaneous equal action that the two differing air movements exert upon each other in the production of the harmonious effect. The same reasoning applies to all movements in nature, whether they be movements of planets or the movements that condition a thought.

No one thing *per se* can be the cause or the effect in any phenomena. Two things at least there must be in the mutual action which evolves the presentation of any phenomenon; and two or more things are evolved in every such presentation. Thus, oxygen and hydrogen are both essential in the mutual action which evolves water. But water alone is not evolved; there is also considerable energy in the form of heat. The mutual action between the two gases; the evolution of water; and the evolution of heat are simultaneous phenomena. But mutual action does not cease. The instant water is evolved it enters into mutual action with the surrounding air and evolves water vapour; the heat instantly enters into mutual action with its environment, and so on unceasingly. Mutual actions must be equal, and must be continuous for they are manifestations of energy, and energy can neither be created nor destroyed.

Equal and continuous mutual action is a fundamental necessity to the stability of the universe.

Mutual action proceeds with infinitely varying degrees of energy, from the mutual action between the elements of an explosive mixture to the imperceptible mutual action between the atmosphere and the hardest rocks. But whether intensely energetic or imperceptibly feeble, the mutual action must of necessity be always equal and simultaneous. The mutual molecular actions in living things, which never cease whilst life continues, evolve the continuous and sequential activities which characterise living things. The mutual actions between the elements of a voltaic cell evolve the continuous movement of the electric current. The order of nature proceeds in cycles of mutual action. Each one of the host of animate beings that live and die, every thought and feeling, each rise and set of the sun, the movements of celestial bodies, are presentations of the eternally continuous cycles of mutual action, which are at once both the cause and effect of all phenomena, and make possible the eternal and perpetually animate universe.

It should now appear clear to the reader that the expression "mutual action" has a wider and different sense than can be attached to the terms "action and reaction." It conveys a conception of the unceasing movements in nature, whereby at every instant of time every effect is a "cause"; every cause an effect in perpetual continuity. And it seems desirable that the third law of motion, in order to make it truly universal, should not go beyond the statement that:—

"All movement in nature is mutual action, equal, simultaneous and continuous."

Every one of the infinite number of modes of perception (*36 et seq.*) in animate and sub-animate nature must initiate some mutual action that is always equal to the energy of movement in the bodies engaged in that mutual action. But we cannot say they are "oppositely directed" or "contrary"; we cannot grasp the sense of those terms as applied to movements of energy which radiate equally in all directions.

When the chemist adds a drop of something he calls a

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"re-agent" into some liquid in a test tube and sees—as a consequence of the "affinities" or "perceptions" of the elements—a colour develop, or a precipitate fall down, he is looking upon the effect of a mutual action, equal and simultaneous, between some molecules in the liquid in the test tube and the molecules in the drop he has added to the liquid. It is quite immaterial whether we term the effect of the "drop" the "action" or the "reaction," for it is impossible for us to differentiate between the actions of the molecules of the drop upon the molecules in the liquid, and the actions of the molecules in the liquid upon the molecules in the drop. All that we know, and probably all that can ever be known about it, is that the actions are mutual and equal. Expressing this mutual action in two different terms leads students to think that we possess a knowledge which enables us to determine, in mutual action, two different kinds of movement. This is utterly wrong and mischievous.

47.—*No mutual action possible without difference in movement.*

No mutual action between two bodies can occur unless there is difference of movement in those bodies. It is this very difference that makes mutual action possible, and we have in many cases to determine such difference. But this is only approximately, because we have to admit into our calculations the subtle effects of perpetual mutual action that all things are subject to. The constant mutual action between all things and heat energy, for instance, necessitates a given temperature being stated in the measurement of gases; in the measurement of distance between two points by metallic tapes and rods—for their lengths are constantly changing with changing temperatures; and in the estimation of energy movements in chemistry; and in other instances where accuracy in results is essential. There must be difference in movement, or there can be no function of mind, no sense (16). If on the open ocean we are travelling on a swiftly moving steamer and we look at the line of horizon ahead, we cannot perceive that the ship is moving by any data furnished by that line. It gives us no *sense* of movement, because it moves ahead exactly as fast as we are moving towards it—we never get any nearer to it.

If we strike a note upon a piano, we get a simple sound ; if we strike another note—its third—we get another sound which differs from the first. If we strike the two notes at the same time, the simultaneous mutual action between the two *differing* sounds evolves harmony ; but it is quite evident that these two differing sounds are equally necessary to the production of the harmony. If we strike yet another note—a fifth—at the same time that we strike the other two, we get a fuller and more complex harmony from the more complex mutual actions that are evolved by union of the three *differing* air movements. This is very illuminative of the fundamental fact in nature, that complexity in function is the invariable result of complexity in structure.

48.—*Laws of physical function must apply to animate function.*

As all movements in nature arise automatically from mutual actions between the same three basic factors, there must be analogy between all kinds of movement ; and if we arbitrarily divide them into two classes—mechanical and molecular—then we may say that mutual actions between suitably differing air movements evolve harmonious movements ; mutual actions between suitably differing molecular movements evolve harmonious animate movements. If differing air movements are incompatible, their mutual actions evolve discord distressing to the ear. If differing molecular movements are incompatible, their mutual actions evolve unpleasant effects upon animate movements—we feel discomfort or pain.

All the varying mutual actions in the evolution of harmony are simultaneous, and each separate movement is equally essential to the effect produced. The same reasoning applies to the mutual actions between sound waves and the mechanism of the ear. We may say that sound is evolved by the action of air waves upon the molecular movements in the structure of the ear ; and we might with equal truth reverse the statement and say that sound is evolved by the action of the molecular movements in the structure of the ear upon air waves. But to express the phenomena as rationally as possible we must say that sound is evolved by the mutual actions between the two differing movements (37, 55). And

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this is where such reasoning leads us. It leads us to see that any physical laws applicable to air waves must be equally applicable to the mind function by which we appreciate sound, and that mind must be a physical energy. For no physical law can have any relation whatever to anything that is supposed to be metaphysical.

And so it is with the evolution of all presentations in nature. Every presentation evolves from mutual actions ; and for every presentation each differing movement that conditions its evolution is as necessary as any other.

In animate things every movement must be some form of animate movement. And every substance that is necessary in the structure of animate beings must have animate movements or properties that are essential to life ; and therefore water—for instance—must have animate properties, for about three-fourths of the substance of all living things is water. All things that live will die if water is withheld from them. How, then, can we *say that water is inanimate?* (64)

49.—*Misleading terms.*

Students get almost ineradicable erroneous ideas through the use of terms in generalisation that are misleading. One day, while talking to an undergraduate, we somehow got upon the subject of chemistry. In answer to a statement of ours this young man asserted that all substances containing carbon were " organic " ; and that it was well known that organic chemistry was the chemistry of the carbon compounds. In vain we pointed out to him that the division between organic and inorganic was purely arbitrary, and that some compounds containing carbon could not possibly be organic—in the sense in which that word should be applied. He had been taught that organic chemistry was the chemistry of the carbon compounds, and he accepted this statement as true, whereas it is only approximately true. For there are a host of compounds containing carbon which are most certainly not organic, in the sense that should be accorded to that word. Whether he missed any qualifying statements made by his teacher or whether the teacher omitted to make any such statements does not alter the

fact that the student had firmly acquired an erroneous conception.

And so it is with the expression "action and reaction"; it creates in the student's mind a conception of activities that are not represented in nature. All action is mutual and simultaneous, and cannot be differentiated into "action and reaction," with which sequence in time is consciously or unconsciously associated.

50.—Incomprehensible movements; two things in mutual action evolve a something else.

The statement by Hobbes (16) "that if everything was in the same state of motion, or, if nothing whatever moved, there could be no distinction between anything, consequently no sense," is a profound truth.

Expressing this truth in other words, we say that mind is conditioned by mutual actions between different movements.

It is, of course, incomprehensible to human beings how differences in movement evolve mind energy—just as it is incomprehensible to us how different movements evolve electric energy, how the mutual action between the gases hydrogen and nitrogen evolves the pungent suffocating gas ammonia, and the gases hydrogen and oxygen evolve water—and so on. We can only know that these things are so.

The reader can form no conception whatever as to *how* he sees these lines. He may grasp the conception that vision is conditioned by mutual actions between the retina and vibrations of light; but how this mutual action becomes consciousness of what he sees, becomes, in fact, an operation of mind, is quite another matter. Man does not know *how* he is conscious; he does not know *how* he thinks. It is not necessary that we should be able to understand how a presentation comes into existence before we are justified in accepting it as a truth.

51.—Isomerism; polymerism; allotropy.

We have drawn attention to the fact that the same elements, when chemically united, form differing substances, having differing modes of motion (18); and that these differing modes of motion when in mutual action with the taste

buds upon the tongue, evolve a decidedly differing perception of taste—a function of mind.

The phenomena of isomerism, polymerism and allotropy in chemistry, which furnish most conclusive evidence that the immediate nature of the differing properties of all differing substances are simply due to modes of motion that vary in range, pattern or intensity, demonstrate that the infinitely varied mutual actions which condition all changes in the perpetual cycles of evolution and devolution are due to the differing modes of motion in the substances mutually engaged. The properties of a substance may therefore be interpreted as the specific modes of motion in that substance ; and the *properties* of any particular atom may be regarded as the specific modes of motion of the electrons within that atom.

In isomerism we find that the same number of molecules of the same elements evolve differing substances having differing properties ; the atoms uniting with each other in different ways forming differing molecules ; and the mutual actions between these differing molecules evolve differing substances.

There are a large number of isomeric compounds that are structurally identical yet have different physical properties. This can only be explained by a difference in the arrangement of their atoms in space, which, as a consequence, must give that difference in *movement* which conditions the difference in their physical properties. The same reasoning applies to polymerism and to allotropism.

In polymerism the *same proportion* of the same elements will form differing substances—thus :

2 of A, and 2 of B may form one substance,

but 3 „ „ 3 „ will evolve another substance.

The same elements in the same proportion form different substances.

In allotropy the *same element* assumes a different physical nature, yet remains *chemically* the same element. Carbon assumes the allotropic form of the diamond, graphite and charcoal. Sulphur assumes four different allotropic forms, one of which is a soft, plastic, rubber-like substance ; oxygen changes into a more chemically active gas-ozone, yet ozone

is *chemically* nothing but oxygen. Phosphorus, which is a deadly poison, changes into a dark red powder, which is not poisonous! Yet *chemically* it is phosphorus, and nothing but phosphorus! The facts in allotropism show that fundamental conceptions in chemistry are not yet quite rightly co-ordinated. *Chemically* the same element could not be both poisonous and harmless.

52.—All phenomena, animate or sub-animate, due to differences in movement.

If we attempt to co-ordinate the facts in isomerism, polymerism and allotropy, we cannot avoid being led to the conclusion that the immediate cause of all differing properties in the atoms of the elements and in compound structures is nothing more than differences in character of movement. This conclusion harmonises with the popular theory that all the different kinds of elements are structured from one form of ultimate or proto matter ; and that the difference between the atoms of differing elements is but that of differences in number and " pattern " of movement of the ultimate particles or electrons that enter into the structure of the atoms of each differing element.

When we have the evidence before us in isomerism, demonstrating that the same number and kind of atoms can be arranged differently, so as to evolve substances having distinctly differing properties ; and in polymerism, that the *same proportions* of the same kind of atoms will also evolve substances having different properties, it is evident that such different properties can only be the result of differing forms of movement of the molecules that structure the substances. *For there is no other possible cause of these differences in properties.*

We know—it is common knowledge—that all structures are in eternal motion, also that every differing elemental molecule has a character of movement that differs from that of every other elemental molecule. Consequently, all different structures of atoms, or elementary molecules, no matter how simple or how complex, must each have a different character of molecular movement ; and these differences of movement are made evident to our senses of perception as different *properties* of matter.

A specific property in a substance is a specific character of movement in that substance (17, 18).

The phenomena in allotropism sustain this conclusion ; for they show that the only known agencies through which an element may evolve a different physical structure are modes of energy—movements.

Oxygen, when heated by electric current, by process of oxidation, by the combustion of ether upon the surface of red hot platinum, is transformed into ozone. Ozone is thus evolved by the absorption by oxygen of the energy movements of heat.

When phosphorus, excluded from contact with air, is heated to a temperature of between 240° and 250° Centigrade, it changes into its allotropic non-poisonous form, or it may be so changed by absorption of the energy rays from radium. Thus, by simply causing an alteration in molecular movements a totally different *property* of the element is evolved—as is the case with oxygen.

Sulphur is heated, boiled or distilled, in order to produce the plastic allotropic modification.

The explanation (?) of chemists that allotropy is due to a difference in the number of atoms of the elements that structure an elemental molecule is *not* an explanation of the phenomena. If it be true that the elementary molecules acquire an increase in the number of their atoms, it is what causes such an increase that is explanatory. If we say that it is due to an increase in the amount of structural energy associated with the allotropic atoms which gives them different movements and consequent different functions, we give an explanation which we can rationally co-ordinate with the phenomena. For oxygen, plus energy, evolves ozone ; phosphorus, plus energy, evolves the non-poisonous form ; sulphur, plus energy, its differing physical structures.

We see in every chemical action transformations of free energy into the confined structural energy of matter, or the converse—the transformation of confined structural energy into free energy. Thus a very large amount of structural energy is set free from the molecules of hydrogen and oxygen when they unite to form water ; and a large amount of free energy has to be introduced into H_2O before oxygen

and hydrogen can evolve from it again into separate existences. In all cases of allotropy, energy appears as the active agent, the inclusion of additional energy making a more complex structure with consequently altered properties.

In isomerism and polymerism the difference in the physical character of substances structured by the same number of atoms of the same elements, or the same proportions of atoms of the same elements, can only be accounted for by assuming that differences in modes or energy of motion are the cause of the different substances evolved—just as it is now commonly believed that the different properties of the different elements are conditioned by differences in the character of the movement of the electrons that structure them.

It is well known that the atoms and molecules of different elements have different weights, and consequently each has a different velocity of molecular movement. The average velocity of a hydrogen molecule exceeds one mile per second ; the average velocity of an oxygen molecule is only one-fourth that of hydrogen. And when different elements become united chemically in the formation of compound substances there must arise differences of properties in those substances which correspond to the differences in the energy and modes of movement evolved by the mutual actions between the differing movements in the elements that structure them—just as the infinite phases of harmony in music are evolved by the mutual actions between differing movements in air waves.

Facts in connection with radiation of heat led Planck to his theory of "quanta" particles of energy. Facts in relation to velocity of light led Einstein to his theory of relativity. Both these theories lead to the recent conception of "action" as being fundamental in physics and *of more importance than mass or energy.* "Action" in this technical sense is not the same as the "action" or "reaction" in the third law of motion. It embraces a time interval, and may be described as *what happens* in a minimum of time by the operation of a minimum of energy. And it is noteworthy that coming from quite a different direction we have arrived at the conclusion that the third law of motion, as formulated

by Newton, does not satisfactorily define movements into which enters a *something besides matter and energy*.

The recent conception of "action" is easily translated into our conception of all action being mutual, equal, simultaneous and continuous, which expresses our restatement of the third law of motion (46). For no one thing *per se* can have any action; there can be no action without difference in movement; no minimum of energy can, at the same moment, have difference of movement. All action must be mutual, equal, simultaneous and continuous; and it must be associated with *something beyond matter and energy*; a something which initiates the movement and determines its character.

The influence of the rapid movement of the gyroscope in evolving "behaviour," which connotes perceptions or functions of mind (42), the influence of rapid movement of a particle in increasing its measured mass (7), the simultaneous evolution of mind, matter and energy as evidenced in the phenomena of gravitation (26), the conception of curved space, the transformation of matter into energy in radioactivity (165), all lead to a conviction that man has reached the borderland of possible knowledge, and must be content with an intelligent conception of the immediate nature of the presentations within that borderland, for it marks the limitations of his reasoning faculties.

53.—*Human intelligence conditioned by physical movements.*

It may be of some help towards getting a grip upon the rationale of the conception that the infinite phases of immediate mind are conditioned by the infinite phases of molecular movement possible to the infinite number of varying molecules, if we consider the mind effects that may be traced—some directly and unmistakably—to differences in molecular movement.

We have already shown that differing molecular movements in compounds give us differing perceptions of taste (18). We have demonstrated that perceptions are the functional units of mind; that intelligence is evolved from the infinite variety of concepts that may be structured from the varied experiences of our five senses (31 *et seq.*). We

have shown that if all the human race were to be born blind and deaf they would rapidly degenerate to an intellectual level beneath that of any lower animal that can see and hear (33). And—here is the point to the above statement—that our perceptions by sight and hearing are conditioned by mutual actions between our sense organs and electromagnetic movements and air movements. Thus the intelligence of man above that of lower animals depends upon the possession of these two senses of perception which are conditioned by *physical movements* and which are given a larger intelligent effect by being able to enter into mutual actions with a more complex brain structure than is possessed by any other animal.

Still more simply and clearly do we sense the relation between movement and mind in our tangible perceptions, and are thus better able to appreciate the truth of Hobbes' statement that—

"If bodies and their internal parts were at rest, or were always in the same state of motion, there could be no distinction of anything; consequently, no sense,"

when we consider what we "sense" when we place our hands in water. If we place the hand into water at a higher temperature than the hand, we feel a sensation of warmth. If we place the hand into water that is colder, we have a perception of coldness. But if we place the hand into water which is of the same temperature as the hand, we perceive neither coldness nor warmth.

Perception of warmth or coldness is a matter of mutual action in molecular movements. Water that is warmer than the hand has greater energy of molecular movement than the hand. Water that is colder has less energy of molecular movement. Our perception of warmth and coldness is a perception of difference in molecular movement. When the molecular energy of movement in the water is equal to that of the surface of the hand we cannot perceive either heat or cold—there is no difference in movement to make such a perception possible.

In our perception of the slightest touch of any substance that gives us no impression of either heat or cold we perceive the difference in molecular movement in our tissues, that are

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subject to the slight pressure caused by the contact ; for pressure restrains molecular movements ; the mutual actions between these movements and the pressure evolves heat energy. We can warm our hands when they are cold by repeatedly squeezing them hard and relaxing the pressure.

An increase in temperature causes more active molecular movements in the tissues. This involves more active metabolism, which is perceived by the organic mind in the part as a sensation of warmth, if the increase is within certain limits. When it rises beyond those limits we perceive a sensation of burning or scalding, caused by an excessive activity in katabolism that anabolism cannot keep pace with, and disintegration of tissue results ; we have movement that destroys, and perceptions that are intensely painful, but the movement that destroys is essentially the same as the movement that builds up. The difference is that of degree, not of kind of movement—a difference that so often misleads to erroneous conclusions.

We perceive no sensation of movement in a floating vessel, if it does not pitch or roll, no matter how quickly we may be travelling, for there is no difference of movement either in the velocity or direction of ourselves and the vessel that bears us. Without differences in movement there can be no evidences of existence ; there could be no phenomena ; nothing could happen. Stop the blood moving through the brain, and conscious mind in man ceases to exist. Stop molecular movements, and all life would vanish from the earth. Stop the movements of electrons, and the universe itself would disappear—if the vortex theory in Kelvin's definition of matter be true.

The primal evidences of mind function—the universal mutual actions between particles of matter—which demonstrate that they perceive each other, are expressed by movement—as seen in gravitation (26). The perceptive senses of man and animal are conditioned by movements and made evident by movements (18). The highest intelligence in man is structured solely upon the data furnished by his perception of movements (29). Functions of mind—even mere thoughts—originate in movements and are expressed in movements (3).

Finally, we come to the conclusion that the infinity of mutual actions that condition all phenomena in nature, mental and physical, are evolved from the infinite variations that are possible in the manner of movements in systems of energy.

We see that there is "action" evolved by the mutual action between the brain neurones and the perceptive movements transmitted to them by sensory and organic nerve systems. This "action" we term conscious mind; and we see in this consciousness an energy quite distinct from the physical energies although it is correlated with them. We have energy movements in this conscious "action" which seem apart from the physical because they are intelligent.

In *Space, Time and Gravitation*, Eddington tells us on page 147 that action is "more fundamental than either mass or energy." Man knows of no other factor than mind which can possibly be more fundamental than mass or energy.

Do we here find that even the new physics of relativity are furnishing evidence of the truth of our postulates?

54.—*Universal mind conditions universal life.*

Universal movement, perpetual and unceasing, expresses perpetual and unceasing life; and universal mind conditions the universal movement. Individual beings have evolved and devolved in countless millions for countless ages, and are still evolving and disappearing for ever—as have the infinite hosts that have preceded them. But the systems of energy—the atoms—that structured and animated the first individual beings that ever existed, are still in existence, quite unchanged and as animate as ever, and will remain animate, giving life to an infinite succession of ephemeral individual beings, so long as the present order of nature remains fundamentally the same.



CHAPTER IV

MIND INSEPARABLE FROM LIFE AND MOVEMENT

55.—*Co-ordination of animate with physical movements.*

All presentations in nature are conditioned by varying values of mind, matter and energy, the inseparable trinity which represents the limit, or ultimate depth, to which human mind may penetrate in co-ordinating the conditions necessary to any particular phenomena; therefore all activities in nature must be subservient to the same natural laws, whether we arbitrarily term those activities physical, chemical, mental, animate, or sub-animate.

The physical law that the illuminating power of a light varies inversely as the square of its distance is equally an animate law—or a law of mind function, and might be stated thus :—

“ The intensity of mutual action between the energy of light and the organic energy of the eye, as evidenced by its impressions upon consciousness, is inversely as the square of the distance of the source of the light.”

It is the perceptive function of the eye that determines all the knowledge we possess regarding the illuminating power of a light; and as every perceptive function is a function of mind the law of the inverted square is equally a law of mind function as it is a physical law.

The action of light upon a photographic film is exactly balanced by simultaneous mutual action of the chemical molecules of the film; and this mutual action gives us the photographic picture. The same electro-magnetic movements which condition light, and by mutual action with the elements of the film give us the photograph—a physical process—enter also into mutual action with the elements which structure the retina and give us visual perception—an animate process!

The incomprehensible mysteries we find associated with

animate life follow, as a natural consequence, from the incomprehensible nature of atomic properties, which give us the incomprehensible effects in chemical mutual actions. All things that live are animated by energy set free in biochemical mutual actions. Every animate being absorbs, or ingests, substances having structural energy, the devolution of which by mutual actions within the living body into simpler and less complex structures, releases the structural energy, which is then transformed into energy movements of mind and body.

In many ways we can co-ordinate animate movements with physical movements. They are subject to physical laws equally with the stone which falls to the earth, or the continuous fall of the earth and the moon towards each other.

The universal application of the law of the inverse square is one of the strongest evidences that all movements in nature are continuous. Molecular movements condition all the activities we term living ; and these molecular movements are subject to the law of the inverse square, equally with all other movements of energy and matter. This surely cannot be coincidence.

Whether it be mutual action between molecules in the act of chemical transformations within or external to animate beings ; between molecules of substances in simple solution or material bodies in mechanical movement, it is the same—equal and simultaneous movement, inviolably involving some transformations of mind, matter and energy, giving the perpetual cycles of movement that characterise all that we know of the universe.

It is a necessary condition of any existences that they are conditioned by other existences. Continuity of mind with living movements and with all sub-animate phenomena is absolute. All the movements we term " living " are but the means whereby mind expresses itself—organic mind in the wonderful movements within us, of which we remain unconscious ; conscious mind in the movements that condition thought. Thus mind and life are resolved into mutual action—equal and simultaneous. No movement without life ; no life without movement. No life without mind ; no mind without life.

Plants and cold-blooded animals behave alike in relation to temperature (56 *et seq.*). At a low temperature they cease to exhibit any sign of life ; and alike they will die if not constantly supplied with the animating energies in atoms of oxygen. Thus living activities are continuous with physical energies, and with the sub-animate elements. William James tells us that "The immediate state of consciousness is an activity of some sort in the cerebral hemispheres" (3). An "activity" is a movement having energy. A metaphysical nothing cannot move and have energy. W. McDougall tells us that we cannot define mind in terms of consciousness ! and that the only alternative is to define it in terms of behaviour (41).

But "behaviour" is action—movement ; all movement is physical mutual action. And as mutual action has been unceasingly continuous from the mutual action of the first two particles of matter that came into existence down to the mutual action necessary to write these lines, mind must be physical, continuous and coeval with matter and energy ; and it must evolve into consciousness in man and animal as one of the simultaneous factors which evolve—in some incomprehensible manner in all mutual actions between bodies (46)—when the properties of the atoms in the blood stream come into mutual action with the properties of the atoms which structure the brain neurones. And as the blood, whilst life endures in the individual, never ceases to flow through the brain, so consciousness never entirely ceases. In sleep we are never absolutely unconscious (191).

Conscious mind in man, therefore, appears as a constant current of intelligent energy flowing from the brain, as a result of the continuous mutual actions that unceasingly operate between the brain structures and the blood constantly flowing through them.

56.—*The erroneous belief that mind is not physical. Butler.*

It is a prevalent but erroneous belief that mind is not physical. Physicists tell us that there are but two things in the universe—matter and energy—and that consciousness is not physical.

Samuel Butler very effectively reasons against the con-

ception of Mind as a metaphysical entity, in his work, *Unconscious Memory*, page 68, where he says :—

“ If I am asked a question and reply to it, the material process which the nerve fibre conveys from the organ of hearing to the brain must travel through my brain as an actual and material process before it can reach the nerves which will act upon my organs of speech.

“ It cannot, after reaching a given place in the brain, change then and there into an immaterial something and turn up some time afterwards in another part of the brain as a material process.”

The fact that the movements of living things are so evidently and unmistakably purposive and dominant over the matter and energy in their structure clearly indicates the existence of a something that has both energy and intelligence, and which cannot be either matter *per se* or energy *per se*, or any combination of those two factors alone. For neither matter nor energy, either singly or combined, can possess any power of automatic guidance. The dominant factor in movements of matter and energy must be another factor—mind. This gives us a factor in nature which is included in our postulate that mind, matter and energy are coeval and inseparable. It does not seem rational for physicists to say that there are only two things in the universe.

All presentations in nature have mind. The imaginary line which has been arbitrarily drawn between the living and the non-living is but where, in the rising complexity of structures, mind value rises so as to be more definitely and objectively evident to our senses by more perceptively evident purposive movements. Below that arbitrary point mind values are so feeble that man has been erroneously led to believe that they did not exist. Everything in nature that *is* must be physical—it cannot be otherwise. The fact that we cannot comprehend the physical nature of consciousness or of mind is no reason why we should dub it metaphysical. It is quite as irrational to consider mind as metaphysical, because we cannot comprehend the physical nature of it, as it is for savages to consider thunder and lightning as due to the supernatural because they cannot

comprehend the nature of these phenomena. Metaphysical is only a more refined or civilised supernatural.

And, if mind is not continuous, physical, and a mode of energy, what becomes of the matter and energy we daily ingest in order to keep going our constant output of mental and physical energy? Does that also become metaphysical as it is transformed into mind energy, and therefore become nothing?

If so, every living thing is constantly transforming matter and energy into nothing! Destroying matter and energy all the while that science is teaching in every university in the world that matter and energy can never be destroyed! And what becomes of the principles of the conservation of matter and energy; or, as we should now put it—of the *sum* of matter and energy?

57.—“Life” not an existence—only an abstract noun.

Life is not an existence; it is simply an abstract noun expressing or indicating activities of mind—*animate movements*—and we may consider “universal life” as indicating the simultaneous activities that result from the unceasing mutual actions and transformations of mind, matter and energy. If any animate being, or any part of that animate being, moves, that movement is determined by mind—organic or conscious. If these two phases of mind are absent, if there be no *movement*, there can be no animate being—there is only then sub-animate existence, that expresses itself in sub-animate movements, such as we find in mutual actions between what is termed “dead” matter—the effects of gravitation, electro-magnetic movements, chemical affinities and repulsions, and so on; and these sub-animate movements are determined by sub-organic mind (110). Universal mind gives us universal perpetual movement. Every movement in nature is concurrent with an activity or expression of mind—conscious, organic, or sub-organic; no matter by what term we denote that movement; every movement is initiated by a perception—a function of mind (30); and every differing mode of perception shows clearly as a distinct phase of mind function which we cannot connect with any other phase, except upon the basic conception of difference in movement (26).

58.—*Variation in structure gives variation in mind.*

Further, character of mind must always be dependent upon the character of the mutual actions in the structures from which it arises ; must vary with every variation in structure (144) ; and must increase in value by the increasing varieties of combinations that become possible by increasing complexity in structures. And the mutual actions in such structures must depend upon the character of the ultimate atoms that form the structures. Thus we arrive at the truth, that character of mind is primarily determined by the character of the atoms in the structures, whose mutual actions are simultaneously transformed into mind energy. Atoms carry their properties with them into all more complex structures (3).

If we compare the character of mind exhibited by man with and without the presence of alcohol, opium, Indian hemp, or other drugs, in the mutual actions in the brain cells from which conscious mind evolves (97), or if we consider the wide difference in the character of our perceptive senses—functions of mind—caused by differences in the structure of our perceptive organs, this truth comes home to us. Our eyes can see, but they cannot hear ; our ears can hear, but they cannot see ;—difference in structure causes difference in mind function.

59.—*Universal perpetual movement.*

Everything in the universe is in a state of perpetual motion in mutual actions. All movement is initiated by some mode of perception—an activity of mind (30). Animate and sub-animate, organic and sub-organic, living and dead (?) matter are but extremes of phases of this universal and perpetual movement.

THE MUTUAL ACTIONS BETWEEN—

1. All particles of matter in the universe evolve gravitation.
2. Varying numbers and movements of electrons evolve atoms.
3. Different atoms evolve different substances.
4. Different substances evolve organic substances.

5. Different organic substances evolve organic structures
 6. Differing organic structures evolve organic mind.
 7. Organic mind and brain neurones evolve conscious mind.
 8. The differing elements in a voltaic cell evolve electric energy.
 9. The same elements in a test tube evolve heat energy.
- and so on.

Every phenomenon in nature is a mutual action of some kind ; and the character of mutual action must have infinite variety, corresponding to the infinite variety of combinations possible to the primary atoms that structure everything. And through all mutual action runs the initiative dominance and continuity of universal mind, as indicated by *behaviour* (41), and evidenced by perceptions (38 *et seq.*).

60.—*What man possessed the greatest mind ?*

If the civilised world was asked to decide who of all men who have ever lived should be credited with having the greatest mind, no satisfactory decision could be arrived at. Religion, sentiment, and other influences would vary decisions ; and even if these factors could be eliminated, the difficulties in the way of a true decision would be insuperable.

For instance, how could one possibly determine a choice between such men as Thales, Aristotle, Archimedes, Newton, Clerk Maxwell, Lord Kelvin and other men of natural genius ? If Maxwell had lived to a ripe old age, as did Newton, what might he not have accomplished ? If Archimedes had possessed the accumulation of acquired knowledge that was available to Kelvin, what might not he have accomplished ? For, with all his limitations, he so advanced science in some directions that nearly two thousand years elapsed before his methods were improved upon.

The difficulty of deciding who of all men should be credited with having the greatest mind is insuperable ; because it is impossible to determine the comparative value of achievements under differing values of acquired knowledge. Given to Aristotle the knowledge of facts that accumulated between his day and Newton's, it is quite possible that Newton and

others would have been deprived of some of their opportunities. Every new fact, principle or law discovered lessens the possibilities of further discoveries to future generations of seekers after truth. It is not open now to any original investigator to discover the composite nature of light, the velocity of light, the laws of motion and gravitation, the conservation of matter and energy, the advanced methods of mathematicians, the mechanical equivalent of heat, radioactivity, the breaking down of the atom, wireless communication, or any other of the achievements of modern times. Further, it is quite possible that history does not record the name of the man who possessed the greatest mind. He may have lived prior to authentic history ; or accident or some untoward circumstance may have left us no record of his having existed. It may have been Thales, who first calculated and predicted an eclipse of the sun ; or, for aught we know to the contrary, it may have been the genius who first made a fish-hook out of a flint splinter thousands of years before history began.

H. G. Wells was recently asked who, in his opinion, were the six greatest men in history. He decided upon Jesus, Buddha, Aristotle, Asoka, Roger Bacon and Lincoln.

A vast majority of well-read persons would substitute other names for some of the above six ; thousands would not include one of them.

And if it is impossible to determine who of all men had the greatest mind, how much further from possibility would it be to determine the second in order of merit ! Possible candidates for first honour might be counted in tens ; possible candidates for second honour would have to be counted in thousands ; and for third place, millions. When we get down to those who are just a little above the average in ability the number would be countless millions. And this downward grade continues with no perceptible break in continuity to the lowest manifestation of human conscious mind in absolute idiocy.

61.—*Mind values continuous from genius to the atom.*

At no place on that downward grade can we draw a line across and perceive any difference whatever between the quality

of mind touching the line on one side and the quality of mind touching the line on the other side.

We can clearly see from this absolute continuity in function, from genius down to its nearest approach to zero in the idiot, that human conscious mind does not differ in the slightest in its essential or ultimate nature, but only in range or quality of function. Exactly as heat or electric energy, from the highest possible intensity down to the imperceptible, does not differ in the slightest in essential nature, but only in range or intensity of function.

Consider also the infinitely varied directions that may be open or closed to the perceptive faculties of different persons. A mathematical genius may have no comprehension of music; a musical genius may have no comprehension of mathematics. The musical genius, regarding the mathematician from the purely musical point of view, could quite reasonably class the mathematician as almost idiotic because he had no appreciation of music; and the mathematician could reasonably regard the musician as of feeble intellect because he could not comprehend mathematics. And so on in an infinite number of ways with persons having differences in value of given perceptions.

In the descending scale of mind function we do not stop within the narrow limits of human conscious mind; for mind is universal and has its influence everywhere. We can track down the continuity of mind to much lower depths.

Any intelligent animal—for instance, a dog, horse, chimpanzee or elephant—has at least as much conscious mind as the human absolute idiot; and we can trace mind down in animals by evidences of their intelligence by such imperceptibly diminishing values that no difference can be appreciated at any point on that downward grade, right down to the lowest animal life in the protozoa or single celled animals.

From this we can still follow the diminishing evidences of mind through the *protista*—a lowly form of life having characters both animal and vegetal—into the more lowly animate organisms—the bacteria, till living organisms become too small to be detected by the most powerful microscope and disappear by merging into the sub-organic,

where the animate and sub-animate, are still united in continuity.

If it were possible for man to watch the movements of individual molecules in the structures of substances from the simplest sub-organic to the most complex in a brain cell, we should find the increase in complexity of structure and movement so sequentially even that the question regarding the starting point of animate movements would still remain just as arbitrary a point as the arbitrary distinction between the organic and sub-organic, and the living and the non-living.

It is quite customary to-day in pathology to attribute an obscure effect to some organism too minute to discover by the microscope. Any reasonable view of evolution must make the chain of events and existences continuous, and cannot admit any missing link between the living and the non-living. The expert chemist of to-day will tell you that the distinction between organic and sub-organic has now no place in his science, except for purposes of classification.

So that from the highest human mind down to what we term sub-animate matter, and right down to the atom, there is a continuous connection of evidences of mind manifestation of gradually diminishing range or intensity, and we cannot draw a line across anywhere and detect any difference whatever between the essential nature of the mind on the one side of the line and that of the mind on the other side. And all along the line, from genius to the atom, we deduce evidence of mind from the "*behaviour*" of the subject ; we see that material atoms and micro-organisms *behave* in an exactly similar way under exactly similar conditions actuated by perceptions (40), and we cannot rationally dissociate that behaviour from the influence of the same fundamental factor—mind.

62.—*The eternal mind energy in the atom.*

We can only perceive the character of "behaviour" directly when it comes within the range of our conscious perceptions ; when it goes below that range we can only follow it by reasoning upon other experiences. For instance, we are quite unconscious of that intelligence within us which,

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alike in summer heat and in winter's cold, regulates our molecular activities so as to keep our bodies at a uniform temperature of about 98.5° Fah. We have no direct perception of this intelligent control, but we must conclude that it is evidence of the activity of a phase of mind that is beyond our comprehension. The immediate cause of all the intelligent activities within us of which we remain unconscious—the beating of the heart, the elaboration of the digestive juices, the secretions of the ductless glands, the evolution of physical and mental energies, the repair of injuries, the removal of waste matter, and the like activities in all other living organisms, animal and vegetal, are all evidences of that which we herein term *organic mind* (94).

We are ignorant of the nature of the molecular activities that form a crystal or that cause such wonderful transformations in chemical mutual actions. The immediate cause of the lower forms of intelligent molecular activity in the sub-organic we term *sub-animate mind* (110 *et seq.*). For whether it be in the cells of the brain, the cells of our internal organs, the cells in a plant, the substances in a solution that form a crystal, or the elements in a test tube, the ultimate *physical* cause that conditions all expressions of mind is the eternal mind energy within the atom. Wherever mind expresses itself we find it expressed in molecular movements; and molecular movements arise from the inviolable properties of atoms. These being the most fundamental things presented to us, their properties "must explain the properties of all more complicated structures" (3). All this is in harmony with the findings of psychologists, that mind is *motor* in its origin, and *motor* in its consequences (3), and thus we arrive at the unavoidable conclusion that mind is inseparable from movement—life.

63.—*The "origin of life" not a legitimate problem.*

The foregoing conclusion leads to a view of what is meant by the term *life* very different to that entertained in popular thought. For *life* is not a thing or an entity; it is only a term—an abstract noun—that denotes those animate activities that are expressions of mind. Mind expresses itself in the activities we term *living*. Life has no more definite

basic meaning than walking, swimming, or flying. Activities that are expressions of mind reach down to the activities of atoms, so that *life* in the same sense in which it is applied to animate movements really extends to all movements in nature, and we may reasonably speak of the "sub-animate life" in the movements of any substance. This runs parallel with the acknowledged arbitrary division between the organic and the inorganic; the division between animate and sub-animate is equally arbitrary. Animate movements are simply more complex than sub-animate movements; that is the only difference. Complexity of movement arises from complexity of structure, and there is an unbroken chain of continuously developing complexity from the atom to the brain neurone, which determines that all movement must have the same fundamental origin.

The reader may now clearly see the futility of the many theories and speculations regarding the "origin of life," as being a *something* that came into existence long subsequent to the origin of the earth. For mind is inseparable from matter and energy, and evidenced its presence in the first particles of matter that came into existence (26) by movements due to the primal perception for mass; consequently sub-organic mind and sub-organic life must have existed from the beginning.

In the progress of evolution organic mind and organic movements evolved by increasing complexity in structures from sub-organic mind and sub-organic movements; then animate mind and animate movements by still increasing complexity in structures evolved from organic mind and organic movements. But all is of necessity perfectly continuous, from the present condition back to the fire mist or the incomprehensible first cause out of which the universe evolved. We cannot discover the origin of life, nor even conceive its origin, any more than we can discover the origin of mind, matter or energy; nor can we even imagine the ultimate something out of which they evolved.

We have no theories or speculations regarding the origin of mind, matter or energy, such as we have regarding the "origin of life"; yet all are involved in the same unfathomable problem of existence; and the fact that many scientists

to-day are attempting to demonstrate experimentally the beginnings of life indicates how far man is yet astray in his conceptions of the truth regarding it. For life—the sub-animate life of molecular movement—already exists in the very substances they are experimenting with; they are looking for that which is all the time under their noses!

64.—*Chemists are now artificially evolving life from the sub-animate.* Prof. Schaefer.

Chemists to-day are manufacturing synthetically from sub-animate elements substances that have *animate* molecular movements that are necessary to human existence; and so are really, and artificially evolving animate life from the sub-animate, but have not yet become conscious of the fact that the problem of the immediate evolution of living activities has been solved by them. Adrenalin, for instance, is the active substance that is secreted by the suprarenal glands. It possesses a living function. Disease, or removal of the glands, by stopping the flow of this substance into the blood stream causes death. Chemists are now making this living substance that has animate properties. But this making of animate substance is *not generating life*, it is only adding or mixing together molecules already having the necessary sub-animate life in such a manner that the life existing in them cumulates in the greater energy of expression, which is termed "animate."

If we accept as true the statement made in the Medical Research Council's Report for 1925-26 that chlorestrol, when exposed to sunlight, will evolve vitamin D, we have actually reached a knowledge of the immediate conditions which, in one particular direction, are necessary to the evolution of the animate from the sub-animate.

Chlorestrol is a solid alcohol which has functions below the arbitrary and indefinite value we term animate. Yet on exposure to sunlight it evolves by mutual action with the energy of that light a vitamin, a substance having the enhanced and more complex functions of that which we arbitrarily term "living." In ordinary language a "dead" substance is transformed into a living substance by the influence of sunlight.

But this is only getting a more particular and exact knowledge of the transformations taking place at the earth's surface where the energy of the sun is perpetually building up living things by mutual action with the sub-animate soil, water and air.

Every substance and every element that is essential to a living organism must have at least sub-animate properties or functions, or it could not be essential to the existence of that organism. And whether such substances or elements be within a living organism or external to it, they still must possess those sub-animate properties. The fact that the properties of atoms are unalterable and the further fact that the relations between structure and function are inviolable—as we demonstrate in Chapter IX—enables us to perceive in the foregoing statement an *a priori* truth.

We anticipate a popular and energetic denial to this conclusion ; but we venture to predict that not many years will pass before it becomes generally recognised as a fundamental truth within common knowledge.

Each substance or element essential to a living thing will, by mutual actions and co-operative association with all the other substances and elements which are also necessary to the structure of that living thing, condition and evolve that degree of animate function which we arbitrarily term "living."

Prof. Schafer, in his presidential address to the British Association at Dundee, 1912, referring to theories regarding the coming of life to the earth from other worlds, remarked :

"The acceptance of such theories of the arrival of life on the earth does not bring us any nearer to a conception of its actual mode of origin ; on the contrary, it merely serves to banish the investigation of the question to some conveniently inaccessible corner of the universe, and leaves us in the unsatisfactory position of affirming not only that we have no knowledge as to the mode of the origin of life—which is unfortunately true—but that we can never acquire such knowledge, which, it is hoped, is not true."

The irrational idea that the earth was in some way inoculated with life from another planet ; the fact that the origin of life is looked upon as a problem that man may in

due time solve ; and the fact that to-day many are endeavouring experimentally to demonstrate the spontaneous generation of life after the manner of Bastian, by the action of light upon weak metastable colloid solutions, or the manner of Leduc by means of osmotic pressure and diffusion, shows the wide gap that exists between popular conceptions of the problem and the actual truth.

Such efforts cannot bring us any nearer to any conception of the ultimate origin of life ; this involves a conception of a first cause that is utterly beyond comprehension. Whatever results such efforts bring about can only be looked upon as evidences of the sub-organic life already existing in the substances they are experimenting with. No matter what results may be achieved by such labours in synthetic chemistry, by colloidal or crystalline solutions, diffusion, osmosis or any other means, the question of the origin of life would remain unanswered.

It is as though they were endeavouring to determine one definite point only upon an infinite length of tapered rod as the only place it could be cut into two lengths, so as to give a thick tapered rod and a thin one.

For the rod could be cut anywhere and give this result ; and wherever it was cut there would be no difference in value of the dimensions of the faces cut. And so it must be with the line of continuity that connects the molecular movements in the animate with the movements in the sub-animate. We may cut across anywhere we please, but the animate value of molecular movements will be equal on each side of the cut.

Life—which must be read as connoting expressions of mind—must be evolving continuously in varying phases with every change in physical structure that evolves increased complexity ; it is an immediate attendant, evolving or devolving with every phase of sub-organic or organic evolution and devolution.

The chemist who in his laboratory evolves a chemical reaction that has never before occurred in nature has in truth evolved a new perception—a new phase of mind. And this new phase of mind is in truth a new phase of living activity. It may be only a humble phase of sub-animate

life, but life it is, and essentially the same as the more complex animate life. And as many hundreds of substances have been evolved by chemists that never were—so far as is known—produced under purely natural conditions, it follows that man has already succeeded in artificially evolving life in his laboratory.

Even if it were possible for man to see atoms and molecules and follow their inconceivably rapid movements in animal cell, plant cell and chemical test tubes, the point separating an mate movement from sub-animate movement would still be an arbitrary point having no actual existence ; for he would see the movements unbrokenly continuous from the most simple in the sub-animate to the most complex in the animate. And so long as man conceives that a definite dividing line exists between the animate and the sub-animate so long will that supposed line be an arbitrary position which man may foolishly speculate upon and wrangle about.

65.—*The tendency of modern thought towards continuity.*

The general tendency of modern thought towards the continuity of all phenomena in nature is a prominent feature in the notable advances made in knowledge during recent years.

In geology we formerly had distinct and separate "periods" marked out by the character of the strata deposited. Now we know that there are no such distinct periods, but that all merge continuously one into the other.

Chemistry, Physics, Biology and other branches of science are continuous ; at various points one branch of science merges into the other. Biology merges into chemistry, chemistry into physics, physics into astronomy.

In chemistry all the different elements were supposed to differ from each other in their ultimate nature. Now we have evidence sufficient to warrant the assertion that all known elements are structures of electrons.

In physics we have varied forms of energy ; these were considered to be all different things. Now we know that all forms of energy are transformable or correlated ; also that matter and energy are correlated.

Only a few years ago it was esteemed a scientific truth that

matter and energy were two different fundamental entities that were each conserved, that the totals of matter and energy were fixed and unalterable quantities. Now we know that each is transformable into the other, and we have to postulate that the *sum* of matter and energy is constant.

Our investigations into the ultimate nature of mind takes us deeper still ; for we find that mind is a factor correlated with matter and energy, and we must now postulate that it is the sum of mind, matter and energy that is constant. For the very fact that all living things have to ingest matter and energy in the form of food in order that they may live and evolve the organic and conscious mind that conditions living movements, proves that mind, matter and energy are correlated fundamental factors, and that mind exists in matter and energy, just as energy exists in matter, and matter exists in energy.

In biology a sharp line was drawn between the animal and vegetal kingdoms. Now we know that there is no line of separation between the two ; that they are intimately connected by numerous forms of life that have the functions of both animal and vegetal organisms and belong definitely to neither—the protista. We have the carnivorous plants that catch, enclose and digest living animals. We also know that the physiological unit of all life—man or worm, tree or grass—is the protoplasmic cell.

66.—*Clifford ; Leduc ; Wöhler.*

Formerly a sharp line was drawn separating the organic from the sub-organic. Now we know that the sub-organic merges imperceptibly into the organic ; that a perfect continuity of evolutionary phases connects them. As Clifford many years ago said :—

“ The line dividing organic matter from inorganic, if drawn to-day, must be moved to another place to-morrow ; and the chemist will tell you that the distinction has now no place in his science except in a technical sense, for the convenience of studying the carbon compounds by themselves.”

And as Leduc says to-day in his *Mechanism of Life* :—

“ All forms and phenomena of nature are united by

insensible transition ; it is impossible to separate them ; and in the distinction between living and non-living things we must content ourselves with relative definitions which are far from being precise."

Less than a century ago it was considered impossible to artificially produce any form whatever of organic matter, such as is produced by living animal or vegetal metabolism ; for to do so would, of course, be to do something which was then considered possible only to the living—would be producing a living function. Yet in 1828 Wöhler discovered a reaction between potassium cyanate and ammonium sulphate that produced urea !

To-day the production of organic compounds is a common fact that causes no surprise. Numbers of artificially produced organic compounds are now manufactured ; we have industries that are built and thrive upon the economic production of them.

The acceptance of Wöhler's production of urea as the first organic substance produced artificially very clearly shows how slow man has been to realise the indications of continuity in nature. Carbon dioxide is a product of living metabolism, the result of a living function ; but it was produced artificially when a fire was lighted for the first time by a human being !

Anyone now sitting in his study reading these lines is exhaling carbon atoms that entered into the structure of food now providing the mental energy he is expending. These carbon atoms—associated in the structure of the carbon dioxide molecules exhaled—diffuse through the air of the study, pass out of window or door into garden or orchard, are absorbed by edible plants or fruit trees, and, in conjunction with other elements and with energy from the sun, are built up again into carbohydrate molecules that may again furnish my reader—or others—with the necessary energy for continuing the flow of animate energy that, whilst life lasts, never ceases flowing through living organisms. Continuity of mind, matter and energy appears to us so evident that it seems almost a waste of time co-ordinating the evidences of it.

In the suspension for an indefinite time of animate

activities in living things by desiccation and the restoration of those animate activities simply by the application of moisture we have conclusive evidence that the arbitrary point where the so-called dead (?) matter merges into the animate may be covered by a molecule of water ! (135). Does not this prove that water has an animate movement or function ? Does not the fact that we are able to produce artificially a substance that is produced by a living organism and is essential to the life of that organism prove that we can produce a living substance artificially ? And if we can produce artificially from sub-organic elements one living function, does not that prove that there is a continuity between living activities and sub-organic molecular movements ? There is no other possible conclusion to which we can rationally come.

67.—Errors in co-ordination ; Spillman ; Max Verworn.

If error in co-ordination is present in conceptions regarding basic phenomena, resulting phenomena that are conditioned by and follow the basic phenomena cannot be satisfactorily co-ordinated—they cannot be made to "fit" properly. Nowhere is this more evident than in "Heredity" and in other problems in biology. Spillman, in his work, *The Present Status of the Genetic Problem*, says :—

"Just at present we have more facts of a certain kind than we know what to do with. We need someone to put a meaning into those facts. We are in the position of a man lost in the wilderness. What he needs to find is a road."

These remarks of Spillman accentuate Clerk Maxwell's statement that "Sciences of this kind will be occupied for ages to come in the co-ordination of these facts" (9). But they never can be truly co-ordinated so long as basic co-ordination remains in error.

Max Verworn seems to have had a suspicion of basic error when, on reviewing the barren results of so many years study of life, he asked :—

"Are we on a false track? Do we ask our questions of nature amiss, or do we not read her answers aright?"

We may answer these questions by saying :—

" You conceive '*mind*' as a something superposed upon '*life*' ; that life is a something from which mind evolves ; whereas life is but the expression of mind ; the basis of life is mind ; all phenomena of life are modes of expression of mind. You have conceived the relations of mind and life upside down, and the result of your studies is barren ; you have striven to co-ordinate biological facts with '*life*' instead of '*mind*'—hence failure.

" It is true that *conscious* mind evolves from the brain ; and this fact has undoubtedly led you and others astray. But the conscious mind of man is only a very small and humble phase of one great and universal mind. What of the organic mind that constructs the brain ? What of the organic mind that exists in everyone of the countless millions of cells that structure our bodies, of whose organic perceptions we remain wholly unconscious, and whose activities are referred to by such terms as '*unconscious mind*,' '*supernormal perceptions*,' '*subliminal mind*,' and '*unconscious cerebration*' ; whose activities '*regulate*' our functions and keep us alive whilst conscious mind is '*dead*' in sleep ?

" Does it not seem reasonable to conclude that the quality and powers of mind that are adequate and competent to do these things must be more subtle and extensive than the functions of the brain which it brings into being ?

" Biologists and psychologists do not yet grasp the immediate nature of or the wonderful possibilities of organic mind ; but psycho-therapeutists are making some slight acquaintance with them.

" Your basic conceptions of the relations between mind and life being erroneous, no amount of study can lead to satisfactory results ; your labour must be barren. If your basic data had been properly co-ordinated, you would have had no cause to complain of results. The very fact that the results you have achieved from such prolonged investigation are so very unsatisfactory is surely sufficient indication that there has been error in the data upon which your studies have been based."

It is sad to think of the wasted efforts of those who have given—and are still giving—so much labour and study in

the attempt to track down a material basis in heredity. All must fail, for the simple reason that there can be no such material basis—except in a sense foreign to their efforts. They try to build upon erroneous data regarding the relations between mind and life. Darwin's "gemules"; Weismann's "Theory of the germ plasm"; various theories regarding chromosomes and "determinants"; chemical and other theories have been laboriously investigated with barren results, so far as a physical basis in heredity is concerned.

When the basic nature of mind and its universal activities are correctly appreciated and co-ordinated; when it becomes general knowledge that mind is the dominant factor in heredity, we may look for some decided advance in rational comprehension of facts in heredity, and results of great but as yet unknown value are possible.

68.—No structure creates energy; energy creates structure.

A Morse telegraphic instrument or an electric motor is moved by an energy. It does not create that energy; nor did the energy come into existence as a consequence of the coming into existence of telegraphic instruments or electric motors. The movements in such machines are expressions of electric energy.

Exactly so with living things. They do not *create* the mind energy by which they move; nor did the energy come into existence as a consequence of the coming into existence of living things. The movements in such living things are expressions of mind energy.

The essential nature of the difference between differing modes of energy is a difference in the character of the movements of the infinitely tenuous matter associated with every mode of energy. The properties of atoms which condition all structures and perceptions are differences in character of movement (*50 et seq.*).

The energy which makes a watch and winds it up is the energy that keeps it moving; that energy did not come into existence as a consequence of the making of watches. The energy that makes living things and keeps them "wound up" by feeding is the energy that keeps them moving—mind energy. This mind energy did not come into existence

as a consequence of living things coming into existence. Living things came into existence as a consequence of mind energy. The mind energy which animates us is immortal ; individual beings or structures are ephemeral. The atom is immortal.

69.—*Prof. Moore : continuous evolution of the animate from the sub-animate.*

Prof. Benjamin Moore in his work, *The Origin and Nature of Life*—an admirable little book, despite its title—states that :—

"Traces of evidence are lately beginning to come into view which are highly suggestive of continuous present day creation (?) of matter at the inorganic level, and of the creation (?) of life from inorganic materials at the organic level."

This is but one of the many indications of the tendency in science to absolute continuity. We think, however, that the term *evolution* would be more suitable in the above statement than *creation*.

Again, upon the last page in the book, he says :—

"Here then we stand at the end of our review of inorganic and organic evolution, and of the origin and nature of life. There is continuity and consistency in it all."

Every effect must of necessity be a phenomenon continuous with the cause of that effect, and the physical conditions of the universe from the present moment back to the beginning must at every moment of time have been of necessity continuous with preceding conditions and with the conditions that followed.

From the waters of the ocean the energy of the sun is constantly raising water vapour ; the vapour is constantly condensing into clouds of microscopic particles of water ; the particles are being constantly aggregated into drops that fall upon the earth as rain. The energy of the sun never ceases pouring upon the earth ; the falling of rain never ceases. The rain moistens the soil and takes up in solution molecules of organic and sub-organic elements, which by mutual actions with solar energy evolves the structural energy in vegetation that provides energy for animate

structures. The surplus rain runs down rivers to the sea, carrying down organic matter it holds in solution, and thus provides food, from which all things that live in the sea are directly or indirectly evolved.

Man eats the food so provided, and he transforms the structural energy in that food into mental and muscular energies. Every structure exhibiting these energies we term animate, and it cannot live, cannot be animate, unless it is supplied with the energies of food. No structure can evolve energy, either mental or physical, out of nothing. If a man ingests nothing for about ten days, his animate movements gradually weaken as his reserves of energy are used up, his temperature falls about 30° Fah. ; the living movements in him then cease ; he is no longer animate ; he ceases to exist as an individual, and the elements in his structure devolve back to elemental molecules and become available again for entry into another cycle of individual existence.

Thus there is a perfectly continuous chain of movement between the phenomena of mind and life and the food we eat ; the soil that grows the food ; the rain that moistens the soil ; the clouds that form the rain ; the vapour that forms the clouds ; the oceans that give up the vapour ; and the sun whose energy causes the vapour to rise. Every link in this chain of continuity is a movement that is continuous with the movement that caused it and the movement that follows it, giving us perpetual and continuous cycles of evolution and devolution in the infinite number of generations after generations of the countless millions of living things on earth, and the absolute continuity of mind and life from the beginning of things down to the present moment.

70.—Conscious mind a constantly changing stream of energy.

Conscious mind is not a fixed something residing in the brain, a metaphysical something, aloof and distinct from the physical, but is part of the stream of intelligent energy (99) that continuously flows through the individual living organism ; supplied by the food daily ingested, carried to every part of the structure by the blood stream, and con-

tinuously expended in conscious, organic and muscular movements. The mind of the reader reading this page is not the same mind with which he read the previous page—in exactly the same sense that the water running under a bridge at one moment is not the same water that ran under it a moment before. The structure of water is constantly varying in a mechanical sense—from limpid in fine weather to muddy in flood times—and the percentage of organic matter in it varies.

Mind is a constantly changing stream of intelligent energy that is continuously flowing through animate beings, and it is most definitely and unmistakably correlated with the physical energies from which it evolves and into which it devolves.

The character of mind constantly varies through differences in blood structure, and may be changed in an infinite variety of ways by the introduction of different substances into the blood stream. No single thought can be reproduced by the *same* mind. No ripple in a stream of running water can ever be reproduced by the *same* water—it is gone for ever. Other very like ripples and other very like thoughts may be reproduced by other mind or other water in the same continuous stream. The current of mind energy in the brain is changing every instant of time; but so long as the molecular structures of the brain remain relatively constant and the molecular structure of the blood remains relatively constant the character of the constantly changing mind stream remains relatively the same.

71.—*Evidences of the physical nature of mind ; effects of drugs.*

In pathology we meet with some striking facts which we give here as evidences of the physical nature of mind and its continuity with material substances and with the physical energies.

The effects of *alcohol* are well known.

The inhalation of *anæsthetics* will cause the evolution of conscious mind in the individual to cease—complete unconsciousness ensues, and for the duration of the period of unconsciousness, conscious mind is as completely blotted out as if the individual had ceased to exist.

A single grain of the substance *strophanthin* introduced into the blood stream causes the evolution of all conscious and all organic mind in man to cease, bringing his individual existence to a close.

Half a grain of the extract of *cannabis indica* will make a person laugh and smile and be pleased with everything ; he will have none but pleasant ideas, and for a time he will be more witty in speech.

No matter how excellent may have been the normal character of a person who has acquired a habit of constantly dosing himself with *morphine*, he gradually loses all sense of right or wrong—"he will lie and thief in the most degrading way—especially if his desire is to obtain the drug—and absolutely no statement that he makes can be trusted."

The thyroid gland secretes an active substance that functions in a specific manner in the evolution of conscious mind. When a patient, as a consequence of an abnormal condition of the thyroid, degenerates in intelligence to a condition approaching insanity he may regain normal intelligence by ingesting an extract of thyroid glands from sheep.

These various effects by material substances upon the evolution and upon the character of conscious mind could not possibly take place if consciousness were metaphysical ; they could not possibly occur if consciousness were not continuous with the energies of the elementary molecules in the drugs introduced into the blood stream.

Atoms are of necessity coeval with matter and energy ; and as consciousness—mind—is continuous with the energies of elementary molecules, the sub-animate activities in sub-organic structures that are commonly termed physical and chemical phenomena are evidences of a lowly animation that is strictly continuous with that which we term animate.

There are other evidences of the continuity of mind, life and movement, but as they are perhaps more serviceable in support of our postulate that mind is a mode of energy, correlated with the physical energies, we shall introduce them in our next chapter.

CHAPTER V

MIND AS A MODE OF ENERGY

72.—*Infinitely varying values of mind in man.*

We have in our last chapter shown that mind in man has infinitely varying values. Therefore the faculty of reason must have infinitely varying values and cannot be a definite and special faculty confined to man alone. Values of mind, and therefore of reason, are as infinite in number as are the values of any one of the physical energies. We have as many values of heat or of electric potential as we care to divide their presentations into; and we have as many values of reason between genius and idiocy as we care to divide the gap between them into. And as these continuously decreasing values of reason in man are not broken when we bridge across to lower forms of life (61), mind or reason cannot be anything that is the exclusive attribute of man.

We have evidence coming from all directions, of error in three popular conceptions :

First: that each individual has a mind strictly confined to himself—a something apart from every other individual mind.

Second : that mind is a special gift to man, differentiating him from the lower animals.

Third : that mind is a metaphysical something apart from the physical.

Man certainly appears to have "a mind of his own," for he cannot perceive the subtle effects of mind radiations from other persons (83). The individual mind in everyone is influenced by radiations from others ; and in those who have less than average intelligence the mind is usually little more than a reflex of the mind in others. We can all easily recognise in other than ourselves the dominance of powerful minds over weaker ones.

A dog has a wider range of mind—or intelligence—than a duck; but no one claims that dogs have received a "special gift" differentiating them from ducks. By a parity of reasoning each of the values of intelligence in man above that which is of lower value may be said to be a "special gift." Man has a wider range of intelligence than a dog; a dog a wider range than a duck—that is the only difference. The essential nature of mind is the same in man, or dog, or duck.

Everything that is must be physical. The metaphysical is not an existence. Mind *is*; it is an existence, therefore it must be physical (5).

73.—*Sufficient evidence that mind is a mode of energy.*

If we reasonably admit that the existence and reality of mind energy may be determined by a weight of evidence, which is considered amply sufficient to demonstrate the existence and reality of other modes of energy, we find that mind is just as certainly a mode of energy.

We turn the handle of a frictional machine or we rub a piece of amber, and we obtain evidence that the effect of friction in these cases is to evolve electric energy. We consider this evidence quite satisfactory, as demonstrating that the energy of mechanical movement in friction can be transformed into electric energy, *although we are utterly unable to comprehend HOW this frictional movement is so transformed.*

We place solutions of metallic salts into voltaic cells, and we obtain evidence which is considered quite conclusive and satisfactory that chemical energy may also be transformed into electric energy, *although we are utterly unable to comprehend HOW chemical energy can be so transformed into electric energy.*

Man ingests the structural energy of food and evolves mind energy. And we have no more reason to doubt that the structural energy of food is so transformed into mind energy than we have to doubt that frictional energy or chemical energy may be transformed into electric energy, although we are utterly unable to comprehend HOW food energy is so transformed into mind energy; for all basic facts in nature are incomprehensible (19).

74.—*All forms of energy correlated; Clerk Maxwell; D. D. Home.*

At the close of the nineteenth century it was universally held as a truth that the sum of energy in the universe was conserved—it could not be increased or decreased. Clerk Maxwell stated the principle of the conservation of energy thus :

"The total energy of any body or system of bodies is a quantity which can neither be increased nor diminished by any action of those bodies, though it may be transformed into any one of the forms of which energy is susceptible."

Thus the infinite variety of differing character in the stream of mind energy flowing from man must be evolved from the structural energy ingested as food by mutual actions within the organism. For even mind energy cannot come into existence out of nothing. The mind can be made more acutely conscious and witty; or duller and more stupid down to idiocy or to unconsciousness (71) by the ingestion of drugs, which undeniably produce these effects.

These variations in mind values in response to the presentations of differing substances to the neurones that evolve conscious mind (18, 30) are quite conclusive as proof that the immediate nature of conscious mind is evolved from or is conditioned by mutual actions between molecular energies. For, as energy is indestructible, yet transformable, the movements of physical energy in that which is ingested must be transformed into the mind energy, organic and conscious, which is unceasingly expended. Thus we see the truth of the conception of psychologists, that mind is motor in its origin and motor in its consequences. It is difficult to determine where this truth may lead us.

For instance, it is believed by many that the "medium" D. D. Home could hold a red hot coal in his hand without being burnt. Sir William Crookes saw him do it, and was satisfied with the genuine character of the demonstration. But most persons—*a priori*—stoutly maintain that such a thing is impossible. But why should they? The heat in a red hot coal is but molecular movement. The hand is covered by an intricate network of nerve fibres that can transform

physical energy movements into the mind movements of sensation (29, 51); and we have no *a priori* certainty that the marvellous intelligence and functions of organic mind may not, in some persons of unusual structure or personality, be so influenced by conscious mind as to function an energy of movement that directly cancels the movements of heat in some manner analogous to the known manner of cancelling two rays of light, by causing the waves in each to directly oppose each other—the energy of light being transformed into another mode of energy.

We are unable to comprehend how the structural energy in a crust of bread may be transformed into that wonderful intelligent energy we term mind, yet such transformations of energy are unceasing in all directions with all forms of energy through every kind of phenomenon in nature. It is such a common every day happening that we have lost the full sense of the incomprehensible mystery of it all.

The current of mind energy now flowing from the writer of these words and expressing the thoughts now being penned was, not long ago, energy in the sun. Some oranges we had for breakfast did not exist a year ago. Within that time the sun's energy was absorbed by the tree that grew them, and there transformed into the structural energies of the nutrient substances in the oranges. Having eaten the oranges, their structural energies are now being transformed into all the modes of energy that animate the writer. The same reasoning applies to all the food that man ingests.

If you sit in the sun enjoying its warmth and absorbing its energy, you may then say that some part of your mind energy was energy in the sun less than nine minutes previously. If you are enjoying the warmth of a coal fire, you are absorbing structural energy in the coal that left the sun millions of years ago.

75.—*Mind in man unceasingly changing.*

The immediate mind energy flowing through any individual brain at any moment of time is never the same as that of a moment before or a moment later. From birth till death the immediate character of both organic and conscious mind is constantly changing, as the result of the ever-

varying character of the structural energy in the blood stream caused by varying character of food and the slow but constant changes in the character of the physiological structures that enter into mutual action with the fluids circulating through the body.

76.—Perpetual transformations of mind, matter and energy movements.

Every form of matter has a large amount of energy in its structure, and as all things are in perpetual movement, structural energy in matter is being constantly transformed into mind energy and physical energy. And conversely, mind energy and physical energy are being constantly transformed into the structural energies in matter (87). Such transformations occur in all chemical actions, whether within or external to the body. In molecular and mechanical movements there are perpetual transformations.

The movement of a hammer suddenly stopped is transformed into heat energy. Vibrations of light waves when stopped and absorbed by our bodies or any material substance are transformed into heat energy. The molecular movements which, in an electrolytic solution, are transformed into electric energy are, in a chemical test tube, transformed into heat energy. The movements of the elementary molecules in the mutual actions within our bodies, which are unceasing while life exists, are transformed into those energies, mental and physical, which are characteristic of every form of living thing. If we solder together two bars of different metals so as to form a circuit and apply heat to any part of it, the difference in temperature at the places where the two metals are joined causes an evolution of electric energy ; and a current will flow around the circuit. Thus by the mere *difference* in molecular movements of the two metals when heat passes through the places where they join, heat energy is transformed into electric energy. The immense masses of snow and ice at the poles of the earth are perpetually forming and melting away as the result of transformations of matter into energy, or of energy into matter ; water is transformed into radiant energy and ice ; ice combines with radiant energy and is transformed back again into water.

77.—*The terms "mind," "matter" and "energy" must always be relative.*

As the three ultimate factors are inseparable and correlated, the terms mind, matter and energy must always be relative ; and we can only distinguish between presentations in nature by the immediate prominence of the part played at any moment by any one of the factors, and by naming the presentation by the term indicating that factor. When matter is most evident we term the presentation matter ; when physical energy is most evident we term it energy : when intelligence is most evident we term it mind.

If one walks, runs or works quickly, we consider it an exhibition of unusual physical energy ; but in all such cases there is an equivalent exhibition of mind energy.

If one does an unusual amount of mental work, one exhibits an unusual activity of mind ; but this can never occur without an unusual expenditure of physical molecular energy.

The immediate prominence of any one factor is a constantly varying value, and may even be but momentary. There are unceasing cycles of transformations by mutual actions that are every moment changing the relative values of the three factors. What is matter at one moment may be physical energy the next ; what is physical energy at one moment may be mind energy the next ; what is a movement of light waves at one moment may be molecular movements of heat the next ; what is organic mind movement at one moment may be conscious mind movement the next ; and conversely, what is conscious mind energy at one moment may be organic mind energy the next. If we had but one line of evidence available in support of our postulate, that mind is a mode of energy—the line that connects the structural energy in food with organic mind and organic mind with conscious mind—that evidence is as amply sufficient as is the evidence of any generally accepted natural fact. But we have other weighty evidence.

The stupendous energy of gravitation is initiated by an intelligent perception (26, 27) ; energy from the sun is perpetually being transformed into the structural energies that condition the mental and physical activities of every

being that lives (8). Every movement, every phenomenon observable by man in nature, evolves from mutual actions between and consequent transformations of the three basic factors.

Mind energy, being correlated with and inseparable from the physical energies, plays the dominant part in these perpetual cycles of transformations, for all movement is initiated by some mode of perception (36). Just as magnetic and electric energies, and as heat and light, and all other movements in nature are correlated, and are mutually both cause and effect, making possible the unending cycles of natural phenomena, so mutual movements of the three basic factors are mutually both cause and effect, and condition all phenomena in nature.

This is the nearest approach we can make to a comprehension of the ultimate nature of anything whatever.

78.—*The relations between mind, heat and electric energies.*

The relations between mind energy, heat energy and electric energy are very suggestive. At every beat of the heart there are differences in electric potential. When two points on the human body, a sufficient distance apart, are included in an electric circuit connected with a delicate galvanometer constructed of a fine thread of quartz or platinum suspended between magnets, the thread will bend from side to side with each beat of the heart. The galvanometer may be a thousand yards or more away from the subject, and still the thread will sway from side to side with each beat of the heart.

There are other delicate instruments which show the correlation between mind energy and the physical energies. The dynamometer and the aerthesiometer will both register operations of mind. In such instances the explanation (?) is given in the statement that these instruments register nervous energy. But what is nervous energy? That is the question.

Every one of the infinite modes of perception which initiate the perpetually varying movements in sub-animate and animate nature must of necessity have energy of motion equal to the energy of motion in that from which they evolve.

But we cannot in accordance with the third law of motion say that they are "contrary" or "oppositely directed" for we cannot comprehensively apply such terms to movements of energy which radiate equally in all directions. Therefore mind itself, whatever may be its ultimate nature, must, in its immediate nature, be a movement of energy. For the physical energy which is transformed into mind cannot be *destroyed*; it must exist as mind energy. And the physical energy into which functions of mind are transformed and visibly demonstrated by the movements of the delicate instruments we have mentioned, cannot be *created* during the mutual actions which condition mind; it must therefore condition its immediate nature.

The electric resistance of the skin varies with the mental emotions. An electric impulse will traverse a nerve and cause muscular contraction—living movement. An electric current is largely used for diagnosis in pathology. In experimental investigations into the manner of the conduction of a nerve impulse, electric energy takes the place of mind energy.

A very important fact has come to light in these investigations. It is of immense prospective value in physical theraphy, and it also strongly indicates the biochemical nature of the mutual actions which condition what we term nervous energy. It is that the *minimum* of stimulation which will induce a nerve impulse is quite as effective as any greater degree of stimulation. We may interpret this as proving that the mutual action—biochemical—that conditions a nerve impulse has a value that cannot be altered by any difference in the degree of stimulus which starts it, because it is the immediate molecular structure of the nerve that conditions the energy of a nerve impulse—just as a minute point of heat will produce exactly the same effect upon an explosive chemical compound as any greater intensity of heat. (The heat here is regarded as the stimulus to the explosion).

Ferrier, in 1874, determined the motor areas of various parts of the cortex of the brain by applying electric energy to them. The animate energies of some fishes are partly transformed into electric energy, stored in special organs

adapted for the purpose by the intelligence of organic mind ; and may be discharged with sufficient energy to give to other animals a paralysing shock. There are insects, plants, animals and micro-organisms whose living energies are partly transformed into light. And as all living activities are expressions of mind, we see that mind energy may be transformed into physical energies—the converse of the transformation of the structural energies of food into mind energy. Thus we have ample proof that mind is a mode of energy correlated with the physical energies.

The energies of living organisms are now universally recognised as being due to biochemical actions. The chemist will tell you that light, heat, electric or mechanical energy may be produced or consumed in chemical changes. Both chemist and physicist will tell you that physical changes are always accompanied by transformations of energy.

The transformation of the food we eat into the tissues and organs of the body, into the osseous framework which supports it, and into the organic and conscious mind energy which animates it, is a continuous process of biochemical actions, which, *outside* the human body, evolve continuously changing phases of sub-organic mind, and all phases of energy movements—heat, light, electric and mechanical energy. Therefore *inside* the body the same results must occur, and the combined activities constitute the animate. For the properties of atoms are unalterable, and these properties must be carried forward with them into all structures of which they form a part (3). Electric energy evolves living movements ; living movements evolve electric energy. Food energy is evolved from atoms ; electric energy is evolved from atoms. Animate energy must be physical energy. Every time a gardener manures his flowers, a farmer his crops, or an animal ingests food, illustrates the fact that mind—which expresses itself in the activities we term animate—is a mode of energy. The amount of energy which can be expended by plant, animal, man or machine is exactly balanced by the amount of energy which is supplied to them from external sources. Neither plant, animal, man nor mechanical engine can give out a particle more of energy than is put into it.

79.—Mind has no definite value and is not confined to living things.

Mind, therefore, in the individual cannot be a something to which we can attach any definite or constant value or that is confined to man. It is of a necessity a factor that is universal. It cannot have any stability, either in form or expression ; it must be a continuously changing manifestation of intelligent energy, operating as the initiative in the continuously changing conditions in natural phenomena. We could not compare it with a lake of water, for instance ; this has some constancy in outline and some stability in mass ; it has a closer analogy with a river, which never ceases changing its form and its energy of motion.

Thus, phenomena of mind as a mode of energy take us far beyond the range of human conscious mind. We see that the mind of man, although it may have a wider range than any other form of individual being, must be but an infinitesimal fraction of universal mind, and that we must include as phenomena of mind a host of facts in nature that are now not recognised as having any connection with expressions of mind.

Phenomena of electric energy alone in relation to the living energies are sufficient and conclusive in themselves as proof that mind is an energy correlated with the physical energies.

The continuous molecular and intermolecular movements occurring in every part of our bodies in anabolism and catabolism—that building up and breaking down of animate molecules referred to generally as *metabolism*, and covering all that is meant by biochemical actions—give us all that we have of mental and physical energy. In the bones, muscles, tissues and organs of the bodily structure the sum of these movements conditions and constitutes organic mind ; in the neurones of the brain they condition and evolve conscious mind (30).

80.—Food and fuel values ; reserves of energy ; feeding with energy.

As the structural energy in fuel is set free in the furnace and is transformed by molecular movements into the energy

that drives the steam engine, so the structural energy in the food we eat, by molecular movements of the same essential nature which occur in the furnace, is transformed into the stream of energy that is constantly flowing through the living organism.

The carbon of the fuel in the furnace unites with the oxygen in the air, evolving energy and carbon dioxide ; the carbon in the food we eat unites with the oxygen in the air we breathe and evolves energy and carbon dioxide.

Food values are now universally estimated by the amount of heat energy they will evolve when they are burnt—or united with oxygen—exactly as fuel values for steam or oil engines are estimated. This one fact alone is practically proof that living energies are correlated with the physical energies. When the supply of food or fuel ceases the living machine or the primary motor ceases working—it becomes dead.

All living things have some reserves of energy in their structure. If a seed is kept so that it can absorb no energy from its environment, it lives on till its reserves of energy are exhausted, then it dies ; it will not germinate when sown in the ground. The animate movements in a living seed are probably the most feeble known to man ; some will live for years upon the minute store of energy they contain.

Broadly speaking, the higher in the scale of animate life we go, the sooner the reserves of energy are used up, and individual existence ceases by breaking down into its sub-animate elements. Many lower animals will live for months without food. Man lives only about ten days, if he ingests nothing. The delicate mechanisms that condition his conscious mind as well as his grosser structure devolve back again into the sub-animate forms of existence from which they evolved. As an individual he becomes extinct ; but the elements of which he was structured still live their sub-animate life—they are immortal—and dissociated from one individual existence, they are available to enter into another individual existence and again contribute their quota of energy to the eternal cycles of evolution and devolution of individual existences.

Every machine that expends energy in mechanical movements and every living thing that expends energy in animate movements must be fed with energy, or they will cease to move. And whatever form of energy be expended by any living thing, whether it be the energy that evolves a poem, solves a mathematical problem, or evolves a blade of grass or a tree, there is no other source from which that energy can be immediately derived than the food that sustains that living thing, the ultimate sources of energy in the food being the sun and the atom.

81.—*Mind energy and heat energy.*

Heat energy is very evidently correlated with mind energy. In the laboratory the mutual action between sub-animate substances will, other things being equal, evolve about double the amount of change per second for every rise of 10° C. in temperature; and conversely. Bio-chemical actions, equally with the actions in the chemist's laboratory, are increased by increased temperature and lowered by lower temperature. In the fevers of pathology the increased temperature causes such an intense organic mind activity in katabolism, that the individual often dies as a result of the exhaustion of reserves of energy. The supply of energy by ingestion and anabolism not being adequate to supply the energy consumed by the fever, and the medical attendant not being able to keep the temperature sufficiently low, the patient may be said to die by a rapid process of starvation, due to an abnormal expenditure of energy.

In death by exposure to cold the rate of metabolism is very much lowered by the lack of heat energy; the evolution of organic mind energy thus becomes so feeble that an effort is necessary to support consciousness; the sufferer wishes to lie down and sleep; and if not prevented, lies down and sleeps for ever. Conscious mind fails because heat fails. When help is at hand from stronger companions, what appears to be brutal treatment is often resorted to in the attempt to rouse and save the sufferer. Here the energy radiated from the body into space is greater than the energy evolved by the failing reserves of ingested structural energy.

There are many intimate correlations between heat energy and mind energy. Heat energy radiated from living things is always associated with mind energy, organic and conscious. A whole volume could be devoted to this interesting fact, and its influences in the personal attributes we term "vim," "individuality," "magnetic personality," and so on, as applied to those who have unusually strong mind radiations. We can see evidences of this something other than heat that is radiated from living things, even in the lower animals. We cannot keep puppies or kittens properly warm by applying artificial warmth to them *before they open their eyes* some days after birth. Only the radiations from the mother's body can do this. And with chickens, the warmth we give them in artificial incubators is not so *vitalising* as the warmth from the mother hen. There is a something missing that man with all his inventive skill cannot supply.

And there is something which is deeply suggestive in the fact that it is only young animals that are born blind—like kittens and puppies—which cannot maintain the normal temperature of the parent, except by radiations from the parent. All animals that can open their eyes at birth can maintain the temperature of the parent. Kittens and puppies can only do so after they open their eyes (150).

The parallelism between temperatures of animate things and intensity in expression of living activities, between the range of varying temperatures living things may be subject to, and the range of mind energy in those things, and also the physical effect of temperatures in accelerating chemical actions, are all evidences of the correlation of mind energy with heat energy.

The most intelligent and active of living things are the warm blooded animals; the least intelligent and least active are the cold blooded animals. The warm blooded animal can only live within a very narrow range of bodily temperature. Some micro-organisms may be frozen and some may be boiled in water—and yet retain life.

The intellect of man is influenced by the temperature of his body. It is no use trying to reason clearly, deeply and sequentially if you are either feverish or shivering with cold. Some cannot work mentally to their satisfaction if the feet

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be cold. And nothing is more conducive to cold feet **in** those who have not a very vigorous circulation than steady mental effort. The mental effort draws energy from the rest of the body ; the head becomes warmer, the feet colder.

Mental effort induces fatigue and hunger equally with muscular effort ; this could not possibly be so if mental energy was not correlated with the structural energies in food. Hunger is really an expression of organic mind—a demand for a further supply of energy.

We could not possibly get fagged, mentally weary or broken down by any amount of mental application if mind were metaphysical. How could any imaginary something, apart from and above the physical, get tired ? Even light energy—which is physical and can be measured—trots around the universe with unceasing energy at a pace of some 186,000 miles per second, and we have as yet had no hint of its getting tired !

82.—*Transformations of energy.*

We know that under all conditions and circumstances available to the test of experience energy is conserved ; and this conservation must be a factor in the problem of the immediate nature of mind. The transformation of one kind of energy into another without increasing or diminishing its amount is one of the most widely evident facts in nature ; it is a basic practical fact in all structural and industrial activities. We transform the potential energies in coal, oil and wood into the kinetic energies of electricity, light, heat and mechanical movements ; we transform mechanical movements into light, heat and electricity. And in all such transformations there is no loss of energy when radiations are correctly accounted for.

Clouds, wind, rain, storms, earthquakes, volcanic activity, radio-activity, chemical actions and living movements, all alike are due to transformations of one kind of energy into another ; and we have not a shadow of reason—unless our ignorance of any exact laws regarding the immediate nature of mind may be taken as a reason—for excluding energy of mind from laws that universally apply to other modes of energy.

It has taken us more than two thousand years to learn what we know to-day about the conditions that operate in the evolution and in the transformations of electric energy, the results of which we see in the electric wonders of to-day. When man perceives that mind is universal, that it is a mode of energy, and begins in earnest to investigate its immediate nature from correct premises, we may hope to learn much more than we know to-day about its evolution from physical energy and its devolution back again into physical energy.

The phenomena attending the movements of the gyroscope (42) give us a rather notable series of energy transformations. If the experimenter himself turns the handle of the electric machine which he employs to keep the gyroscope in motion we have :

- 1st The structural energy in the food eaten by the operator transformed into conscious mind.
- 2nd The energy of conscious mind transformed into the energy of muscular movement.
- 3rd The muscular movement transformed into the mechanical movement of the electric machine.
- 4th The mechanical movement of the machine into electric energy.
- 5th The electric energy into the mechanical movement of the gyroscope.
- 6th The mechanical movement of the gyroscope into perceptions of position in space—functions of mind.
- 7th The various movements of gyroscope and operator into heat energy, which radiates away into the air ; energy which becomes available for transformation into the energies that are assimilated in the structural evolution of such food as started the cycle of operations in the experimenter. And so long as the operator keeps turning his machine these transformations by mutual actions are equal, simultaneous and continuous phenomena.

All activities in nature form parts of perpetual and continuous cycles of transformations of energies, and within these cycles we are, by force of facts and by simple reason, obliged to include the energy of mind. And if there be a basis in fact for Kelvin's theory of the dissipation of energy

these cycles of energy movement will continue to that far distant period when all energy becomes so evenly balanced that all forms of movement in the universe will cease, because then there can be no differences in movement—the universe and all in it will be dead.

But this theory of the dissipation of energy is based upon the further theory that heat is the primary and dominant energy of the universe. Yet we have seen in our consideration of the possible behaviour of the two first particles of matter (26) that the movements of the greatest magnitude in the universe—the movements due to gravity—may be attributed to a mode of energy—mind—dominating heat or any other mode of energy. And we certainly have not a scrap of evidence that the total of mind energy is lessened by any form of radiation.

The energies in operation, when a star suddenly appears where no star was before visible, may be the result of activities of universal mind that may keep the cycles of energy movements in the universe going on for ever.

83.—*Mind radiates.*

Mind, as a mode of energy, correlated with other modes of energy, must radiate. If we attempt to form some conception as to what form of radiations conscious mind assumes as the stream of mental concepts flow from the brain, we come to some interesting conclusions. We know that during operations of consciousness some energy is transformed into heat; the temperature of the brain rises with intense thought; and we have reason for assuming that mind radiations bear a similar relation to mind that heat radiations have to light. There is an intimate correlation between heat energy and mind energy (81).

We have the fact in physics that radiations of light, when they strike any substance, are, to a variable extent, absorbed by that substance as *heat*. If the radiations fall perpendicularly upon the surface of a dull black object, the mutual action arising as a consequence between the object and the light instantaneously transforms practically all the light energy into heat energy. The object, when thus heated by light, in turn radiates away its heat energy; but

the instant the heat rays leave the object they are re-transformed back again into radiations of light. Thus, heat and light are mutually both cause and effect.

We cannot conceive that mind radiations can be less subtle than light radiations; and the energy movements which condition a thought must radiate in all directions in the very act of thinking the thought. And whatever be the nature of those radiations, when they are absorbed by another person who is in what may be termed a suitable receptive condition, or sympathetic mood, they are re-transformed back again into the same thought that originated the vibrations—just as heat vibrations are re-transformed back again into the light vibrations which originated them. And the recipient of that thought remains unconscious of the manner of its entry into his mind; for it is organic mind—not conscious mind—which perceives.

Conscious mind cannot trace the origin of that which merges into consciousness (30).

The fact that mind does radiate and that the concepts in the brain of one person may be transferred to the brain of another person in the manner we have tentatively outlined is very evident in the phenomenon known as hypnotism.

Man, by suitably delicate mechanism of his own contrivance, can indirectly perceive and measure the infinitesimal heat we receive from a star that is an immeasurable distance away; and it would be contrary to the known subtle operations of organic mind in man to contend that its mechanism is inferior in perceptive range to any mechanical devices he may be able to fashion. Thus we may with reason conclude that many occult phenomena now thought to be due to supernatural causes are simply physical phenomena. For it is quite reasonable to assume that mind vibrations may traverse space as rapidly as do the physical vibrations of light, and may impress themselves under some rare combinations of conditions upon some other mind a few yards or even thousands of miles away at practically the same instant of time.

84.—*Incomprehensible movements ; all movements in mutual action simultaneously evolve other movements.*

A first cause is beyond the grasp of reason. We have to take the existence of the primal factors—mind, matter and energy—as the starting point of our efforts to acquire further knowledge regarding the existing order and sequence of activities in nature ; and the fact that these three factors are coeval in time, correlated and inviolably inseparable, must form the basis of our edifice of knowledge, however extensive that edifice may become.

Every step in the evolution of conscious mind is physical ; every step is a movement of energy. No phenomenon of any kind is possible, except by some differences in movement between two or more things which simultaneously evolve some other phenomenon. We term walking, riding or any other muscular exercises physical activities ; but we cannot do these things without a simultaneous exercise and expenditure of mind energy. Reading and studying we term mental application or activities of mind ; but we cannot do these things without simultaneous transformation of the structural energy in food into the energy of mind. Even the profoundly mysterious energy of gravitation is inviolably associated with mind and matter (26). Psychologists express such truths when they say that the immediate state of consciousness is "an activity of some sort," and that all states of mind, even mere thoughts and feelings, "are motor in their origin and motor in their consequences" (3). The mutual action of two differing movements in the cortex of the brain evolves a third movement—that "activity of some sort" which constitutes consciousness. We have got down to the fact that immediate mind cannot be differentiated from movement (18). Every thought and every movement of any part of the body is conditioned by molecular movements. If we could see and follow the rapid molecular movements in a neurone, we should be able to record the moving picture of a thought, see the differing movements which shape differing thoughts, and recognise them by merely looking at the movements—even as we recognise the subject of a portrait by the differing movements of light waves which condition vision, and just as

"living" presentations are shown at picture shows by the rapid movement of non-living presentations.

The evolution of the qualities of movement which condition conscious mind is not a whit more incomprehensible than is the evolution of the quality of movement that constitutes crystals of common salt, which evolve from the united specific movements of the atoms of the green, noxious poisonous gas, chlorine, and the atoms of the metal sodium ; or, more incomprehensible than that, the simple difference of molecular movements in different metals, when soldered together in a circuit, will cause heat energy to evolve into electric energy as it passes from one quality of molecular movement in one metal to another quality of movement in the other metal (75).

In both the above instances we see three different presentations in nature as one simultaneous phenomenon—two differing movements of energy simultaneously evolving a third movement of energy ; just as differing movements in the neurones of the brain simultaneously evolve a third movement—mind energy.

All such fundamental natural facts are beyond our comprehension (19) ; but we can see that all movements must have the same essential nature, originating, as they all do, from the same three inseparable factors ; and the movements of that which we arbitrarily term "mind" must be as definitely physical in their immediate nature as any of the movements of what we arbitrarily term "energy" or "matter" in the chemical or physical laboratory.

85.—*Immediate mind energy : energy expended must be balanced by energy ingested.*

At any given moment of time every thing or being that is animate, whether plant, animal or man, is expending in some manner a definite amount of energy. And although it is impossible to state the exact amount in any given instance, the fact that this must be so is of service in reasoning out the conditions that must accompany activities of mind. We term this definite amount *the immediate mind energy.*

Every thing or being that is animate has a temperature

that differs more or less from that of its environment ; and the more animate the thing or being, the more constant is that temperature, despite differences in temperature of the environment. Even plants and trees have a temperature. This is maintained by the breaking down into energy and less complex structures the more complex structures of the food, which, in some form or another, is ingested as an inviolable necessity to all animation. For energy can neither be created nor destroyed ; whatever the amount of immediate energy expended at any instant of time, that energy must of necessity arise from transformations of the structural energies of food ingested.

So long as we remain animate we cannot stay the output of immediate mind energy ; we cannot stop thinking ; the activities of organic mind cannot cease. But we may in various ways to some extent control the total of immediate mind energy expended. Yet, whatever the amount may be, it must be supplied from sources external to the organism. Those who have a large expenditure of immediate mind energy must ingest largely the structural energy of food. Dominance in the individual is invariably associated with assimilative capacity. Other things being equal, the one who can assimilate the most food will dominate the one who assimilates less. Also the man who weighs 160 pounds will dominate the man who weighs only 150 pounds, other things being equal. For the heavier man must have a larger volume of organic mind. This is in full agreement with Einstein's mathematical deduction that the mass of a body is the measure of its energy content !

86.—Hungry children at school ; organic mind must first be served with energy.

Educational authorities have only recently learned by experience that a large waste of effort occurs in attempting to teach underfed children. Pure reason ages ago should have taught us this as an *a priori* truth. The little things have no organic mind energy to spare for transformation into conscious mind efforts ; the insufficient energy they derive from their insufficient food is all required for the animation of the basic organic movements of life. The

most fundamental animate movements have always to be first served with any energy that is available. This fact is very evident in pathology.

A coincidence. After writing the above (1925) we laid down the pen for a rest, and picking up the daily paper, we read :

"London, October 20th. Dr. Savage, Surgeon of St. Bartholomew's Hospital, declared that a child of five years was too young to commence school, as the brain was not in a condition to learn until a child was seven years old. He would refuse to allow a child to attend school until seven years of age, even if the authorities fixed the age at five years."

The attitude of Dr. Savage is very reasonable. The development of the structure that evolves conscious mind energy is the work of organic mind. If the energy of organic mind is diverted abnormally into conscious mind efforts before a certain development of the brain is reached, there is insufficient energy left for its proper and full development. Consequently, the ultimate intelligent possibilities in the child are lowered by the less complete development of the organ of conscious mind. In the case of hungry children, structures already developed lack immediate energy for full function ; in the case of children too young, abnormal use of immediate energy prevents normal development.

87.—Expenditure of energy; surplus energy; ingestion and assimilation.

Expenditure of energy is constant ; we never cease expending energy from the moment we are born till the moment we die. The amount so expended constantly varies, although at any instant of time that amount is some exact quantity. Ingestion of energy is not constant, either in quantity or in time ; and the body is provided with the means of storing away part of the energy ingested when it exceeds the immediate expenditure.

Shortly after a hearty meal there is a larger flow of structural energy (88) into the blood stream from the digestive track than is immediately required ; this is stored up in the body till the flow of structural energy from the digestive track falls below the level of immediate requirements ; then

the stored supplies are drawn upon ; and normally, when the stored energy that is easily available becomes exhausted we feel the sensation of hunger.

Hunger is an expression of organic mind, which is correctly interpreted by conscious mind as a demand for more energy in the form of food. The whole process of storing away surplus energy and bringing it forward when required is the work of organic mind (96)—that wonderful intelligence of which we remain unconscious and about which we have so much to learn. These operations of organic mind are referred to by physiologists as “ regulation !”

In man the liver acts as a store room for surplus energy flowing into the blood stream ; when the amount to be stored is beyond the capacity of the liver the excess is usually deposited in the intercellular tissues as fat. Hunger first draws upon the stores of energy in the liver ; when these are exhausted and no further supplies are ingested, then the fat deposited in the tissues is drawn upon. When we are drawing upon the reserves of glycogen in the liver, our operations of mind are functions of energy that are transformations of the structural energy in olycogen ; when we are drawing upon our reserves of fat, our operations of mind are transformations of the structural energy in fat.

We may be allowed to remark incidentally that the modern habit of eating too frequently debars the liver from exercising one of its most important natural functions, i.e. feeding the blood stream by discharging its stores of structural energy ; it is kept constantly stuffed with useless supplies of energy—hence congested and sluggish livers and the many diseases that this too constant condition leads to.

The prevalent idea that “ little and often ” is a good habit is an erroneous one. Such a course certainly keeps the system quietly and evenly running within a restricted range of activity. But it ultimately leads to restricted function and lack of reserve energy. In any machine, or in any organism, if range of movement is habitually restricted, the power of full movement is gradually but surely lost. In human beings it is a habit that must prematurely lessen animate function and resistive power against the ills that flesh is heir to. The effect is analogous to that

produced by restricted movements in those who labour too long in some particular manner—they get *muscle bound*.

Animals that live upon food that contains but little nourishment—cows and horses, for instance—may eat grass all day long and remain healthy ; their physical structure is adapted to it.

Man may live for weeks without ingesting anything except water ; many animals may live for months, some have been known to exist for years, without ingesting anything whatever—in the sense in which the term *ingest* is used. This appears contradictory to our statement that all living things must ingest in some form all the energy they expend in animate functions, whether of mind or of body. Animals that go for long periods without food are comparatively lifeless during those periods, and the very feeble expenditure of energy is fully met by a store of energy within the system.

An animal that is being hunted by a natural enemy and fleeing for its very life is drawing largely upon its reserves of energy ; and if it escapes, its animate activities will remain enfeebled until its reserves of energy are restored by the ingestion of more energy than is expended.

88.—*Structural energy ; dominant personality has unusual assimilative capacity.*

The expression "ingestion of energy" is quite correct. We eat structural energy. We should ingest the carbon, oxygen and hydrogen that structure carbohydrates and fats if we drank water and ate charcoal. But we should not ingest the *structural energy* that is added to these three elements when they are united chemically in starches, sugars and fats during the growth of the plants or animals that evolve them. This also applies to all proteids. We eat for the very purpose of obtaining this structural energy from the food we eat ; and to say that we *eat* or that we *ingest energy*, quite correctly expresses the essential nature of the act of eating or ingesting food.

Actors or orators who expend energy mentally, and athletes, who expend energy bodily, who are centres of attraction to large audiences for short periods of time, very often expend more energy in those periods than they do in

all the rest of the twenty-four hours. Consequently, such persons have invariably a physical vigour and a digestive capacity above the average. Every observant person will have noticed that the dominant energetic personality carries with it a commensurate nutritive energy.

Other things being equal, the person who assimilates the most structural energy in the form of food will dominate the person who cannot assimilate an equal amount. This may be stated as a law to which there can be no possible exceptions.

It will perhaps save trouble to some superficial readers if we draw attention to the words "assimilate" and "assimilates" in the above statement. A man cannot increase his assimilative capacity by eating more food than he can assimilate. We do not, as a matter of fact, assimilate all that we eat.

Expenditure and radiation of energy, mental and organic, is the key to the mystery of the influence exercised by what is termed a "strong personality." The dominant person cannot expend or radiate energy in larger amount unless he assimilates energy in larger amount. It is common knowledge in chemistry that no change in the chemical composition of a substance, no change in the mutual actions between differing molecules, can occur without the transformation of some form of structural energy into heat or electric energy. It is common knowledge that we eat to obtain further energy to replace the continuous output of energy by our mental and physical activities; and that the energy so ingested is utilised in the renovation of structure—anabolism, and in the breaking down of structure—katabolism. This furnishes the sum of immediate organic mind energy and conscious mind energy which is available to sustain the current of animate energy that is constantly passing through and from the body as mental and physical phenomena.

Except the energy that is absorbed in the building up of the physical system in the development of the adult, all the energy we assimilated from food must be emitted from the body as energy of movement, energy of heat or energy of mind—for although energy may be transformed, it can

neither be created nor destroyed. The volume and the character of this radiation of energy from the body determine the degree of influence we have upon others.

89.—*Physical and mental dominance.*

There are many phases of dominance. Sheer physical bulk, with its accompanying bulk of organic mind, may dominate over a smaller person with less organic mind, but with a more active conscious mind. Or one physically small may dominate a much larger person by reason of a more acute conscious mind.

A man with a good digestion and a sixteen collar can easily get into parliament—if he can talk—even if his intellect does not rise above the average, whilst a man with an intellect above the average may fail because he has not the power to assimilate energy sufficient for the expenditure required to adequately impress his hearers. For mind energy—both organic and conscious—radiates even as do all other modes of energy, and these radiations unconsciously influence an audience. In public life assimilative powers above the average are essential to success in “getting there” and keeping there; intellect above the average is not so essential—hence the well-known character of the average politician. But when by good fortune, assimilative and intellectual powers above the average are combined in the one individual, then we get the man who makes history; all the rest pass unknown into oblivion.

G. Stanley Hall in his *Life and Confessions of a Psychologist*, tells us that the world's best work has been done in moments of superb health; he cites Goethe, Napoleon, Gladstone, Bismarck, Helmholtz, Burbank, Rockfeller and Edison. To succeed, says Mr. Hall, “one must first of all be a good animal.”

The above list of names could be very largely extended. Being a good animal simply means being able to ingest and transform an adequate amount of structural energy in the form of food into the abundant stream of mental and physical energy that continuously flows from those who have supernormal health.

And, as Hall remarks, although invalids have at times

accomplished wonders (by unusual concentration of their limited energies upon a single purpose), the fact remains that the great original minds who have been supernormal in health far outnumber those who have been subnormal.

Every popular public entertainer who engages the attention of large audiences must have a supernormal flow of organic mind energy to support his large expenditure of conscious mind energy, and a corresponding supernormal nutritive energy. Energy cannot evolve from nothing.

90.—Necessity for sleep ; every impression upon consciousness is an expenditure of energy.

The universal necessity for recurring periods of sleep in all the higher animals, and particularly so in man, results from a lowering of the available energy supply below the level of the combined expenditure of conscious and organic mind—expenditure exceeds income ; and we have to sleep in order to accumulate reserves of energy sufficient to carry us through another period of conscious activity. We can stay the expenditure of energy by conscious mind—by sleeping.

These are most significant facts. They show that physical energy is necessary to evolve conscious mind ; that conscious mind evolves from physical energy ; that mind itself must be a mode of energy correlated with the physical energies ; that conscious mind must be continuous with organic mind (96), and that organic mind must be fundamental to conscious mind.

We also learn from the above facts that every impression upon the conscious mind involves an expenditure of energy ; and we can more clearly understand why the room is darkened, why we must not make a noise, and why the street is strewn with straw or tan to deaden sound in cases of severe illness. Also why the quiet of the country is so favourable to recuperation of the run-down worker in the city.

Looking at a flower, hearing someone talking, feeling a sensation of heat or cold, thinking about anything, whatever requires the attention of conscious mind, causes an expenditure of energy. And if professional nurses of the sick had sufficient intellectual grip to put this item of knowledge

into full practical application, thousands of lives might be saved annually—if only by a more rational use of fomentations and poultices. These are much too frequently applied so hot as to demand an unnecessary expenditure of energy on the part of the patient just when conservation of energy is most important. But so long as blistering does not ensue, it is wrongly thought that all has been done properly.

As expenditure of energy in the animate movements of sensation must be greater in amount when the intensity of sensation is greater (193), it is a very serious mistake to apply heat in therapeutics at a higher temperature than is absolutely necessary. *Volume* of warmth, as evenly continuous as possible, which gives a sensation of comfort is what is required; not intensity of heat which has to be resisted.

All living movements must be mutual actions, equal and simultaneous, and must operate within the laws of the physical energies. If we exclude fractions, a temperature of 118 is twice as hot as a temperature of 108 in relation to blood temperature, and will require an expenditure of *four* times the amount of animate energy in mutual action. The operations of our senses of perception are mutual actions that are equal to the energy in that which we perceive. The animate energy that acts mutually with external energies must be equal to that external energy. And as all energies are subject to the law of the inverse square, if we halve the intensity of a light, or a noise, or a hot application, only one quarter the amount of animate energy is drawn upon in the functioning of a perception. Hence the value of the dim light and freedom from noise in the sick room.

91.—*Organic mind more fundamental than conscious mind.*

In pathology there are many evidences of the fact that organic mind is more fundamental than conscious mind.

We can see that in the evolution and devolution of the individual, organic mind is the first to appear and the last to disappear. Conscious mind is always absent at birth (30) and it always departs before organic mind, when the individual ceases to exist. In normal death, in senility, the individual grows weaker as the normal supply of energy grows less, as a consequence of enfeebled metabolism due to

degeneration of structures, and this continues up to a certain point, when unconsciousness supervenes, because there is not an inflow of energy sufficient to support the expenditure of both conscious and organic mind. The position is analogous to that when we fall asleep (193). But the organic mind still carries on with the reduced income, and consciousness may even return after an interval, just as it returns to normal persons after sleep, because the inflow of energy when consciousness has not to be supported accumulates sufficiently to support another period of consciousness. After the last flicker of consciousness has died away the conscious life of the individual may be said to cease; but organic mind and organic life may continue for some time after. Death cannot be considered to have occurred till these organic activities cease; and the body becomes cold because the physical biochemical actions have ceased evolving the energy that is necessary to individual existence.

Conscious mind always dies before organic mind. The organic mind in an animal may still be observed to be active hours after the animal has been cut to pieces. This may be seen in the movements of the heart muscles. By being kept in suitable media at a proper temperature, the organic mind and life of a part of an individual may be continued even years after the rest of the individual has died and been buried.

When we ponder over such facts and realize that conscious mind, from genius downwards, is essentially the same thing and continuous with organic mind, and that organic mind evolves from the physical energies, we begin to see clearly that all phases of mind cannot be other than modes of energy correlated with the physical energies. Conscious mind energy evolves from organic mind energy; organic mind energy evolves from food energy; and the structural energy in food evolves from the energies in the sub-organic.

92.—Problems where reason is useless to us.

We cannot achieve any satisfactory concept regarding the fundamental nature of the activities starting from the perpetual energy of the atom, that lead continuously upwards to the activities of conscious mind in man. But we can see

that in some manner the movements in this continuous chain of mutual actions are inviolably associated with, and conditioned by, the degree of complexity in structure of the infinitely varied substances that are evolved from varying combinations of atoms. For throughout all nature increasing range in mind function runs parallel with increasing complexity in structure.

The fundamental units of mind as represented by the varied perceptions of the atoms (36) are all carried forward into the structures of which they form a part ; and the more complex a structure becomes, the more complex and the more varied as a *necessity* must become the perceptions and consequent range of mind function.

When we observe and reflect upon the incomprehensible results of differences in structure and function that follow the joining of atoms together in chemical union (18, 19), we cannot help seeing that our reason is useless to us in the direction of understanding how the coming together of different elements and substances results in the evolution of mind energy ; but we have no difficulty in perceiving the fact that it does so, or in perceiving that we must accept that fact as a natural truth, although it is incomprehensible to us—even as we accept the results of chemical actions as natural truths, although they are equally incomprehensible to us.

The truth that the range of perceptions or functions in the sub-animate increases with complexity in structure and continues increasing while structures still increase in complexity, and so pass in unbroken sequence into the animate, is as adequately proven by observation as are the truths regarding the results of the chemical union of the elements. And it is needless for any sceptical reader to ask : " How can such a thing be possible ? " We cannot possibly know HOW ; no man will ever know this. We can only draw attention to the many observed facts that prove it to be so.

93.—The infinite variations of function possible to the elements that structure man.

There is no substance, thing or being, that can function in any manner except as conditioned and by virtue of that

which is innate in it. Every different element has an atom or elementary molecule that differs in structure from those of every other element. These differences in structure have of necessity differences in function (144). There are at least sixteen different elements known to be present in the structure of the human body, and the number of possible variations in structure and function of the differing primary molecules and the aggregates of molecules that may be evolved from them are infinite in number.

The number of elements that are actually present in the human body is really unknown. There may be twenty or more—it is well recognised as very probable that elements may be present in the human body in amounts too minute to be detected. This makes it possible, and even probable, that no two human beings in the countless millions that have existed have ever been exactly alike. It also makes possible that infinity of variation in the expressions of conscious mind in man that begets our wonder and admiration.

Included in the sixteen different elements that are always present in man's structure are those that are capable of the most definite allotropic modifications; those that are the most versatile in their affinities or functions; and those that are the most energetic in their mutual actions (120). These exceptional elements amongst the ninety or more known to us, have not come together to form the crown of evolutionary development by pure chance only. They are there because of their versatility and energy; because only the most accomplished of the elements *could* evolve, by the versatility and energy of their atomic functions, nature's highest achievement in evolution—that complexity in structure and that range and subtlety in function found in the physical mechanism that conditions the energy of conscious mind in man—the brain.

CHAPTER VI

CONSCIOUS MIND CONTINUOUS WITH ORGANIC MIND

94.—*Conscious mind ; organic mind ; consciousness universal.*

As mind is continuous from its highest manifestation in man to its lowest in the monatomic elements, its varying values must be infinite in number ; just as the gap between the highest and lowest manifestation of any other mode of energy may be divided into an infinite number of parts. It is not possible, therefore, for language to furnish distinctive terms indicating each separate value of mind.

The many varied terms that have come into common use as indicating varying phases or values of mind energy are too indefinite or vague in meaning for our purpose in this volume. And since there have as yet been no definite terms introduced, indicating the distinctive ranges of mind energy we have to refer to, we have perforce to introduce two new terms—organic mind and sub-organic mind.

Thus, we divide mind into its three most distinctive ranges of activity :—

1. Conscious mind—In man and the higher animals.
2. Organic mind—In all that lives—man, animal, or plant.
3. Sub-organic mind—In all matter sub-animate.

The sense or meaning we give to these three arbitrary divisions of mind is precisely that which we give to the three arbitrary divisions we commonly use in relation to values of temperature—cold, warm, hot. Heat is essentially the same thing, no matter how high or how low be its value. Mind is the same thing, no matter how high or how low be its value.

Universally man is credited with having mind, no matter to how low a value that mind may reach. The great gap between genius and the lowest intelligence in man is bridged

by continuous and imperceptibly diminishing values ; and we have no evidence whatever that diminishing mind values cease at the lowest exhibited by man. On the contrary, we have abundant evidence that they still further decrease, that no movement or presentation in nature is possible without the functioning of some value of mind (26).

In thus making conscious mind in man one of the three arbitrary divisions of universal mind, it must be clearly understood that we do not withhold the attribute of consciousness from the other two divisions of universal mind. If mind is universal, consciousness must also of necessity be universal, and all values of mind must have a consciousness that is proportionate in vividness to the intensity of mind energy.

We make the conscious mind in man and the higher animals one of the three divisions because it is so evidently the range of mind activity that he is most intimately acquainted with and is the most important personally and philosophically ; and we hereinafter refer to it for the sake of brevity as "conscious mind." We have no reason of authority whatever to limit conscious mind to man and the higher animals, except that we cannot comprehend the nature of the existence or the manner of consciousness in the organic ; or in the feebly animate and the deeper sub-animate.

If we limit that which is possible to within the range of human comprehension a host of accepted truths must be denied because we cannot comprehend them. We cannot comprehend the ultimate nature of conscious mind, of matter, energy, electricity, magnetism, gravitation or even the nature of the organic mind activities within our own bodies by reason of which we live. It were as unreasonable to deny that we live because we cannot comprehend the ultimate nature of living activities as to deny other than our own consciousness because we cannot conceive the manner of consciousness in other things than ourselves.

Facts within common knowledge show that there exist, even in man, phases of consciousness that his own conscious mind cannot conceive the nature of. A person born blind cannot conceive the nature of the consciousness we term

sight ; a person born deaf cannot conceive the nature of the consciousness we term sound.

It is impossible for us to place any limit to range of consciousness ; and we can only apply to our investigations into the immediate causes of manifestations of mind such reasoning upon facts within common experiences and knowledge as we apply to other facts in nature. And if true reasoning upon such facts indicates a universal consciousness, we must accept that universal consciousness as we do the many other phenomena in nature, whose ultimate natures are beyond our comprehension. Such a course leads us to the conclusion that every one thing in nature, animate or sub-animate, possesses an intelligence and a consciousness of a value sufficient for the necessities and conditions of its existence ; otherwise it could not exist ; and the lowest values of such consciousness must be, in a sense, analogous to the low heat values in such substances as will boil away into vapour by absorbing the heat in a block of ice (43).

95.—Multiplicity of terms. Intelligence and reason.

A multiplicity of terms of an indefinite nature applied to activities of the same essential thing, however useful they may be in imaginative literature, tend, in basic problems, to obscure the truth. The very proper use of a term is to indicate a something as definitely as possible ; and when a large number of terms, each of which is assumed to define a something definite, are applied to that which is one and in its very nature indefinable, a chaos of impressions, rather than intelligent conception, must result.

Conscious mind in man is indicated by the terms perception, sensation, consciousness, imagination, memory, thought, sense, intelligence, will, intellect, reason, joy, sorrow, and many others. Not one of these phases of mind activity are possible without conscious mind. We cannot separate sensation or perception from consciousness ; we cannot differentiate between sense, intelligence, intellect and reason. We cannot even draw a definite line between reason and unreason. What one reasonable man thinks reasonable, another reasonable man thinks unreasonable. Alienists differ as to where sanity and insanity meet. Even

in idiocy the subject must have a reason for what he does, although his reason may be an idiotic one. And, for aught we know to the contrary, any one of the phases of conscious mind which are indicated by the many terms above mentioned may be experienced in some manner of varying intensity of mind, in both the animate and the sub-animate. When organic mind is distressed during sleep by the presence of unsuitable food it is usually expressed by the modicum of conscious mind—which is always present, even during the soundest sleep—in unpleasant dreams in which *fear* is the factor. This is a very strong indication that organic mind has not only a consciousness of its own, but an intelligence. It really seems as if the organic cells were afraid for their lives because of the character of the food pabulum supplied to them. Intensity of organic mind function is transformed into an unpleasant intensity of conscious mind.

It is generally admitted that animals have some intelligence; it is also generally assumed that animals cannot reason. But one cannot have any intelligence unless one has a modicum of reason. And if animals have intelligence, they must certainly possess some power of reasoning. If any act of an animal evidences intelligence, that act must of necessity be a reasonable one; for if it were not a reasonable act it could not be an intelligent one.

Reason has an infinity of values. Mathematicians can reason out truths that cannot be comprehended by persons of lower mind capacity. Yet, no matter how low a value of reason any man possesses, he is credited with having a divine capacity that elevates him above the level of the lower animals. But this difference between the highest and lowest value of reason in man is greater than the difference between the lowest in man and an intelligent animal (60). And we should have equal warrant in asserting that the most intelligent men had a divine gift of reason that placed them in a creation apart from human beings with a lower value of reasoning capacity.

96.—*Organic mind has functions beyond the range of conscious mind.*

Contemporary psychologists are now fully aware that operations of mind extend beyond the range of conscious mind in man; that mind cannot be defined in terms of consciousness, but must be defined in terms of "behaviour" (41). "Behaviour" in psychology is continuous with "regulation" in physiology; both are evidences of the operations of mind of which we remain entirely unconscious. In our three arbitrary divisions of universal mind these manifestations of the activities of mind in living organisms that are beyond the grasp of our conscious mind are included in the term *organic mind*.

The inviolable continuity existing between conscious mind and organic mind is a fact of supreme practical importance; and when properly appreciated may lead to developments in the betterment of conditions of life such as would seem incredible to us to-day. For organic mind has a host of accomplishments and functions that are impossible to conscious mind; and it has a wide range of intelligence that is beyond the range of comprehension; yet conscious mind may be so brought to influence it that we may indirectly, through conscious mind, determine that organic mind shall do that which is impossible for conscious mind to do directly.

The mutual influence of mind upon body and body upon mind has long been recognised, especially in pathology; but no systematic and particular study has been devoted to the immediate nature of the simultaneous mutual action that is unceasingly operating and influencing the functional values of conscious and organic mind.

In auto-suggestion such influences upon organic mind are referred to as being due to *sub-conscious* mind; in medical practice they are vaguely alluded to as evidences of the influence of mind upon the body, or the influence of mind in disease. In faith cure they are referred to the supernatural; and at spiritualistic séances effects traceable to the influences of mind upon mind are referred to spirits of the dead.

Organic mind covers such terms as—unconscious mind, subconscious mind, unconscious cerebration, dreams, supernormal perception, subliminal perception, unconscious mem-

ory (Butler), biotic energy (Moore), intuition (Bergson), psychic force in spiritualism, regulation in physiology. It has a range of activity far deeper in scope than the conscious mind of man, and an intelligence and a consciousness of a quality that man cannot comprehend.

The difficulty in grasping the conception that there are phases of conscious intelligence within us of which we always remain unconscious is really no greater than we experience if we attempt to conceive why our eyes are unconscious of what we hear, and our ears unconscious of what we see.

Baudouin, in his *Suggestion and Auto-suggestion*, speaking of the subconscious says :—

"The sub-conscious (the term does not mean an *inferior* or *subordinate* consciousness, but a '*hidden consciousness*' ; a consciousness that lies at a lower level than the familiar consciousness of everyday life) is comparable —to use Pierre Janet's simile—' to the deeper geological strata ; those covered by the superficial and visible stratum to which latter our ordinary consciousness may be compared. The subconscious is a storehouse of *the memories* that have lapsed from the ordinary consciousness, of the wishes and sentiments that have been repressed, of the impressions of a distant past. But it is very far from being inert, for it contains in addition the subsoil waters which are unceasingly at work ; it contains the suggestions that will well up into the open after their hidden passage.' This is all imagery, but it serves, better than pure abstractions, to convey some notion of the complex reality we have come to recognise in the subconscious."

What Baudouin here refers to as subconscious mind is our organic mind. In one sense it is "at a lower level" than the familiar consciousness of everyday life, for it is the foundation upon which the conscious mind of man is structured. In another sense it is above that level, for it has the intelligence necessary to evolve that physical mechanism which alone makes conscious mind in man possible. Conscious mind does not, and cannot, construct the brain ; that is the work of organic mind. The newly-born child is a complex of living organs, all evolved by organic mind, yet it possesses

no conscious mind—except that unknown quality of consciousness inherent in the organic of the existence of which it never becomes conscious.

97.—*Evolution of conscious mind ; influences in food.*

Our conscious mind evolves from the mutual action that is constantly proceeding between the movements of organic molecules in the blood stream and the movements of organic molecules in the brain cells that function conscious mind. At any given moment of time conscious mind and organic mind have a certain combined character of intensity and volume, the sum of which we term the *immediate mind* (85) ; and this immediate mind is always changing in value ; a slow and constant change during growth and decay of the physical mechanism ; quicker and more irregular changes through altered blood structure, due to differences in diet.

Every person doing mental work requiring intense concentration knows quite well that certain articles of food are incompatible with good work. The diet that suits one best is one that produces a blood structure which functions most perfectly and energetically with the physiological units of body and brain. Most persons who write and study much soon discover the kind of diet that the best results can be evolved from. The athlete or the prize-fighter diets himself so as to evolve the largest possible flow of organic mind—physical energy. But it is from organic mind that conscious mind evolves ; so that even in mental work, dietetic " training " will give the best results.

Such facts prove that the character of immediate mind in normal persons arises from the physical—the immediate elemental structure of the blood. How widely known is the common fact that the introduction of a little wine into the blood stream at once alters the character of immediate mind ?

When the structure of the brain is sub-normal—as in idiocy—the mutual action between blood and brain cannot evolve rational conscious mind.

How could such things be, if mind, as is so commonly believed, were a something apart and distinct from the physical ?

98.—*Organic mind constructs the mechanism of conscious mind.*

Organic mind came into existence millions of years before man's conscious mind. It came into existence at that moment in evolution when the more complex structures of elements that we term animate evolved from the less complex structures of elements that we term sub-animate ; and a vast period of time then elapsed in nature's laboratory before the progress of evolution evolved the individual conscious mind of the higher animals.

Man's conscious mind originally evolved from organic mind ; it continuously evolves from organic mind to-day. The marvellous and subtle intelligence of organic mind is indicated by the fact that it actually constructs the wondrously complex physical mechanism in man that functions consciousness—the brain. Every part of every individual that lives is evolved under the guidance of organic mind. The conscious mind of the greatest living genius cannot construct a single living cell ; man cannot even imagine HOW he thinks ; he cannot comprehend the nature of the activities within his own body, by virtue of which he exists. All such things come within the range of the activities and intelligence of organic mind. Man's conscious mind, his intelligence, his reason, and all the activities these express, depend upon, are conditioned by, and evolved from, organic mind.

The range of mind activities that come within the meaning of organic mind embraces all the varied activities that control the physiological units—the cells, and all the varied animate organs structured by the cells, whose co-operative activities evolve the stream of energy that conditions individual life. Thus organic mind is the dominant energy in the evolution of the individual and of the hereditary tendencies of the individual. And all these wonderful powers of organic mind may be guided and influenced by conscious mind to an extent yet unknown. The inviolable continuity between conscious and organic mind makes this possible ; and we have overwhelming evidence that such an influence is in unceasing operation in every conscious individual.

Practical results are being obtained to-day of the possibilities of this influence in auto-suggestion and in faith

healing ; but we are only just beginning to be dimly aware of the extent and value of the services it may render ; we are yet far from an adequate knowledge of the conditions necessary to fully secure those services. This is very evident in the lack of pre-natal control over hereditary character. Our knowledge in this direction may take centuries to increase largely—even as it has taken over two thousand years since the discovery of electric energy to acquire a knowledge of the conditions necessary to make so full a practical use of it as we do to-day. When organic mind becomes fully recognised as an energy that may be influenced and even directed under certain conditions by conscious mind ; when this natural fact draws as much attention from original investigators as was devoted to electric phenomena, we shall no doubt have some astonishing developments. A great bar to progress is presented by the fact that we have no means as yet to measure intensity or volume of mind energy, such as we have to measure other modes of energy. We can only hope that somehow this difficulty may be overcome.

99.—*Organic mind in "regulation" ; intelligent energy.*

An exhaustive study of the activities of organic mind would fill a large volume. Within our own bodies it is continuously doing things that are beyond the possibility of achievement by man's conscious intelligence. If we are heated from within, we are cooled from without ; if we are cooled from without, we are heated from within ; thus maintaining the constant temperature that is necessary to our well-being. If we cut ourselves or break a bone an unusual activity and a re-arrangement of material at the injured part follows till the injury is repaired. If a poison finds entrance into man or animal, organic mind immediately commences to produce substances to neutralise that poison. If a dog is fed upon starchy food it will produce digestive juices that are rich in enzymes that digest starch ; if you change its diet to meat, it will produce juices rich in proteid digestives. If we ascend from low levels to higher altitudes, the air becomes more tenuous, and less oxygen is supplied to the lungs ; but organic mind at once proceeds to produce more red blood cells, in order to provide the system with the

necessary oxygen. If we rise but a hundred feet, organic mind will evolve about ten thousand more red cells per cubic millimetre of blood.

It is impossible for man to check the operations of organic mind or stay its functions of intelligence ; he is obliged to *see*—if his eyes are open—the activity is beyond his control. And it is the same with what are termed *instincts* in animals—a term invented to cover ignorance. They are movements of organic mind intelligence that must occur just as they do occur, and cannot occur otherwise. Just as we see when our eyes are open just what we see—and cannot see otherwise.

Amongst lower organisms we meet with some remarkable instances of the wonderful powers of organic mind. If we cut a polyp into two, the organic mind in each separate half sets to work and builds up a complete individual, and we have two where we only had one. If the head of an earth worm is cut off, the organic mind of the worm will construct a new head complete in all details. Cut the tail or a leg off a salamander, and a new leg or a new tail will be produced. There are fresh water worms that cut themselves into two as a natural process, and the head part grows a new tail, and the tail part a new head. We may cut the root, branches and leaves of some plants into hundreds of pieces, and the organic mind in each piece will evolve a complete plant.

If a clerk with his soft hands leaves his desk and takes to farm work with spade and hoe, the organic minds in the animate units—the epithelial cells forming the skin which covers the palms of his hands—perceive at once that they require more protection from external influences, and immediately commence to thicken the outer horny layer that protects them. The clerk develops a hard horny layer on the palms of his hands many times thicker than ever grew there before. This is the work of organic mind. The conscious mind of the clerk cannot do it ; he does not understand anything about the matter. All the science in the world cannot explain the essential nature of such operations ; but we can plainly see that they are determined by an intelligent energy.

If reason does not accompany other activities of mind

than those within the arbitrary and narrow range we term conscious mind, how then does a worm that is cut into two *know how* to grow a new head upon one half and a new tail upon the other? The same question could be put regarding an infinite number of problems in evolution and reproduction. How does a cow know how to produce a calf? It is certainly not by conscious mind. To say such things are "natural" is to say nothing; for everything that is, is natural. Is it not self-evident that there must be a conscious intelligence guiding these wonderful activities; and is it not self-evident that this conscious intelligence goes beyond the range of the possibilities of that conscious mind with which we are so well acquainted?

The above-mentioned phenomena of organic mind, and many others that could be mentioned, are indicated in physiology by the term "regulation," the immediate nature of which is considered one of the most difficult of problems. But, if we view the phenomena from the position we take regarding the continuity of mind, we see mind to be what it really is, a universal intelligent factor, expressing itself as conscious mind, organic mind and sub-organic mind; then the way is open to a luminous conception of the basic nature of "regulation."

Investigators are more and more impressing upon us facts which could not be except upon the conditions of continuity between organic mind and conscious mind. We read of the "education of oysters" (Prof. Gardiner); of "cells that are teachable" (Dr. Albert); and of microbes "acquiring a capacity" (Dr. Topley). In the acquisition of knowledge nothing exceeds in value a true conception of the ultimate factors to be reckoned with in any phenomenon we are studying.

100.—*Continuity between conscious mind and organic mind.*

The continuity between conscious mind and organic mind may be most definitely recognised and studied in man where we find conclusive evidence showing that, whilst life continues in the individual, conscious mind is constantly under the influence of, and modified by, organic mind, and

organic mind is constantly influenced and modified by conscious mind.

In the structure of man and the higher animals there are two distinct systems of nerves and two distinct systems of muscles. One system of muscles is controlled by conscious mind ; we may use them or not as we please. The other system of muscles is controlled by organic mind ; we are unconscious of their movements, and have no direct control over them. Such movements include the beating of the heart and other vaso-motor movements of the circulatory system, peristaltic movements, muscular movements within the eye, etc.

One system of nerves—the sensory or afferent—transmit to the brain, where they appear as conscious presentations, those organic mind impressions or movements that condition perceptions (18). The other system of nerves—the organic or efferent—convey energy impulses of which we are unconscious to the organic muscles, causing movements of which we remain quite unconscious.

Thus the very structure of our bodies is adapted to the activities of our two arbitrary yet distinctive phases of mind, conscious mind and organic mind ; and that they are continuous and influence each other is shown in many ways.

The conscious mind energy involved in the attention necessary to hearing a question and replying to it must of necessity be continuous with the organic mind operations that occur on the lines of communication between the ear and the brain and between the brain and the tongue. The conscious mind involved in deciding that we will take a walk cannot be otherwise than continuous with the organic mind energy that comes into play as we step out.

All the fibres of both sensory and organic nerve systems lead to and ultimately meet in the brain, in an inextricably complex network of cells and nerve fibrils ; and thus the brain becomes the "central exchange" for messages to and from all conscious and all organic mind activities in the body.

The brain is therefore an organ of unconscious or organic mind, equally as it is an organ of conscious mind. And here in the brain must occur that continuous transformation of organic into conscious, and conscious into organic mind,

which, both under normal conditions and under abnormal conditions, cause the many mysterious phenomena in regulation and in psychism that puzzle us to-day.

When we expose ourselves to severe cold, we know nothing of the bustle of activities in the intelligence and executive departments of our organic mind system in consequence of the imperative demand for an increase in the production of heat. We cannot understand or imagine the maze of inter-communications between, or the range and subtlety of organic mind exercised by the millions of our organic cells whose co-operative activities convert the food we eat into the energies of organic and conscious mind.

Take a slice of bread in your hand. Look at it. Think about it—deeply. Can you, by any operations of your intelligence or reason, evolve courage, resolution or ambition out of it? Can you by any effort of conscious mind transform that piece of bread into the mind energy necessary to solve a problem, play a game of golf or make a mental calculation? All the science and intellect in the world cannot do it. But eat it—eat it—and the organic minds in the cells of your organs of nutrition and assimilation, co-operating with the organic minds in your brain cells, will transform it into the mind energy necessary to do any one of these things. We cannot admit the marvellous activities of organic mind without being impressed with the utter incongruity of associating such intelligence with unconsciousness. Organic mind must have a consciousness and an intelligence that, in its own range, goes far beyond our conscious intelligence. If one lung is destroyed by disease, the remaining one, if it be sound, will commence to do double duty. If one kidney is removed, the one left will take upon itself the work of two, and rapidly increase in size. If three-fourths of the thyroid glands be removed, the remaining portion will avert the death that would follow entire removal. White blood corpuscles—the phagocytes of Metchnikoff—defend our bodies from the intrusion of harmful forms of life by killing and eating them. When flesh is cut or a bone broken, the phagocytes gather about the cut or break and prevent any intrusion of micro-organisms that would cause injury and prevent healing. There is an

organic intelligence in our bodies that is constantly working to keep us healthy, even though we consciously do things that are prejudicial to health. In every way possible for anything animate to demonstrate the possession of consciousness and intelligence organic mind so demonstrates their possession. It is really ridiculous in man to think that he alone possesses all of the conscious intelligence that exists or is necessary in the infinitely vast, varied and incomprehensible activities in nature. This appears especially so when we consider that he does not even know how he thinks. The entire human race and all that has or ever will happen to it are but infinitely trivial and momentary incidents in relation to the immensity and duration of the universe. And that universe must have infinite resources of all the energies and attributes that condition all existences.

101.—The expenditure of immediate mind energy.

The total of immediate mind energy in any animate being is the sum of its immediate conscious and organic mind energies (97). Conscious mind cannot function except upon organic mind as a basis for its evolution and expression. At every moment of time we have a definite amount of immediate mind energy. When we feel lazy after indulgence at the dinner table it is because the organic mind energy necessary for digestion draws largely from that immediate energy, leaving less available for the activities of conscious mind. When we cannot eat on account of mental excitement, it is because the immediate mind energy is so largely drawn upon by consciousness that we feel we cannot supply the necessary organic mind energy for digestion.

The physical mechanism of the heart is controlled by organic mind, and we cannot by mere conscious effort alter the rate or energy of its beat; yet unusual effects upon conscious mind are transformed into effects upon the organic mind controlling the heart, and excitement may cause the heart to beat quicker or stronger, or mental shock may cause it to cease beating.

The breathing mechanism of the lungs is normally controlled by organic mind, but we can modify its activity by

act of conscious mind ; we can breathe faster or slower, deeply or more shallowly, or even stop breathing for a short time. We have thus proof that conscious mind may influence functions of organic mind.

The act of deglutition is performed by conscious mind, and that conscious mind movement is absolutely and of necessity continuous with the unconscious organic mind activity that carries the food through the digestive track—the peristaltic movement.

We cannot, normally, by exercise of conscious mind so influence the organic mind of the structure of the stomach as to eject its contents ; yet the conscious mind effect of an unusual sight, such as a ghastly wound, will so influence it that its contents may be promptly ejected.

The young lady cannot consciously control the calibre of the capillaries in her cheeks ; that is determined by organic mind ; yet effects upon the conscious mind may cause them to contract or dilate, and she pales or blushes. She cannot consciously produce tears ; but the conscious mind may be led into channels of thought that will influence organic mind to produce them.

In pathology we meet with many instances that prove the mutual influences that organic and conscious mind exert upon each other. The numerous cases of "shock" during the great war, when all kinds of abnormal mental conditions resulted from physical causes, make this truth very evident. It gives much trouble at times to the physician in diagnosis, particularly in the hydra-headed activities of hysteria. Such influences also give the very substantial basis, in fact, for the results obtained by the Christian Scientists, who believe in "faith cure" ; for the sometimes most remarkable results obtained by physicians who utilise the condition of hypnosis for making useful impressions upon organic mind ; and for the results of auto-suggestion as practised by Coué and his followers.

102.—All forms of energy radiate ; mind radiates.

All modes of physical energy radiate ; and we may *a priori* deduce that mind, being a mode of energy, must radiate (83). The facts in hypnotism prove that this is so.

Mind radiates even as heat, light, or electric energies radiate ; and we are but just beginning to learn how to turn this fact to advantage.

The operator in hypnosis may act directly through the organic mind of his subjects without consciousness on the part of the subject regarding what the operator may be trying to do with him. The conscious will of the operator is transformed into the unconscious will of the subject ; or, in other words, conscious mind in the operator is transformed into organic mind in the subject. It is being done every day by physicians, who induce hypnosis for curative purposes ; and also by entertainers, who do it to amuse an audience.

The facts in hypnosis demonstrate that mind radiates and is continuous between individuals—although there is no consciousness of such a connection ; that no person's mind can be strictly individual ; and that every person's mind is continuously and unconsciously intermingled more or less with radiations from other minds in proximity.

We thus get a grasp upon a reasonable foundation for the cause of " panic " in crowds ; for the savagery of normally peaceful men during the excitement of war ; the rapid spread of absurd crazes in habits and cults ; herding instinct ; and for an understanding of the cause that leads us to the recognition in some persons of that power of attraction which we term " personality " or " personal magnetism." The strongest minds radiate the strongest influence, but they affect us in no perceptibly conscious manner ; the effect is too subtle to be defined. That this is so agrees with what we have already stated—that perceptions are functions of organic mind, and that we have no conscious knowledge of what we touch or see until the organic mind impression of the sense organ has been transmitted to the brain, and there transformed into consciousness (30). As we cannot possibly be conscious of the conscious mind in others, the only manner in which mind impressions from other persons can reach our own consciousness is by means of our own organic mind ; and, as a consequence, it cannot be differentiated from the mind that originates within ourselves.

Fear, in disease, is a form of auto-suggestion that can act with direful effect, retarding recovery, and even leading to a

fatal issue. Epidemics are more widely spread by fear of contagion. In India the high mortality from snake bite is largely due to fear. A savage when told by his medicine man that an enemy has stolen his heart will almost assuredly die. Pointing a bone at his enemy is one of the most dreadful things an Australian aborigine can think of in the way of revenge. In the South Sea Islands it is not uncommon for a robust man, as a consequence of some deep vexation, to lie down and say he will die, and he does die ; sometimes on the very day he has decided that he will die !

All such instances as the foregoing demonstrate the influence of conscious mind upon organic mind, made possible by the inviolable continuity that conditions all phases of mind activity.

103.—*Perception by organic mind precedes conscious mind perception.*

We do not see or hear by conscious mind. The cerebral centres in the brain transform into conscious mind the organic mind perceptions of our five senses. If the optic nerves that connect the eyes with the optic lobes in the brain were cut across, blindness would instantly result, although the eyes and optic lobes remained uninjured. The eyes themselves, we cannot help concluding, would continue to see so long as they remained structurally normal, but there would be no consciousness of what the eyes saw. Organic mind perceives before we are conscious of perceptions, for it takes *time* for the movements that condition a perception to be transmitted to the brain centres and there transmuted into a conscious phenomenon ; even as it takes time for an electric movement to travel along a metal wire.

Organic mind from a portion of the body may be cut off by accident or disease from communication with the brain ; and consciousness is lost in relation to that portion, although organic mind still remains active in the portion so cut off. A person may be quite unconscious that he possesses feet or hands so far as any conscious sensations from them are concerned. By injury to the spine he may be quite unconscious of the existence of the lower half of his body ; yet organic mind in the parts affected will continue to receive

the same impressions of touch and environment, although it is impossible for them to reach the brain and be transmuted into conscious mind impressions.

By concussion of the brain a person may temporarily lose all consciousness of existence ; yet organic mind will keep the living mechanism in order until connection with the brain again becomes normal and he awakes to conscious life again. All such well-known facts indicate that the two distinctive phases of animate mind have distinctive physical structures as a basis. This distinction of structure that accompanies each distinctive phase of mind function is a fact of some importance, to which we shall have occasion to refer further on.

104.—Effects of organic mind upon conscious mind.

Equally with evidence of the effects of conscious mind upon organic mind we have evidences of the effects of organic mind upon conscious mind. The organic mind in the cells of a disordered liver expresses its feelings through the conscious mind by sensations of depression or ill humour. The cells of the whole body, when supplied with a little alcohol, express their feelings through the conscious mind by a sense of exhilaration ; any abnormal condition of any part of the body gives an abnormal character to the organic mind of that part ; and this must have its influence upon conscious mind. It cannot be otherwise, since the basis of conscious mind is organic mind. It is well known to-day that an organic disease in the brain of the notorious Lenin was the primary cause of the death of thousands of Russians.

H. Addington Bruce, in his *Psychology and Parenthood*, quotes authentic instances where the moral character in growing youths was entirely altered by the removal of abscessed and impacted teeth. Trivial physical defects, adenoids, enlarged glands, eye and ear troubles, will cause children to be morally and mentally backward. The diseased organic mind of the diseased organs exerts an influence that depresses the evolution of healthy conscious mind.

When an animal upon a hot day strolls to the shelter from the sun afforded by some convenient tree, it is obeying the

desires of its millions of organic cells—they will be more comfortable in the shade. When a man eats in response to his conscious sensations of hunger, he is obeying a call from the organic mind in his communities of cells for a fresh supply of energy. The conscious mind in both cases interprets the perceptions of organic mind, just as it interprets in terms of consciousness the perceptions of our five senses.

The prospective mother, at times, receives impressions from organic mind that are wondrously subtle. She has to provide nutrition for both herself and the rapidly developing child. Her assimilative resources are taxed to the utmost. For the proper development of the child certain definite quantities of a number of definite elements are absolutely necessary. If, in her average dietary scale, one of these elements is lacking in quantity, she first begins to feel unsatisfied with her food, and longs for something, but does not know what it is. Soon, however her organic mind, by its insistent impression upon her conscious mind, indicates what it is she requires. Thinking over this and that, trying to arrive at some dish that will relieve her unsatisfied longing, she suddenly and most surely knows what it is. And it does not matter how unsuitable it may appear to be for a person in her condition, it almost invariably turns out to be just the right thing. The only rational explanation in such cases is that the conscious mind correctly interprets the messages that organic mind impresses upon the brain (218).

Coindet, of Geneva, reflecting upon the fact that persons suffering from goitre got into a habit of eating the ashes of sea sponges, was led to use iodine in such cases—and with good results. Earth eating, or geophagia, and the habit cows acquire of chewing bones, point to impressions made upon conscious mind by organic mind, indicating substances containing molecules that are lacking in quantity in the daily food.

In certain forms of so-called "nervous disorders" there is a lack of normal correlation between conscious mind and organic mind. In hypochondria the subject often shows a distinct inability to transform conscious mind into the organic mind energy of muscular effort. In hysteria we see

conscious mind transformed into organic movements in a manner uncontrollable by the subject. In such cases it seems quite clear that a persistence of some duration in a divergence from normal healthy habits of mind and body have caused derangement in the very citadel of the living mechanism.

All this leads us to a recognition of the fact that each one of the individual organic cells in the complex animal organism has a consciousness and an intelligence of its own. We have a large number of cells in our bodies that differ in structure and function ; and each differing cell requires some difference in the nature of the nutrient molecules which it absorbs to furnish the energy for its specific activities. For instance, the cells of the liver must require a pabulum that differs from the pabulum required by the cells of the brain ; the cells of the pancreas require a pabulum that will not satisfy the thyroid. When the food ingested lacks a sufficiency of the particular nutrient molecules necessary to any particular organ, we can conceive the individual cells in that organ expressing their dissatisfaction by a lowered or an abnormal function. And as all of conscious mind arises by transmutations of organic mind, it must in some degree be affected by any difference in the character of the organic mind from which it arises. The individual cells in the complaining organ *know* what it is they require ; for millions of years such cells have normally been supplied with and utilised a sufficient proportion of the nutrient molecules now lacking ; and the manner in which they indicate to conscious mind the particular food that contains an abundance of the required molecules is but one of the incomprehensible wonders of organic mind.

105.—Organic mind effects in pathology. John Wesley.

In pathology many striking instances are seen of this amazing organic mind intelligence. Patients sometimes have an intense longing for some particular food that the medical attendant has prohibited as harmful ; but the patient cannot resist the temptation to eat it when opportunity offers—result, immediate improvement ! How the organ involved managed to indicate to conscious mind just

the particular food that contained a sufficiency of the needed nutrient molecules, it is impossible to say ; we can only rationally connect the result with an activity of organic mind.

A gentleman, seventy years of age, became seriously ill. He refused to see a doctor, being strongly prejudiced against average medical practice. But his sufferings became so severe and he was such a trouble to his family that he at last consented to be taken to a sanitorium. The medical officer in charge examined him, and stated that there was a large internal growth ; that he had sought assistance much too late ; that no treatment could be of any service ; and that it was very doubtful if an operation would be of any use. He could stay at the sanitorium if he pleased as a guest, but that he would be given no treatment, as it would be useless. Asked if it was a malignant growth, the medico would not say, but was of the opinion, considering the old gentleman's age, condition and symptoms, that it was so.

The next day the old gentleman sought further advice from a specialist, who, after a physical examination, told him that he had a large growth involving all the principal internal organs, originating probably in the pancreas ; that an operation would be useless ; that he "*considered it his duty to inform him that he had not long to live,*" and advised him to set his affairs in order as soon as possible.

The old gentleman then took the case into his own hands, and had nothing more to do with doctors. He decided he would go to a seaside resort, where he could indulge *ad lib.* in a diet consisting mainly of fish, oysters, and oranges—these being three items of food for which he had a decided craving. He reasoned that, as cancer—like rheumatism—occurs more frequently as age advances, it was very probable that—like rheumatism—cancer was a nutritive disorder.

That is now five years ago, and the old gentleman to-day has no evidence of disease about him, and is as healthy and vigorous as most men of his age. No sort of a crisis occurred during recovery ; he slowly and imperceptibly got well.

That old gentleman is now writing these lines, and the growth above mentioned delayed the publication of this volume more than three years.

Here again we see evidence of the intelligence of organic mind as impressed upon and correctly interpreted by conscious mind. There are many complex activities of organic mind intelligence constantly operating within the body of which we always remain directly unconscious. The organic mind of the body elaborates its own "drugs"—the hormones—stores them, and liberates them in definite places as required. If these hormones are, from some cause, deficient or improperly distributed, diseases of a serious nature result. But this does not happen without some alteration of the impressions that organic mind is constantly making indirectly upon conscious mind. If we can correctly interpret such impressions, all the better; but if we cannot, we may still powerfully influence by auto-suggestion any attempt by organic mind to return to normal function.

John Wesley, the founder of the Wesleyan Church, wrote a small book on *Primitive Physic*. In that work he gives an account of what happened to a farmer who was supposed to be dying of dropsy, which is well worth noting here. The farmer was, by medical authority, restricted to a small amount of liquid daily, his normal drink being "home brewed," which was forbidden. His medical attendant at last gave up all hopes of his recovery, and told the wife she might as well let him have anything he wanted to eat or drink, as there was no hope of saving him. When the wife told her husband he could have anything he wanted, he immediately called for a quart of home brewed—and another—and another. He got drunk on good beer, and recovered! We have not in this case any direct evidence that there was a distinct organic mind impression upon conscious mind regarding any particular desire. But the immediate demand for beer points to this conclusion. It is reasonable to suppose that the beer provided correct molecular movements necessary to put the organic cell activities to rights and so cured the dropsy. We would not have quoted this incident upon a less authority than that of the famous John Wesley.

106.—*Organic mind effects in mediums. Auto-suggestion.*

It is when organic mind is more than usually dominant, as a consequence of the semi-conscious or very faintly conscious condition of mediums, when practically all of the immediate mind energy is available for its operations, that the many mysterious happenings occur that have led to the popular belief in spirits. As the medium of any unusual exhibition of its powers is quite unconscious of its activities—which often range beyond the powers of the medium's conscious mind (102)—witnesses of the phenomena, seeing and hearing evidences of things for which they can ascribe no reasonable cause, are easily led to believe them due to some supernatural agency.

The fact that we have no conscious perception of the functions of organic mind or of the influences that conscious mind exerts upon it also leads Christian Scientists into the delusion that it is faith in their religious dogmas that cures the sick. In the cases we have mentioned of abnormal organic function being brought back to normal by the influence brought to bear upon it by conscious mind there is not a scrap of evidence of any supernatural agency.

In the remarkable results obtained in auto-suggestion a religious faith in anything supernatural is quite unnecessary. The practice of auto-suggestion simply expresses a more practical and definite appreciation of the facts, so long dimly and vaguely known to physicians, that the mental condition has an influence upon the physical condition and the physical condition has an influence upon the mental condition.

Louis Rénan, after a most careful and exhaustive investigation of the results of differing treatments for tuberculosis, formulated the following statement as a truth :—

“ Every new method for the treatment of chronic tuberculosis, provided that it is harmless, will give satisfactory results.”

Any new treatment gives the patient renewed hope, and this effect upon conscious mind is sufficient to cause an improvement in the organic mind activities concerned in the disorder. It is the failure of organic mind energy in the cells upon which the dreaded bacillus thrives that permits

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it so to thrive. With normal organic energy they could not exist. Millions of persons every day draw tubercular bacilli into their lungs and are never any the worse for it ; the normal and healthy micro-organisms that structure the lungs will not allow the invaders to live and thrive.

107.—*Thyroid glands.*

Probably the most convincing example of the correlation between organic mind and conscious mind is furnished by the nature of the activities of the thyroid glands and their influence upon conscious mind in man. We are not conscious even of the existence of these glands within our bodies, yet if by disease the thyroid secretion becomes insufficient, the normal intelligent activity of conscious mind may be reduced to a state of dullness or torpor approaching idiocy. But we can restore the intelligent activity of conscious mind by the administration of pills made from an extract of thyroid glands of sheep, or by eating the glands themselves. Organic mind in sheep may be transformed into human conscious mind ! Sir William Osler, speaking of the results of thyroid treatment, says :—

“ We can to-day rescue children otherwise doomed to helpless idiocy ; we can restore to life the hopeless victims of myxoedema, a triumph of experimental medicine, for which we are largely indebted to Sir Victor Horsley and to his pupil Murray. . . . unparalleled by anything in the whole range of curative measures. Within six weeks, a poor feeble-minded toad-like caricature of humanity may be restored to mental and bodily health.”

Gley, a prominent French observer, remarks that the results show that :—

“ The genesis and the exercise of the highest faculties in man are conditioned by the simple chemical action of a product of secretion, a fact which should be born in mind by psychologists.”

We are indebted to Prof. Benjamin Moore's *Origin and Nature of Life* for the above quotation.

Thus we are led to the unavoidable conclusion that the organic mind in the thyroid glands of a sheep has the same essential nature as the organic mind in the thyroid glands

in man. For organic mind in sheep may be transformed into man's conscious mind—intelligence and reason ; indicating to that extent, at least, the truth of our postulate that all mind is one and continuous.

108.—*Organic mind never tires, never sleeps.*

So far as our knowledge of the immediate nature of mind extends, it appears that organic mind never tires, never sleeps, but is for ever incessantly at work in the individual organism. In the individual the supply of immediate energy must first be drawn upon for the purposes of the basic organic mind that keeps the organism alive. Conscious mind is more or less vigorous in proportion to the excess of immediate energy available in the organism above that which is necessary for the activities of organic mind. During our waking periods we expend energy by conscious and by organic mind activities at a rate a little in excess of the rate at which our metabolic activities evolve it ; and when the reserves of energy acquired during the previous period of recuperation in sleep become exhausted we require another period of sleep in order to again acquire a reserve of immediate energy to support conscious mind through another period of wakeful activity.

Although conscious mind requires periods of rest in sleep, it appears, even in the deepest sleep, never wholly to cease to function. The mother who will sleep soundly through much louder sounds will awaken at her baby's faintest cry ; the engineer of a ship at sea will wake up instantly if his engines cease running. The ever wakeful organic mind keeps some little corners of conscious mind always awake.

Memory is a function of the unceasing activities of organic mind, and enters largely into dreams ; further on we devote a chapter to these phenomena.

CHAPTER VII

ORGANIC MIND CONTINUOUS WITH SUB-ORGANIC MIND

109.—*Undetectable movements ; indefinable structures.*

All forms of energy, whatever their nature, extend from a maximum that cannot be defined to a minimum that cannot be defined. The minimum is not only below direct perception by our senses, it is also below indirect perception by means of any instrument of delicacy yet produced. We can indirectly perceive radiations of such a feeble nature that the amount of energy involved is insufficient to enable the mind to function a definite concept of the amount ; just as in the opposite direction we deal with distances and magnitudes so vast that it is impossible for human mind to grasp definite concepts of them. No human mind can grasp a definite concept of the vast abyss that is bridged by the "light year" of the astronomer. We cannot grasp a definite concept of the amount of energy we receive from a star that comes to us across that vast abyss. But we have instruments that can measure it, and the physical mechanism of our eyes can enter into equal energy of mutual action with it and give us a consciousness of its existence.

So with mind energy ; its most feeble manifestations are movements of a value so minute that we cannot form any definite concepts of them. All physicists to-day are quite certain that radiations of energy so feeble as to be beyond detection by the most delicate instruments are ever at work and exerting an influence upon the grosser material in nature. Animate individual structures diminish in size till we cannot perceive them directly with our unaided senses ; we have to enlarge them with the microscope before we can see them ; but even then we cannot reach the limit in minuteness of living things. We are quite certain that living individual structures exist that cannot be objectively

perceived by any means yet known. Pathologists often refer to effects produced by ultra microscopic organisms. There are many of these germs that no man has ever seen—individual living things so small that they can pass through filters designed to prevent micro-organisms from passing through.

If animate organisms exist so small as to be beyond our powers of definite conception, how inconceivably minute and weak must be the humble organic mind that animates such organisms ? Yet the organic mind that does so animate them must be inviolably continuous with the organic mind in man.

Down among these invisible organisms and among the many remarkable substances that have animate properties and are essential to living activities, the hormones, opsonins and vitamins, one at least of which the chemist can now make artificially (64) from non-living or sub-animate elements, we are actually within that indefinable region of molecular activity where the complexity of animate structure evolves without break in continuity from the molecular activities of less complex sub-organic structures ; the difference being merely one in the range and character of mutual action between differing elementary molecules.

110.—*Evolution of organic mind ; iron ; carbon dioxide ; sulphur.*

It is self-evident that in a very complex structure of atoms such as an organic proteid molecule, which contains more than a thousand atoms, the sum of organic mind energy and the range of organic mind function must be greater if we increase the number and variety of the atoms that structure it ; for we must have in every molecule a cumulative effect of the specific properties of all the varied atoms which enter into its structure. Atoms and sub-organic molecules have perceptions (36, 39), and consequent sub-animate movements ; these build up the proteid molecule, which has that wider range of perception and function which we term organic mind. Thus mind is perfectly continuous from the atom to the organic mind in living substance.

The animation in a sub-organic molecule, or in the animate organic molecule, is not directly evident to our senses of perception ; it lies far below the range of the most powerful microscope. But we can see the effects of their movements when they are assembled together in the large numbers that are necessary to the structure of the smallest visible animate organism ; and we term this cumulative activity of a mass of sub-organic molecules living movement, i.e., life.

If we expose a bright surface of iron to the influence of the atmosphere a mutual action between the metal and oxygen immediately commences upon every part of the bright surface. This movement cannot be seen, either directly or indirectly ; but it is continuous movement, and after some time has elapsed we can directly perceive the cumulative effect of the movement in the dulled surface of the metal ; it is covered by a film of oxide of iron. Here again we see how mutual action, equal, simultaneous and continuous, merges into cause and effect ; the mutual action between the oxygen and the metal is the cause of the effect of dullness on the metallic surface. This continuous process of oxidation, this sub-animate movement which is beyond our powers of perception, and which we know of only by its results, is of essentially the same nature as the living movements within our bodies from which we derive the energy necessary for our mental and physical activities ; and, equally with the rusting iron, we only know of these movements by the results of the continuous and imperceptible mutual actions going on incessantly within us.

Oxidation is a slower process, but it is of the same essential nature as burning ; hence the energy value of food is estimated exactly in the same manner as the energy value of fuel for a furnace ; it is determined by the amount of heat evolved by burning. A grain of iron that slowly rusts into oxide evolves exactly as much heat as a grain of iron that burns quickly, and with such intense heat and brilliance, in oxygen gas. And a grain of fat that is dropped into the fire evolves exactly as much energy as is evolved from it within our bodies in the bio-chemical processes of nutrition.

The properties of the atom being fundamental and unal-

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terable, it follows that the mutual actions upon each other of the atoms in the organic molecules which structure the body must be the same in essential nature as the mutual actions upon each other of similar atoms outside the body, and that living functions and activities are essentially the same genetically as the functions and activities of elementary molecules in the laboratory of chemist or physicist. Hence it is possible to-day for the chemist to manufacture substances having exactly the same properties as living substances within the living body (64). When the iron in the red blood corpuscles absorbs oxygen from the air in the lungs it is doing exactly what it would do in a chemist's test tube, if it could be placed there under similar conditions.

Carbon dioxide is produced in the tissues by the oxidation of the fuel we ingest as food, exactly as it is produced by a lighted candle or in a furnace, as a means of evolving light energy or heat energy. When the blood, in its movement through the body, encounters the molecules of carbon dioxide in the fluids and tissues, it picks up these molecules—from which no further energy can be derived—and carries them to the lungs to be expelled from the system.

Every elementary and every compound molecule within a living body contributes its own quota of specific animate energy to the sum, which constitutes the whole of the animate energies, mental and physical, of that body; and the lack of any one of the physical properties of the molecules would result in the death of the individual. If iron would not rust, if carbon would not burn, if hydrogen did not have an affinity for oxygen, not a living thing known to man could exist on the earth to-day. We see that man's very existence and the existence of all other living things is conditioned by mutual actions between fundamental elements that are essentially activities of sub-animate life. We are obliged to conclude that all activities in nature have a common genetic basis; that the organic is continuous with the sub-organic; that so-called "dead" matter is continuous with living matter.

We can now fully appreciate the profound significance of Rutherford's statement that "the properties of the atom

must explain the properties of all more complicated structures"; for it involves the conception that mind and life evolve from the fundamental mind and life in the atom. An atom is the unit of mind and life in the sub-animate; the living cell, a complex structure of atoms, is the unit of mind and life in the animate.

The properties of elementary molecules being unalterable, the mutual actions between carbon and oxygen, between oxygen and iron, or between any other two or more elements, whether they occur in a living body or in a chemical test tube, must be exactly the same in essential nature. Sulphur is one of the elements that is always present in the structure of the human organism; present because it has properties which are necessary to human existence. This element has a keen perception or affinity for the element hydrogen. One molecule of sulphur unites with two molecules of hydrogen and evolves a molecule of the gas hydrogen sulphide. This gas is valuable to the chemist by reason of its wide capacity for mutual action with other elements. It has an offensive smell like rotten eggs; it is poisonous when inhaled or absorbed into the system. It occurs free in nature, in volcanic gases, in certain medicinal waters, and is evolved by the putrefaction of animal matter. It also occurs in the intestines of unhealthy persons, especially after eating eggs or cheese, giving the dejecta a most offensive odour. If sulphur is applied to the skin *externally*, hydrogen sulphide is evolved; if the skin is torn or cut, and the sulphur comes in contact with the raw flesh, a mutual action may occur with the evolution of sulphurous and sulphuric acids, and these may cause severe irritation.

In the formation of hydrogen sulphide in the intestines and in the formation of sulphurous and sulphuric acids by mere contact with the flesh, we have *animate* "behaviour" of the sulphur that is exactly the same as the "behaviour" of sulphur in the chemist's test tubes. It mutually acts with other elements, or "behaves" in the same way, whether in association with animate or with sub-animate matter. And as we can only determine an activity of mind in terms of "behaviour" (41), if mind is the actuating energy in the one case, it must be so in the other case. When the unalterable

mutual actions of the elements occur in our bodies they are termed *animate* or *living* functions ; when they occur outside the living body, they are termed *inanimate* or material functions ! Why ? An infinite variety of mutual actions occur within the living body amongst the sixteen or more different atoms of the elements that enter into its structure ; and the sum of the energy of these mutual actions constitutes the life of the individual. But they must be essentially of the same nature as those that occur between the same elements outside of the body ; and if they are living activities inside the body, they must be living activities outside the body.

III.—*Sub-organic and organic evolution.*

A more intelligent conception of the continuity between organic and sub-organic mind may be grasped if we take a brief survey of the probable course of events that must have followed each other during sub-organic and organic evolution and we may thus attain a more comprehensive view-point. We see to-day in the heavens that systems, suns, and worlds evolve from nebula or fire mists. These, cooling down through æons of time, gradually assume more definite and solid forms. In the process of cooling the earth's fire mist slowly devolved and simultaneously slowly evolved ; first, into the varying forms of the elements ; second, into aggregations of elements ; third, into liquids ; fourth, into solid matter. All that we term evolution is equally and simultaneously devolution ; no form of existence can appear or be evolved unless there is an equal disappearance or devolution of some other form of existence. The sum of mind, matter and energy remains constant, and the existence of the universe eternal.

As the various atoms of matter appeared, they mingled and united with each other, impelled by that sub-organic mind which is inherent in their structure (26), and evidenced by their perceptions, which are commonly referred to as their "affinities" or their "properties." Thus different substances came into existence.

During the infinitely slow and continuous cooling through immense periods of time the continuously lowering energy environment constantly offered opportunity for the evolu-

tion and existence of new forms of substances, having structural energy which balanced the immediate energy of their environment ; and these, by union wherever possible with those previously existing, evolved other substances, thus continuously extending the possible variety, complexity and functions of substances in nature.

Intensity of energy environment on earth has, from the beginning, been slowly but constantly lowering, and is certainly still getting lower. It is very probable that elements existed in the beginning which have since disappeared from the earth, because the energy tension in their structure made them unstable in the much lower energy environment that in course of time followed that in which they were evolved. Even to-day elements are slowly devolving and evolving simultaneously into other elements having less energy content ; they are "bursting," as it were, with their own structural energy because the energy environment of to-day is much lower than it was when the radioactive elements were first evolved ; they have become unstable under a low external energy pressure. Many elements to-day must be disappearing whose radiations cannot, or have not yet, been detected ; other unknown elements are probably coming into existence that could not evolve under an energy environment greater than exists to-day. But these movements are of necessity so infinitely slow, and the quantities involved so infinitely small, that we cannot yet obtain any objective evidence of their existence. Our conclusions here are in perfect agreement with the fact that the atoms of the radio-active elements are the heaviest of all known atoms, and with Einstein's conclusion that the mass of a substance is the measure of its energy content.

Vacuum tube phenomena are the exact converse of radio phenomena. Radio activity is a phenomenon of devolution—matter is resolved into energy and matter. In the vacuum tube we have evolution—matter is evolved from energy and matter. Radio-activity is a slow continuous process ; but in the mutual actions of the elements in the chemist's laboratory there always occur rapid transformations of energy into matter, or of matter into energy. But these

incomprehensible transformations have always been hidden under the expressions "evolution of heat," or "absorption of heat." When oxygen unites with hydrogen there is a large amount of atomic energy instantly set free.

When the crust of the earth became sufficiently cooled, water made its first appearance on earth ; and when, after probably a long interval of time, it came to a sufficiently low temperature, it became possible for the more complex animate activities to evolve from the less complex activities of the sub-animate ; for water is the most versatile substance known to the chemist ; it has a wider range of activities, physical, chemical and electrical, than any other known substance, and it has the greatest capacity for specific heat of any known substance ; it is the highest genius amongst sub-animate substances, and is therefore the very substance best adapted to continue the movements of the sub-animate into unbroken connection with movements of the animate, and to form, as it does, about three fourths of the weight of all that lives.

But all these changes through all the vast periods of time were of necessity continuous ; every order of nature at any period in evolution presents a set of conditions which are the effect of, and continuous with, previous conditions ; and the cause of, and continuous with, succeeding conditions. The movements we term animate must of necessity have evolved from and been continuous with the movements we term sub-animate ; and it is quite evident that the basic nature of the first animate activities would be continuous with, and of essentially the same nature as, the sub-animate activities from which they evolved, any difference being but a change in degree—not any change in nature.

That this is so is evidenced by the evolution of the animate from the sub-animate, that continues unceasingly in the countless millions of living things to-day, in the eternal cycles of the evolution and devolution of individual being. Animate vegetation is to-day constantly evolving from the sub-animate—or sub-organic—soil, air, water and solar energy ; man and other animals are continuously evolving from the vegetation.

112.—*Perpetual evolution and devolution.*

Assuming the universe to be eternal all phenomena in nature must be embraced in the unceasing, mutual equal and simultaneous activities of evolution and devolution. Every action in evolution must be balanced by an equal action in devolution. The universe appears as an infinitely vast cycle of continuous and unceasing evolution and devolution, which embraces an infinite number of lesser cycles—from solar systems covering æons of time down to the ephemeral cycles of lowly living things of a few hours duration.

In our own bodies there is an unceasing evolution and devolution; our energies, mental and physical, all arise from the devolution of the structures we ingest as food; our metabolic processes break down these structures and we use up in evolutionary activities the structural energy thus set free. Our finger and toe nails, the external layer of the epidermis, that is constantly peeling off the surface of our bodies, the enamel on our teeth, the hair that we shave off the chin and the barber cuts from our heads, are all dead (?) matter, intimately connected by continuous intermediate states with the actively living cells that produce them; evolution and devolution, mutual actions, equal, simultaneous and continuous, connect the living and the non-living.

Oyster shells *grow* from small shells into large ones, equally with the animate oysters within them. The structure of shell and oyster is continuous. The molecular movements which condition the growth of both are continuous. But we cannot, within the common meaning of the term, say that an oyster shell is "animate." Where then does the "animate" cease, if oyster and shell are continuous in movement and structure?

These instances alone are sufficient evidence in support of our postulate that animate and sub-animate, organic mind and sub-organic mind are essentially the same, differing only in *degree* of animation actuating their movements. For the atoms that structure the dead (?) portions of nails, skin, hair, or shell are all as lively and active as before they were assimilated into animate function. They have only

ceased to co-operate in function ; their properties are unalterable, their activities are perpetual.

That "all life comes from previous life" is a truth, but not in the sense commonly attached to this expression, as though all animate life came from animate life ; as though life was a fundamental existence, and not a mere term, indicating the more complex activities we term animate ; but in the sense that all animate life comes from sub-animate life in the sub-organic ; from the immortal life and activities in the atom. And as living activities are but expressions of mind, the differing values in our three arbitrary divisions of mind : conscious mind, organic mind, sub-organic mind, are absolutely continuous ; the sub-organic being represented by the fundamental and specific activities within the atom, each distinctive atom having distinctive and specific values of the three inseparable factors, mind, matter and energy.

113.—*Properties of atoms unalterable.*

We cannot by any means known to science alter in the slightest degree the fundamental nature of any atom. This is so well recognised that the discovery of radio-activity has not in the least affected the permanence of the atom as the basic fact upon which the science of chemistry securely rests. The fact that the heaviest of the atoms are slowly breaking down into energy and other atoms of less energy content and of lower atomic weight, does not affect the fundamental nature of the atom itself. So long as an atom exists its properties are unchangeable. Radio-activity is a property of atoms.

If we take atoms of an element from a piece of ore that has lain for millions of years a thousand feet below the surface of the earth, atoms of the same element from a meteorite that has fallen to the earth after existing for unknown millions of years in the depths of space, or atoms of the same element from a cell in the human brain, we find those atoms and their properties are exactly alike and undistinguishable one from the other. All atoms, except the stupid and inert monatomic, may be induced by the chemist to enter into a large variety of compounds ; may be subjected to the most

intense heat and passed through any form of violent treatment that man may conceive for as long as he pleases, yet they all will maintain their integrity of structure and their properties unaltered. The monatomic gases may be subjected to the same treatment without any result, the chemist cannot combine them with other elements. These elements have but one phase of sub-organic mind—the perception for mass only—and are therefore the least intelligent things in nature.

Every different kind of atom, except the inert monatomic, has perceptive functions that differ, and consequent "behaviour" that differs, from that of all other atoms; and these lowly functions of sub-organic mind are carried forward with every atom that enters into a compound molecule, and must of necessity give those molecules a wider range of sub-organic mind activity—they must be more intelligent. But the nature of this intelligence must of necessity be of the same essential nature as that of the more simple intelligence in the individual atoms of which it is structured.

114.—Universal movement indicates universal intelligence.

As compound molecules increase in complexity with increasing number and variety of the atoms that structure it, the intelligence in the compounds, as exhibited by their "behaviour" in movements acquires a wider range than that in the less complex compounds, but still the essential nature of this intelligence cannot be in any manner altered; it is only a difference in degree, not in kind. And this increasing intelligence keeps pace with increasing complexity in structure; until its expressions of activity become visible as animate movements and we have demonstration of the fact that mind expresses itself as movement (16). But this expression of mind energy made visible by movement is absolutely the same in essential nature and is continuous with the expressions of mind in the sub-organic, which have movements below visibility. The sub-organic, electromagnetic movements that condition light, air movements that condition sound, molecular movements that condition heat, movements that constitute olfactory and gustatory perceptions (18), electronic movements that condition electric

energy, are all invisible movements. By the mutual actions that occur as a necessary consequence of these movements impinging upon the animate body more complex movements come into play, as the perceptions of our sensory organs. These sensory movements and perceptions are strictly analogous to the simultaneous third factors that evolve in the mutual actions between sub-animate elements. Common salt is the simultaneous third factor evolved in the mutual action between sodium and chlorine. And just as the molecular movements in common salt are continuous with the molecular movements in sodium and chlorine, so movements of perception in the animate are continuous with movements in the sub-animate. The division between the living and non-living is purely arbitrary ; it has no actual existence. It may be placed anywhere in a long sequence of substances that are continuously increasing in complexity and range of movement. All that has movement has animation.

Everything in the universe is in contact, directly or indirectly, with everything else, and everything in the universe is in perpetual movement in mutual actions. The earth is in contact with the sun through the streams of solar energy and gravitational energies that connect them, and thus movements in the sun have a constant influence upon movements on the earth. The same is true, to a less extent, in relation to every star in space. As everything is in movement, and as everything is in contact, all things exert an influence upon each other. Universal movement is universally continuous ; animate movements must be continuous with sub-animate movements ; universal movement indicates universal animation—life.

115.—*Man's limited range of perceptions.*

It would be unreasonable to suppose that man, with his very limited range of perceptive senses, should be able to conceive the infinite variety of perceptions that must result from the infinitely varied character of the possible fortuitous contacts and consequent mutual actions that occur in nature.

Man can only be conscious of a small number of sensations that occur in the infinitely varied mutual actions that are

incessantly occurring in his own body. His range of conscious perception is limited by his five senses ; and his range of comprehension is limited to concepts that he can build up from the experiences of those five senses (35). There are an infinite number of organic perceptions within him of which he remains for ever unconscious.

When we reflect upon the facts that every conscious mind perception evolves in the brain from simultaneous mutual action (19, 29) ; that everything in nature is in perpetual mutual action, and that every movement must be initiated by some mode of perception (59), we cannot do other than conclude that there is a phase of perception in all mutual action, and therefore a consciousness in nature beyond our comprehension. For that consciousness cannot come within the range of the experiences of our five senses, and we cannot therefore build up any conception regarding its nature (33-35).

116.—Anthropocentric tendencies ; origin of the terms "living" and "dead."

It is the very impossibility for man to comprehend any consciousness other than his own that has so easily led him to the egotistical and anthropocentric conclusion that the things which he in ignorance arbitrarily terms "inanimate" or "inorganic" cannot possibly have perceptions, and consequent consciousness—mind.

If the structure of the eye can see, but not hear or taste ; if the structure of the ear can hear, but not see or taste ; if the structure of the taste buds can taste, but neither see nor hear ; what is more obvious and rational than to assume *a priori* that amongst an infinite number of different structures in the host of animate and sub-animate things there must be many other modes of perception of the nature of which we can form no conception ; and that all forms of structure must have some mode of perception and consciousness unknown to man ?

Difference in intensity of expression of mind energy in movement has given us the terms "animate" and "inanimate." When one could see a thing move, it lived ; it was alive ; it was animate ; when the thing did not move, it

was dead—inanimate. The range of *one* sense of perception—human vision—put a limit on the possibilities of living activities! And the terms “animate” and “inanimate” are kept in use, just as though it was a proper and correct thing to limit the range of nature’s activities to within the range of our limited perceptive senses! It is absurd for man to confine activities in nature either to those within the range of human comprehension or within any arbitrary divisions of his own invention. If he does so it will be for ever impossible to correctly co-ordinate many of the most common and familiar phenomena in nature.

117.—*Terms that mislead.*

The average mind becomes warped in its conceptions by the use of terms that express untruths, and is led unconsciously to accept as facts, concepts that have no existence in reality. We say that a vessel is empty; it is full of air. We speak of a vacuum; it is filled with an electro-magnetic and a gravitational field of energy. We speak of still water; it is in inconceivably rapid and perpetual movement. We speak of the inanimate; we know of nothing that is inanimate. We speak of life as though it had a concrete existence; it has no concrete existence. We speak of death; but nothing really dies; it is but the individual being that ceases to be individual. The “company” of molecules of the elements, operating as a co-operative individual being, dissolve the partnership. The individual elements that formed the company cannot die, cannot lose their individual existence. They all live on, every one of them, as intensely alive as ever, and after dissolving partnership in one individual being they are ready and available for taking a share in the living activities of another individual being. For the atom is a veritable organised system of mind, matter and energy that expresses itself in an amazing and continuous activity.

The effect upon the mind, from childhood upwards, of terms that mislead in basic meaning must have a retarding influence upon the realisation of true conceptions when maturing intelligence attempts to grasp fundamental realities. We speak of “up” and “down”; yet there is

neither up nor down in the universe. The fact that man formerly believed that *up* and *down* were actual in universal direction probably long delayed a true conception of the movements in the solar system. For it was supposed that the result—if the world turned completely round on its axis every day—would be that man and all things on the earth's surface would be turned with the earth, upside down; and everybody and everything would fall down, down—. Therefore the authorities (?) agreed that the earth could not possibly revolve. And Galileo was imprisoned for saying that it did so!

118.—*Volume and intensity of the energies.*

With mind energy, as with the physical energies, we have infinite variation, both in volume and in intensity. We may have large volume with small intensity; small volume with great intensity; or any number of intermediate values.

If we add one volume of water at 30° temperature to an equal volume at the same temperature, we get twice the volume of water and twice the volume of heat; but the *intensity* of heat energy in the water remains the same—30°.

If we attach one battery cell to another in the manner termed "parallel," we merely add to the *volume* of electric energy evolved; we do not add to its intensity. But if we attach the two cells in the manner termed "series," we get no increase in *volume*, but we get twice the *intensity* of electric energy.

In like manner, we get increased *volume* of atomic mind when atoms are brought together *mechanically*; and increased *intensity* when they are brought together *chemically*.

This analogy appears the more significant when we consider how closely the nature of electric energy approaches to that of mind energy (78). Every different kind of atom added by chemical union to any other atom or atoms increases the range or intensity of mind functions in the structure evolved; and it is thus that structures, by increase in the number of different atoms that condition them, rise up from the sub-animate and merge without break in continuity into the activities we term animate.

No matter what the quantity of the same substance may be, its intensity or range of mind function remains the same. A ton of water has no greater range of affinities or perceptions than a single drop ; but the volume of these activities is immensely greater. And so it is with a grain of iron, and a ton of iron, or of any other element or substance. No matter how minute the quantity of any element or substance, it has exactly the same intensity of perceptions, or affinities, as any larger quantity. The smallest particle visible to the eye may have millions of elementary atoms in so complexly organised a structure that it functions with a mind intensity greater than is possessed by a bulky animal. This helps us to understand how the wonderful intelligence in ants and bees may evolve from their microscopic brains. The chemist to-day makes practical use of the fact that the smallest possible quantity of any substance has the same qualities of function as any larger quantity ; and by the evidences of these activities he can determine the presence of an infinitely small portion of an element when diffused through a large quantity of other substances. Many a criminal has been made to suffer for his crime by evidence based upon the unalterable nature and intensity of sub-organic mind functions in the atom. A very minute quantity of arsenic, for instance, may cause death. This minute quantity may remain for years buried and spread abroad in the dead body ; but no change whatever occurs in the atoms of the poison. The expert chemist can collect it again from the decomposed body.

The whole of mind in the energy of universal gravitation is infinitely greater in volume than the mind in a drop of water ; but the mind in that drop has a wider range. For the energy in gravitation has but one perception—that for mass only (26) ; the drop of water not only has perception for mass ; it has a very wide range of other perceptions. Thus the drop of water may be said to have more intelligence than the immeasurable volume of universal gravitation.

The sum of the perceptions of the elements oxygen and hydrogen is very small, compared to the wonderful range of perceptions that give to water its incomparable value. And so it is with other elements. The mutual action between

any two elements involves the simultaneous evolution of a third something (50), that has a range of perceptions exceeding the sum of the perceptions of the elements from which it evolved. This is why we find mind values in all living things, invariably increasing with increased complexity in elemental structure ; it is a matter of necessity—it cannot be otherwise.

Three fourths, approximately, of all the living things that exist, is water. Water has a host of animate properties—living functions—which are evolved by the union of the sub-organic mind in atoms of oxygen and hydrogen. Chemists can evolve these living functions by synthetically evolving water from the two gases—they can artificially manufacture a substance having properties of life, and to that extent at least they manufacture life. Yet the multitude to-day look upon the problem of the immediate nature of life as unsolved, and unsolvable ! It is "mind" that remains an unsolvable mystery ; there is no such "thing" as "life" (57).

Naturally, it will of course be objected that water *per se* is only a medium ; that it does not possess life, but is an instrument, as it were, employed by some mysterious vital entity. But there is nothing really rational in such an objection. It is on a par with the ridiculous idea that life was brought to this earth from some other worlds in space. There is no necessity whatever for referring the evolution of life either to anything extraneous to our planet or to any mysterious vital principle—unless we assume mind to be this mysterious thing.

119.—*The sum of life in an animate being, the sum of its atomic life.*

The sum of life in any animate being is the sum of the organic life in its many differing organic structures ; and the sum of life in every one of these differing structures is the aggregate of the sub-organic properties or functions of the atoms that are essential to these structures. Take away any one kind of these atoms, and the existence of that animate being ceases. If we take away either oxygen, hydrogen, nitrogen, carbon, phosphorus, sulphur, calcium,

potassium, iodine or any other kind of elementary atom necessary to the human organism, man would cease to exist. And as animate individual life would cease as a consequence of the withdrawal of the atoms of any one of the elements essential to its evolution, those atoms must all have animate functions ; and we cannot give to any particular element a place of honour as a primary and mysterious immediate cause of life.

There is really nothing mysterious about the *immediate* cause of life. It is quite plainly to be seen that it is immediately evolved as the cumulative effect of the continuous mutual actions between a large number of different substances ; the sixteen or more of elements of which those substances are structured, and the infinitely varying phases of energy evolved as third factors in those mutual actions.

The sweetness of sugar is essentially a form or pattern of molecular movement conditioned by the chemical union of atoms of carbon, hydrogen and oxygen (17). These movements impressed upon the molecular movements of the taste buds upon the tongue give us the sensation of sweetness—a distinct function of mind, for we are conscious of it, and consciousness is undoubtedly a function of mind. Sweetness is a property or function that comes into existence simultaneously with sugar in the mutual actions between oxygen, hydrogen and carbon when chemically united. As with the various elements whose mutual actions evolve varying phases of mind, we cannot with sweetness ascribe its evolution to any one of the three elements in the structure of the substance that functions it ; all contribute a something that is necessary. Neither carbon, oxygen nor hydrogen are sweet ; in fact, they have no taste at all ; yet when they are united in proper proportions they give us sugar with its sweetness ! This is no less remarkable, no less mysterious, than that the mutual actions between a larger number of elements give us mind with its intelligence.

The sub-organic movements in sugar are expressions of sub-organic mind. When impressed upon the animate structure of the tongue they are transformed into organic mind ; and then, by the further mutual action of organic mind with brain neurones, are further transformed into

conscious mind as sweetness. The sub-organic mind that conditions the molecular movements in sugar as it does in all other substances, increases in range and value as atoms are added together in chemical union ; and *grows* into the more complex organic mind. Organic mind in organised substances increases in range and value as substances are added together in the rising scale of animate structures and *grows* into conscious mind. There is no mystery in it any deeper than the mystery in every mutual action, for every mutual action gives a result that is incomprehensible to human mind ; there is no rational connection between mutual action and that which simultaneously appears as a consequence ; there is no necessity for the conception of any mysterious vital principle, other than universal mind. The basic mystery is the ultimate nature of mind itself ; and this is no more incomprehensible than the ultimate nature of matter or of energy.

120.—The most versatile and energetic of the elements enter into animate structures.

We could, *a priori*, deduce from facts within common knowledge that in the "fortuitous interplay of chemical forces" from which arose the structures of sub-organic, organic and animate life in a continuous and ascending scale of complexity in structure and function, the most versatile and the most energetic of the elements would be found in the most versatile and energetic of animate structures.

Of the eighty or more elements that are available to enter into structures, only about sixteen are known to be always present in the human body—carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, chlorine, sodium, potassium, calcium, magnesium, iodine, silicon, fluorine, manganese and iron.

No other sixteen atoms of matter out of the ninety or more known to exist, have so wide a range of activities as those which structure animate beings ; and no five have a wider range than carbon, hydrogen, oxygen, nitrogen and fluorine. No other five atoms of matter have the energy of activity possessed by atoms of fluorine, potassium, sodium,

calcium or magnesium. Fluorine appears in both the foregoing groups because it not only has such a wide range of activity, but is also the most intensely active chemically of all known elements.

The most widely-used and popular vegetable—the potato—contains an unusual amount of potassium. The most popular condiment—common salt—contains more than three sevenths of sodium. The most popular spa waters contain sodium, magnesium, calcium, carbon, iron, sulphur. The most popular and common medicine is magnesium sulphate. The prominence of four of the most energetic elements known to exist—potassium, sodium, calcium, magnesium—in the most popular food, condiment and medicine cannot be simple coincidence.

Iron has the most energetic magnetic properties of any known element. Phosphorus, sulphur and carbon stand out distinctively from all other elements because of the qualities they possess of assuming different forms of physical existence—allotropism. The melting point of phosphorus is worthy of noting, as it exactly coincides with the limit to which human temperature may rise without fatal results— 110° Fah. This may be a coincidence—it probably is not.

Thus, no less than thirteen of the sixteen elements known to be present in the human body are not only dominant in executive ability in the chemist's laboratory and in sub-organic nature generally, they also "play" in the drama of the evolution and devolution of mind and life distinctly "leading characters" in energy and versatility; they are the most capable of the eighty or more "characters" that the "manager" Nature might choose from.

Water, a product of two of these elements, is a substance which constitutes, on an average, about three fourths of the mass or weight of all things living; it has an immense dielectric constant, also a capacity for specific heat greater than any other known substance. Take one pound, or any other equal weight of water, lead and mercury at the same temperature. The water will give out, or will absorb, thirty times more heat than mercury, and more than thirty times more heat than lead, in falling or in rising one degree Fahrenheit in temperature! The human body is approxi-

mately three fourths water; water is the result of the union of the two elements oxygen and hydrogen. The importance of the capacity of water for specific heat can be grasped when we consider the importance of keeping the body at a constant temperature of about 98.6° Fahrenheit; for normal function becomes deranged when the temperature of the body rises above or falls below that temperature.

Further, taking the surface of the earth, to which man is of necessity confined, of the twelve most plentiful forms of matter not less than ten are always found in human tissues. Thus, in order of plentitude we have oxygen, silicon, aluminum, iron, calcium, sodium, potassium, magnesium, hydrogen, titanium, chlorine and carbon, only two of which—aluminum and titanium—are not found in our bodily structure.

Such facts cannot, as we remarked above, be all coincidences. In evolution there are no coincidences; there are only mutual action and the third something that evolves simultaneously (50). The facts are evidences of a basic necessity in evolution. They show what we might have concluded *a priori* from our postulate, that mind is continuous and evolves from the sub-organic. For in the evolution of the animate individual, the most energetic and versatile of the sub-organic elements would naturally play the leading parts; the most energetic and versatile structures would of necessity evolve from the most versatile and energetic elements.

121.—Mind in the atom continuous with and essentially the same as mind in man.

Atoms, being the most fundamental structures presented to us, must carry their properties with them into all more complex structures (3). Mind, being universal and continuous, must continue from atom to man (61). Perceptions being the functional units of mind, atoms must have mind, for atoms perceive (36). These perceptions the atoms carry with them into all compounds of atoms. All the different atoms that enter into compounds have differing modes of perception—differing phases of sub-organic mind. Any two atoms uniting to form a compound must carry with

them into that compound their two distinctive characters and capacities of sub-organic mind.

Atomic movements are invisible to man, and where no movement is visible man originally concluded there was no life. The erroneous conception of "dead" matter came into man's thought thousands of years before he acquired the knowledge that the molecules of the atoms were in perpetual movement. When the elemental molecules, in countless millions, become aggregated together in the processes of evolution by continuous mutual actions, the sum of the invisible movements of the immense multitude of individual molecules becomes large enough to be objectively visible to the unaided eye; the multitude is termed an individual being, a living thing, because it can be seen moving. But there cannot be any essential difference between this visible living movement and the invisible movement of the elemental molecules, the sum of whose activities constitutes the movements of the living.

We demonstrated in the previous chapter that organic mind was continuous with conscious mind. Thus, finally seeing that organic mind is continuous with sub-organic mind, we perceive that the mind in an atom is continuous with and essentially the same thing as the conscious mind in man. We also perceive that mind is universal; one, and inseparable from matter and energy, and that it is a mode of ceaseless energy-movement, dominating all other movements of energy in nature.



CHAPTER VIII

EVOLUTION AND DEVOLUTION OF INDIVIDUAL BEING

122.—*All individual being sustained by devouring forms of life.*

In the evolution and devolution of individual being we obtain much evidence, more or less direct, of the truth of all our postulates ; evidence that strengthens and sustains all that we have advanced in the previous chapters. And to grasp the full value of this evidence it is necessary that we should take a broad survey of the conditions and environment under which living things come into existence and disappear in the continuous cycles of individual being. For we cannot otherwise acquire a proper sense of proportion in value of the immediate causative factors that lead to the perpetual stream of evolving and devolving animate life. Familiarity with commonplace facts of profound significance causes us to lose the sense of their relative importance.

Has any writer ever yet with sufficient weight of purpose called attention to the fact that the evolution of all animate beings has taken place and is still taking place almost wholly by the absorption of the structural energies from other animate beings in processes of devolution ? That ever since individual beings have existed they have lived by eating other individual beings ? All individual beings that now exist or are in process of evolution are so existing and evolving at the expense of other living things in process of devolution. Even the inoffensive herbivora consume the living herbs and grasses, and in turn become food for the omnivorous and the carnivorous, and the herbs and grasses live by absorbing forms of sub-animate life.

The struggle for existence amongst living things is, and

always has been, an unspeakably cruel and brutal necessity. Every day, for hundreds of thousands of years and down to this present day, countless millions of living animals and countless millions of living embryos are eaten alive by other animals ; and the victims, by their devolution, furnish the necessary sub-animate molecules for the evolution and sustenance of other individual life. These perpetual cycles furnish us with a most impressive example of the continuity of mutual action—mutual action between that which ingests and that which is ingested.

123.—Tennyson ; volume of life always equal to what is possible.

Nature is, as Tennyson expresses it in his "In Memoriam," "red in tooth and claw."

Since animate life was possible on this earth of ours its volume has always maintained an average value that has run parallel with the range of conditions possible to life. Wherever animate life has been possible that life has come into being and increased until the means available for the sustenance of further animate life became exhausted. The fact that mind is universal in perpetual movement permeating all that exist as animate or sub-animate, and expressing itself in the activities we term sub-animate as well as in the movements we term animate (110, 121) necessitates this continuous balance between animate life and the sub-animate possibilities of that life. Land, sea and air are crowded with all the animate life that they can sustain.

124.—Irrational evolution and devolution of animate life.

As physical conditions in the subanimate are, and always have been, changing, a host of living creatures that evolved when conditions were more than usually favourable have always had to die when physical conditions became adverse. Not a year has ever passed since animate life became established on earth that has not seen its host of living things die as a result of changing conditions. To-day we could count the yearly victims to droughts and floods by the million. Never a year passes but that on some part of the earth there is a drought that starves to death domestic and other forms

of life, and in other parts floods that drown them. And famines are not unknown that starve thousands of human beings to death.

A further irrational destruction of life is seen in the devolution of at least nine thousand nine hundred and ninety nine out of every ten thousand ova and germs that are evolved by living things and beings. Not one in ten thousand of ova or germs that are produced by nature arrive at mature or adult life.

Tennyson (*ibid.*), speaking of nature, says: "Of fifty seeds she often brings but one to bear." But he must have used the word "fifty" as a poetic necessity, for he very much under-estimates. Any fair-sized willow tree will evolve a million seeds in one season, and if only one in the million grew to maturity the earth would soon be overrun with them. An average cod fish may evolve five millions of ova. One female has been known to have produced eight millions. If one in fifty thousand of the ova of cod fish survived to maturity, the oceans of the world would in a few years not be able to find room for them. Every female child that is born has an average of about two hundred thousand human ova in its ovaries. If we reckon the average family as four, only one in fifty thousand evolves into a human being. Not one in many millions of the spermatozoa evolved by man becomes part of another human being. In some cases a pair of animals produce ten millions of offspring, out of which only two, on the average, survive in the struggle for existence—one in five millions! (E. Ray Lankester.) If all the descendants of a single green fly survived and multiplied for a few seasons the whole earth would be covered by them. And if one oyster's progeny all survived and multiplied for four generations there would be no room anywhere on earth, where oysters could live, for the existence of any other living thing!

Of microscopic diatoms alone there are more than four thousand different forms, and they multiply with incredible rapidity. It has been estimated that a single one would produce a thousand millions in a month! If every diatom lived its normal span of life, all the waters of the earth would soon become solid with them.

125.—Relative values ; the universe ; the earth ; man.

Reflect a few moments upon the infinitesimally small relative value of the whole earth and everything upon it in relation to the universe. If the universe within the range of telescope and camera were reduced to the size of the earth, and the earth itself reduced in like proportion, a scientist, if he could have stepped aside into space before the reduction, would not be able to perceive the earth with his most powerful microscope. If he piled hundreds of such worlds in a heap upon his microscopic slide he would be able to see nothing—the heap of worlds would be too small to be visible! And when we further consider the evidence furnished by the spectroscope, that suns in space have material elements similar to those on earth, and that millions of worlds exist, a large proportion of which must be in a physical condition somewhat similar to that on earth, and capable of supporting life, of what value or consequence can we possibly estimate this insignificant world of ours, or the infinitesimally small moving particles we call living things that crawl over its surface, killing and eating each other?

After such reflection, how can one possibly believe that the universe came into existence because it was necessary to the earth, or to any thing or being that has evolved upon it ; or believe that man is a special creation, and that other forms of life were evolved for his use and benefit ? He has been evolving and devolving, concurrently with an infinite number of other forms of life, for many thousands of years ; and, like any other animal, he has killed and eaten every other animal he could get hold of and digest. Sometimes, on account of adverse conditions, but generally because he has enjoyed doing so, he has killed and eaten countless millions of his fellow men. The natural conditions of individual being have always been, and still are, of such a nature that it is impossible to conceive that any intelligent or beneficent providence cares for or exerts any kindly influence upon the conditions of any living thing. So we are perforce obliged to conclude that all individual being evolves and devolves by the fortuitous interplay of the lowly intelligence that gives sub-animate life movements to the various

elements that constitute matter. We are also obliged to leave the problem of the ultimate nature of this lowly intelligence, or sub-animate mind, involved in the inscrutable mystery of a first cause.

126.—*Nothing is created, nothing destroyed. Evolution and devolution must balance.*

In the continuous cycles of evolution and devolution of individual being nothing is created, nothing is destroyed. Therefore all activities and developments in evolution and devolution can be nothing beyond mutual actions that are equal, simultaneous and unceasing between the fundamental factors which evolve by transformations the infinite variety of presentations in nature (44). And every movement in what we term evolution must be balanced by an equal movement which we contradictinguish by the use of the term devolution. All activities in nature must therefore be continuous, from a volcanic upheaval to a poetic effusion ; from the movement of a comet to the fall of a raindrop (8, 59) ; for all arise essentially from the mutual actions that are unceasingly and fortuitously operating between the eternal primal factors. The departure in evolution—or we should say, the supposed departure—from sub-animate movements to animate movements, which are purely arbitrary distinctions of man's own invention, was not an act of creation. This would not be consistent with the recognised truth that under the existing order of the universe nothing can either be created or destroyed. The transition from what we herein term the *sub-animate* to the *animate* was simply an extension of that continuous development in complexity of structure which is now indicated by the distinctive term *evolution*. Animate evolution of individual being arose as a necessity from the less complex movements of the sub-animate, when mutual actions between sub-animate structures became sufficiently complex (64, 164).

127.—*Change of character of life by changing environment.*

There are more than a million differing species of animal life existing on earth, to-day. It is of course, impossible to state other than an approximate number. Along with

these there are the unnumbered different species of plants. And as both plant and animal are animate we must include them both within the meaning of the term *living things*. We have evidence in palæontology that many forms of individual being have become extinct. To-day we have approximately one thousand eight hundred species of snakes, ten thousand different species of birds, eighty thousand different species of beetles—and so on. New species of living things are not only being discovered to-day, there are also new species being evolved. Ever since animate life first appeared on earth there has been a continuous evolution and devolution, not only of individual being, but also of type of being, as a consequence of constantly changing physical environment, and it cannot be possible that evolution, either of species or type, has ceased. This changing of the character of life by changing environment can be demonstrated in the laboratory (206). And so long as physical conditions on earth keep on slowly changing, this changing of the character of life on earth will continue, as it has done in the past, to cause the disappearance of type and species and the evolution of new type and species, so long as conditions continue to allow the existence of any animate life.

There has been a gradual reduction in the percentage of carbon dioxide in the atmosphere since life appeared on the earth. The wonderful vegetal growth that produced the enormous coal deposits, so useful to man to-day, could not have evolved so luxuriously, had there been but the small percentage of carbon dioxide that exists in our atmosphere to-day ; and we may safely conclude that the earth does not evolve so much animate life as it did during the period that evolved the prehistoric monsters and the dense vegetation which evolved our coal beds. Carbon dioxide is most readily absorbed by plants when the proportion in the atmosphere is about nine per cent. This is about two hundred and seventy times more than we find in the atmosphere to-day ! The growth of plant life, the volume of individual mind and being evolved and devolved in a given time, depends on the percentage of carbon dioxide in the atmosphere—a gas that will not support animal life ! As volcanic

discharge of carbon dioxide and the burning of fuel gradually lessens, the earth will evolve less animate life.

128.—*Microscopic units of life ; communities of units.*

Man and animal, down to the protozoa, are structured of the micro-organisms which are termed "physiological units." These units—or cells—are themselves individual existences ; each has a life of its own. Thus, every such individual man or animal above the level of the protozoan is a community of microscopic individual existences, bound together and working together in mutual agreement for the good of the co-operative individual being. The micro-organisms are structured by compound organic molecules having thousands of atoms ; compound organic molecules are structured of single organic molecules having hundreds of atoms ; single organic molecules are structured of elementary molecules, the most of which have only two atoms. The evolution of living things from atoms is unceasing and continuous, and reaches in volume to the full extent the present physical conditions on earth will allow. And the reverse processes in devolution have of necessity the same volume and the same unceasing continuity. Human skill or influence can but momentarily restrict this volume of life from pouring forth in some form ; if checked in one direction, it will break out in another. This is why new forms of micro-organisms, pathogenic and otherwise, are at times recognised ; why new and strange disorders break out amongst living things. Every year we hear of new pests that trouble the agriculturalist, and new diseases that puzzle medical authorities. The volume of micro-organic life is forced into existence by forces beyond man's power of control. The epidemic of Encephalitis Lethargica—sleepy sickness—in Sheffield in 1924 was apparently a disease of such a nature. And of this we may be quite certain if changing environment is but just beginning to show its effects upon man, there will be an extremely slow but constantly increasing succession of outbreaks of previously unknown diseases that all human effort will be powerless to avert. All animate life is at the mercy of the sub-animate environment which conditions it.

129.—*Design in nature ; natural law.*

Our postulates cannot be true if there is *design* in nature ; if there is *purpose* in the existence of man, or any definite end to be achieved. For they involve universal fortuitous mutual actions between the fundamental factors that cannot occur otherwise than as they do. And this necessity to act just so and in no other way is the result of natural laws. The mutual actions between any two similar things under similar conditions must always produce the same results (141). All research and investigation in every branch of human knowledge is based upon the fact that similar things under similar conditions must function in a similar manner. And if it is advanced that natural laws are the result of *purpose* or *design* the case is not bettered ; for natural laws and purpose or design are incompatible in the sense in which those terms are used to account for natural things. If a woodpecker's long bill was designed for the purpose of enabling it to reach insects in the cracks in the bark of trees, then that long bill could not have evolved naturally as the result of the fortuitous mutual actions that occur under natural laws, for design would then run counter to natural laws. The long bill of the woodpecker came into existence at an infinitely long period of time *subsequent* to the establishment of natural laws, for these laws must have existed from the very beginning of things. To give validity to the conception that the woodpecker's bill arose by design, we have to prove that some intelligence superior to and more dominant than that which is assumed to have designed natural laws interfered with the natural sequence of events in nature in order to destroy the insects it had already designed ! That is quite an unanswerable position against the assumption of intelligent design in nature. It is sheer nonsense, for instance, to conceive that antelopes were designed to be fleet of foot in order to escape the carnivora, and then be obliged to conceive that the carnivora were designed so as to be able to destroy the antelopes despite their fleetness ! If we admit design, we must admit that the cat was designed to eat the mouse and the mouse designed to feed the cat ; that birds were designed to eat worms, and worms designed to feed the birds. And when a shark bites a man in two we

should admire its powerful jaws and its adequate arrangement of sharp cutting teeth, designed by nature for the purpose, rather than refer to it as a "horrible monster." If there is design in nature, the shark was designed to live, and it has as much right *naturally* to eat man as man has to eat shark or any other fish. There is no more reason for calling a shark a "horrible monster" because he eats man than there is for calling man a "horrible monster" because he eats fish.

Natural laws either do or do not determine the course of events in nature, for a natural law is absolute; nothing can alter or interfere with it. And if it is objected that fortuitous mutual actions are not compatible with natural law, we may say that such objection has no validity. When accidents occur—say a railway collision—the extent of destruction and damage that ensues when the trains collide is governed by the law which states that the energy of momentum is proportionate to the square of the velocity. When gamblers throw dice, the fortuitous movements of the squares of ivory are governed by the laws of motion and gravitation equally with the planets that revolve about the sun.

To say that natural laws came into existence by design is no more rational than to say they came into existence because they did so. For it remains a matter of no consequence how those laws came into existence—the effect is the same. The cruel, useless and senseless operations under natural law are still matters of fact and still continue (122-4). We cannot make abominable conditions into beautiful conditions by simply imagining a beneficent and all-wise cause.

After at least a hundred thousand years have elapsed since man came into existence, men to-day still kill and eat each other; the mode of reproduction of man and the course of evolution and devolution are still the same as that of the brute beast; feeble micro-organisms still attack man and conquer him in the struggle for existence; and the most cultured nations still periodically shed the veneer of civilisation, and slaughter each other in as fiendish a manner as ever did primitive savages. Only a few years ago the most civilised nations on earth commenced slaughtering each other

and killed men, women and children by weapons of war and poison gas, by disease and starvation, at an average death rate of over five thousand human beings per day over a period of more than four years !

There is not a shadow of rational evidence in any direction of any glorious purpose or design in the existence of the human race, after many thousands of years of travail ; and we are justified in doubting the existence of any such purpose or design, especially when we consider how easily, on the one hand, such a conception could arise in man's anthropocentric egotism, and on the other hand, see how senselessly cruel such design appears under the " eat or be eaten " conditions that prevail throughout all nature. If we say that nature designed cats to eat mice ; to be consistent, we must admit that mice were designed to feed cats. But, then, if mice had not been designed, would it have been necessary to design cats ? And so *ad infinitum*.

130.—Only change of movement gives evidence of existences.

We have seen that mind is conditioned by movement ; that there could be no perceptions, and consequently no mind, if there were not differences in direction or intensity of movement (16). And as all of living activities are expressions of mind, all activities in the evolution and devolution of individual being are conditioned by mind. Matter, actuated by energy, could move for ever in *uniform* motion without any evidence of the existence of mind. It is only when movement changes that we have any evidence of its existence. Hence the statements made by psychologists to-day, that " the immediate state of consciousness is an activity of some sort " ; " that all states of mind, even mere thoughts and feelings, are motor in their origin and motor in their consequences " (3) ; and that we must " define mind in terms of behaviour " (41).

" Activity " and " behaviour " of any kind are movements ; and we find it impossible to avoid the conclusion that mind can only reveal itself as a movement which simultaneously evolves from a mutual action, just as harmony reveals itself by combining the differences in movement of different notes in music. Every thought is a mental

picture, evolved by differing molecular movements in the physical mechanism of the brain, just as everything we see, is a picture evolved by the differing movements of light waves upon the physical mechanism of our eyes.

Thus, the evidence of the existence of each of the three basic factors is mutually dependent upon the existence of movement.

Energy cannot evidence its existence unless there is matter to move.

Matter cannot evidence its existence unless there is energy to move it.

Mind cannot evidence its existence unless there is matter to perceive, and energy to move the matter.

And this universal continuous movement expresses itself in the unceasing cycles of evolution and devolution of animate and sub-animate existences. Evolution and devolution are mutual, equal and simultaneous activities (126).

131.—Atoms, the fundamental units of perceptions.

In tentatively following the path of nature in the evolution and devolution of individual mind and being, we commence with atoms as the most fundamental structures known to us, in which we have certain evidence of *units* of mind—perceptions (26). We might go deeper still and commence with electrons, as probably having *units* of perception, but we prefer to start on the more substantial basis of the atom.

The atoms of the differing elements of matter have each a form or pattern of movement that differs from that of the atoms of all other elements ; and these differences in movement condition and make possible the range and nature of their perceptions. Even in the solid bodies of the metals we have undoubted evidence that the molecules are in a state of perpetual movement. If a block of pure gold be placed in contact with a block of pure lead, and the blocks are examined from time to time, traces of one metal will presently be found throughout the other. Gold molecules will travel through lead ; lead molecules will travel through gold (Prof. John Cox). The monatomic elements of the argon group of gases have as yet but one known mode of perception—that

for mass only. All other atoms and molecules of atoms have perceptions more or less numerous. They perceive both mass and variation of character in mass and evidence these perceptions by simultaneous mutual actions which simultaneously evolve substances that are combinations of different atoms. But the substances have a physical character that we cannot rationally connect with the character of the elements which evolved them. They have acquired in some mysterious manner a different and more complex range of movements, and a consequent different and more complex range of perceptions. These mutual actions between elementary molecules are considered by the chemist as due to "affinitive" or "attractive" properties in the elements. These terms indicate nothing more than an attempt to define the nature of the phenomena. But if elementary molecules attract each other and move in a very definite and purposeful manner as a consequence of that attraction, it is quite evident that in some manner unknown to us they have a perception and a consciousness of the presence of each other—just as in the case of the two particles of matter in space that move towards each other (26). For even in masses of elements or substances the molecules are at a relatively great distance apart, and all of chemical mutual action is simply a rearrangement of molecules in space.

Not only are the unalterable properties or functions of the elementary molecules carried with them into the structures of which they form a part; for the mutual action in chemical union between different molecules evolves other functions not possible to the individual molecules. As we have already pointed out, from every mutual action there must simultaneously evolve a presentation which we cannot rationally connect with the factors in the mutual action—we only know that it is so. And the result of such mutual action in chemical union is an extension of function which widens out as complexity of structure increases, until the range of function we term animate arises from the sub-animate. If this were not so, the functions of four differing elements, when united in every possible way, would only number twenty-four.

132.—Infinite variation of mind function possible to the elements in man.

With four different numbers the number of possible permutations is only *twenty-four*. Yet the number of different substances, each with its distinctive functions, that have been evolved from the four elements, oxygen, hydrogen, carbon and nitrogen, runs into *thousands* and new substances are still being evolved by the chemist ! The possible permutations with figures is a fixed quantity that is easily calculated, but it cannot be exceeded. If the sixteen elements that enter into the structure of the human body were mere numbers the total possible permutations would reach a sum so large as to be practically sufficient to furnish a different functional movement for every possible mental concept for it runs into more than twenty millions of millions.

So it can be easily seen that the vast number of possible different substances that may be evolved from the sixteen primary elements that structure the human body reaches such a number that the variations of movement possible to them become practically infinite and more than sufficient to furnish differing modes of movement and combinations of modes of movement for every possible condition, intensity, direction or manner of mind function in the animate being. The importance of a recognition of these infinite possibilities will be more fully appreciated when we come to consider the phenomena of sleep, dreams and memory.

The critical reader will no doubt perceive an apparent disagreement between our concepts of "patterns" or "modes" of molecular movement and the evidently erratic movements of molecules of water, as seen in the "Brownian movement" (20). But we have so much evidence of orderly movement in other directions that we are warranted in assuming that even in the movement of water molecules there is an order which has not yet been determined. The differences in the specific heat of different elements and substances indicate that there must be specific forms of molecular movement in them all. The popular conception of the structure of matter—whorls or vortices of energy—involves forms of movement. The popular conception of the structure of an atom, which is compared to a miniature

solar system, with electrons revolving about a centre in a systematic order, indicates varying patterns of movement for every differing atom. The stars in space are moving in an apparently erratic manner in all directions, yet each one is considered the centre of an orderly system of movement comparable with our own solar system.

133.—*Influences of environment. No two persons alike.*

The influences of environment can never be exactly the same upon the processes of evolution in any two individuals. Consequently no two persons can be exactly alike. This applies not merely to outward appearance ; it applies equally to internal structures ; no two persons have exactly the same character of physiological structure, and this difference may vary to a considerable extent. This explains the reason of the saying that "one man's meat is another man's poison"; also why certain drugs act so differently upon different individuals, and have at times caused serious trouble. In this connection we see evidence of the fact that any alteration in structure must cause an alteration in function (141).

The expression used above—"the influence of environment"—must be taken in its broadest sense. Thus, the food we eat is environment until it is absorbed—it is the environment of the digestive track. The mother is "environment" for the developing young. Sunlight and meteorological conditions are environment.

A person born of parents whose principal protein food was beef will not have exactly the same relative quantities of the sixteen structural elements in the constitution of his physiologic structures as a person born of parents whose principal protein food was bacon (147). And a person whose parents were vegetarians will differ in some respect in physical structure from both of the above. And, other things being equal, a person born on the warm and sunny side of a street will have a physical structure different from a person born on the cool and shady side of the same street. Also, other things being equal, a person born of parents who are keenly interested in scientific matters will have a keener interest in science than a person born of parents who are more interested in pictures.

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The influences of the sub-organic environment impress themselves strongly upon organic development (148). These structural differences are constitutional; all conditions in after life are more or less affected by them. When departure from average normal structure is very decided we get a decided "idiosyncrasy." Most persons, if they have no such decided idiosyncrasy themselves, are acquainted with someone who has. We have had personal acquaintance with many. One could not take milk in any form; another could not eat any kind of fish without being seriously ill; one big robust man, who could enjoy bacon pie, dare not eat a piece of cake if an egg had been used in its making; and a niece of ours would always get a disagreeable red flush on *one side* of her face if she ate an apple at dessert! Such instances could be quoted indefinitely.

And as the possibilities of variation in the sixteen or more elementary sub-animate molecules and the immense number of compound molecules that evolve from them and structure the body are sufficient to furnish that infinite variety in individual character of structure with which we are so familiar, so they are sufficient to furnish the infinite variations of movement that condition the infinite variations of organic mind function. Every operation of mind "is an activity of some sort" (3). The operations of sub-organic movement run with absolute continuity into the operations of organic movement. Organic mind and sub-organic mind are continuous.

Man cannot go beyond the depth of immediate causes. He cannot comprehend how grass is evolved into feathers, conscious mind and geese; or into wool, conscious mind and sheep; any more than he can comprehend how the food he eats is evolved into himself and his own conscious mind; but he can easily comprehend that food and the energies that environ him are the immediate causes of these manifestations in the evolution of individual being. And he has not a shred of rational cause to imagine that there is any ultimate difference in the evolutionary processes that evolve geese, sheep, man and all other forms of animate being.

All things that live must evolve by the same natural laws

from their environment ; they are at the mercy of the sub-animate.

134.—*Death only a relative term.*

The cycle of evolution and devolution in the individual includes the time occupied and the activities that occur between the evolution of the germ from elementary molecules and the devolution of the individual so evolved back again into the elementary molecules that commenced its structure. Volume of living structure and activity slowly increases in evolution from elementary molecules upwards, and slowly decreases in devolution down to elementary molecules. There is no place in nature where what we term "death" occurs, using this term in the sense which denotes a cessation of the activities which condition sub-animate life. There is no death at all in a strictly scientific sense—there is only dissolution of partnership. In exactly the same sense, science says that nothing can be destroyed—there is only change in the form of existence. There is nothing destroyed when a candle burns away and disappears as an individual structure ; the elementary molecules that structured the candle still exist, every one of them unaltered ; they have only entered into other partnerships—transferred their sub-animate activities into other kinds of elementary and compound molecules.

If oranges were so small that one orange alone could not be seen, and hundreds of them heaped together were necessary in order to be visible, we should see such a heap as a yellow individual object. The mutual actions between the ray of light coming from the heap and the mechanism of the eye would evolve the perception of a yellow individual object.

If now comes along a breeze that disperses the oranges so that no two remain together, the *object* ceases to exist. But the invisible individual oranges would still exist ; and if they were again gathered together the individual yellow object would again come into existence. The oranges would not "die" simply because they were dispersed. The same thing happens in the devolution of the individual, which we term "death" ; nothing dies. Although the individual

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ceases to exist, the sub-animate elementary molecules that structured the individual all exist quite unaltered, and just as animate as ever ; they have simply ceased to co-operate together in the organic structures of a particular individual. By and by they will enter into partnership again and contribute their mite to the animation of some other individual being. Nothing is lost ; nothing destroyed.

Devolution of the individual is a reversal of the process of evolution ; and in all forms of life the process takes place more or less slowly, so that one or more parts may disappear into the sub-animate, whilst others remain in the animate. The whole cycle of evolution and devolution may occupy only a few days—as in some of the lower organisms ; extend to a hundred years—as with man and other animals ; or may reach to over a thousand years—as with some trees. What is termed the "death" of the individual occurs when the co-operative activities of the countless millions of individual organic molecules that structure the individual cease. But the total and absolute devolution of this co-operative individual existence does not occur until the animate organic molecules have devolved back again into the elementary sub-animate molecules that structured and animated it.

Thus the term "death" has but a very vague and indefinite meaning ; for "life," in a strictly scientific and fundamental sense, is perpetual ; the animation in the elementary molecules is unalterable and indestructible.

In the poisoning of man and the higher animals by strychnine, for instance, the heart continues to beat after breathing has ceased, and it is wrongly stated in textbooks that "*the heart continues to beat after death.*"

This is manifestly impossible. Death of the individual is not an event that happens of necessity when one portion ceases to co-operate with the rest, and cannot in any event happen in a moment of time. Nor can it in any case be possible to determine the precise moment of what is termed "death," as there is no known definite line separating the animate from the sub-animate. The individual is only partly extinct so long as any mutual and co-operative action continues between any of the millions of individual cells

that constitute the individual. The beat of the heart is an animate movement ; if it beats, it is alive. Every one of the individual cells in the animate body remains alive until the mutual actions between its organic molecules cease, and the cell breaks down into the less complex sub-animate compound and elementary molecules that conditioned its structure.

Many persons have been buried alive after all the usual evidences of animation have ceased. Many have recovered after the heart has ceased to beat and breathing could not be detected. Only a few days ago Prince Matsukata of Japan, after heart action and respiration had ceased, was pronounced dead by his medical attendants ; a few days after he was able to take nourishment. The prince was over ninety years of age.

The fact that activities of organic mind still continue after all ordinary evidences of individual life have ceased should cause a proper appreciation of the fact that activities of mind which condition living movements occur far below the level of perception, either direct or aided by the microscope.

135.—“Individual being” difficult to define precisely.

We are led to question what meaning is to be attached to the term “individual being” as applied to co-operative life by the many things that happen in pathology. A portion of an individual may be dead and buried whilst the rest of the individual lives for many years afterwards ; this happens in most cases of amputation. Or, on the other hand, the individual may be dead and buried and portions of that individual may remain alive for months or years after.

Grafting one animate individual being upon another has been a common practice for ages in the evolution of better kinds of fruit ; and grafting one part of an animal upon another has also been successfully accomplished. To-day all kinds of living tissues from animal and man can be kept alive for some time, and made even to grow after being cut from the individuals of which they formed a part. This class of work, although practically in its infancy, is showing a great extension of possibilities. Blood, which is a living

part of an individual, may be transfused into and become part of another individual. The celebrated John Hunter, about 160 years ago, successfully grafted a human tooth upon the comb of a cock ; and also grafted the spurs of a young cock upon a young pullet.

Organs have been removed from individuals and grafted into the bodies of other individuals, giving the new possessors a fresh lease of life. Dr. Alexis Carrell has succeeded in transplanting from one cat to another the two kidneys with their adjacent tissues. He has also successfully transplanted a leg from one dog upon another dog. Years ago he placed a portion of the heart of a chicken into suitable media that furnished the necessary nourishment, and kept refreshing or changing the media at regular intervals. From the last reports we hear that this part of the chicken is still alive and has even grown although the chicken it came from died, and was buried, twelve years ago ! Other workers are emulating Carrell, and it has been amply demonstrated that practically any organ or part of an organ may be cut from either a recently dead or a living individual and kept alive in a suitable environment for an indefinite period of time.

136.—*The "dead" brought back to life.*

Individuals may be actually dead—in the common sense of that term—and yet be restored to life. It is on record that after a fatal (?) operation a child of eleven months died ; its heart ceased to beat, and its respiration ceased ; but the child was restored to life by an injection of adrenalin. Some animals may be cooled down to near freezing point and kept so for hours, until all evidence of life has ceased ; yet when gently warmed, they come to life again.

There are micro-organisms and visible animals and plants which may be desiccated and kept dry for years without showing the slightest evidence of life, yet will become animate when subject to a little moisture.

In the British Museum a snail in its shell was gummed to a board for four years. It was brought back to animate life by a careful supply of moisture and lived for two years afterwards. Seeds that have remained dead for a hundred years have become animate and produced plants when the sub-

animate molecular movements of water have come into mutual action with the sub-animate molecular movements in the seeds.

Such cases as above are *not* cases of *suspended animation*. They are cases on the borderland between the animate and the sub-animate. They are "dead" in the sense with which the term "dead" is commonly used. If we drained all the blood from a man all the authorities in the world would say he was a dead man. But suppose we could keep that man in exactly the same physical condition, without the slightest decay or alteration in structure of tissues and organs as Carrell did with the heart of a chicken (135), for a month or a year, and then a sufficiency of healthy blood was infused into him from a number of volunteers, the man would certainly commence living again!

This is precisely analogous to the animals and seeds that have been "killed" (?) by desiccation; the tissues and organs cannot change because no moisture is present, no diffusive or osmotic action takes place. When moisture is added, the one kind of molecule that is necessary to raise the structure in complexity from the sub-animate to the animate is added, and the animal or plant lives again as an animate individual. The addition of the molecules of water gives an extended range to molecular movement, and it rises in value from non-living to living movement.

The re-animation of desiccated animals and plants by application of moisture furnishes us with the most significant evidence of the immediate nature of those evolutionary and devolutionary processes in individual beings which we term "life."

The evidence we presented above regarding parts of individuals being dead whilst the individual lives, and parts of the individual being living whilst the individual is dead, shows that the term "individual" has a very wide and indefinite significance and that we cannot use that term with exact meaning.

Man, animal or plant may be cut up into hundreds of pieces, and each piece can live an independent existence as an animate community of individual cells.

The foregoing facts are sufficient evidence that both the

co-operative sub-animate and animate activities of individual existences all evolve from the atom. But we are so accustomed to confine the sense of terms to the most evident presentations of that which we indicate by a term that it seems strange to us—or even absurd—to apply the same term to the most feeble presentations of any form of energy although we are well aware that all forms of energy reach from an unknown maximum down to a minimum that is imperceptible.

137.—Minimum and maximum expressions of energy.

Many persons would think it absurd to speak of the *heat* in a block of ice ; yet the amount of heat in a block of ice at freezing point is nearly as great as that in the human body. Reckoning from absolute zero, the human body has 310 degrees of heat ; ice at freezing point has 273 degrees of heat—a difference only of about one eighth.

Electric energy will instantly kill any living thing ; yet electric energy is constantly present in all that lives, although we cannot perceive it with our unaided senses. Sub-animate energies, essentially the same as living energies, are universally present in all the things and substances we term “dead” matter ; but we do not yet recognise these sub-animate energies as being fundamentally the same as the energies we term animate. For instance, we do not recognise heat as animate energy ; yet there is probably no fact in nature more self-evident than the fact that the heat of our bodies is animate energy ; for if a third part of this heat is withdrawn from them we shall surely die ; and a divergence of even one degree from normal temperature indicates some abnormality in animate function.

The rounded pebble by the roadside, apparently lifeless and inert, is not so in reality. It perceives the influences of the physical elements and enters into mutual actions with them, that will gradually and imperceptibly cause its ultimate disintegration into the soil that mothers vegetation ; and these acts of perception involve activities of sub-animate mind. This is not a whit more mysterious or in any sense further from our ability to comprehend than other acknowledged evidences of nature's profound depths in activity.

138.—*Strutt's radium "clock"; association of movement with life.*

A radium "clock" has been made by R. J. Strutt, using as a motive power thirty milligrams of radium bromide, a quantity equal in weight to about one half of a drop of water. This, with appropriate mechanisms, is sealed into a glass tube. The energy radiated from this small amount of radium bromide causes two suspended gold leaves to swing apart from each other. When the divergence reaches a given angle, the energy is discharged by a contact and the leaves fall together and again diverge as before. This is repeated continuously about once a minute, and time can be measured by it with accuracy. The "clock" will keep going for more than two thousand years to come if no accident happens to it. Thus, a weight of matter about the weight of half a drop of water can cause continuous movement visible to the eye for a period of over two thousand years! How can we rationally say that this wonderful manifestation of energy comes from "dead" or "lifeless" matter?

It is universally habitual to connect movement with living activities; if a thing has no movement, we say it is dead. When the doctor comes to examine the victim of a serious accident, he determines by the presence or absence of perceptible movement whether he shall say or not say that the victim is dead. He feels the pulse to determine if the heart beats; he notes if there are any movements that denote respiration. Even wild animals appreciate the significance of movement. If you stand quite still a wild creature will come to within a few yards of you, if you are to leeward. Give a loud yell—without moving—and it will raise its head, prick up its ears, and look around, then start quietly grazing again. But if you turn your head, raise an arm, or move a step, it will run for its life. How can it be possible for dead matter to move? Yet we are compelled, if restricted to such arbitrary terms as "animate" and "inanimate," "living" and "dead," to term radium bromide "inanimate" or "dead" matter, although so minute a portion will give visible animation to a mechanism for a period of time that covers many generations of the longest lived of

human beings. The very nature of man's consciousness makes it difficult for him to clearly see the truth that every form of movement involves some mode of perception ; and perceptions are fundamental units of mind (23).

139.—Difficulty of determining where individual life begins.

We have pointed out how difficult it is to determine where individual being ceases to exist ; it is equally difficult—or impossible—to determine where individual life begins. Our individual conscious mind does not come into existence till some time after birth. But the individual organic life existed prior to conception in two separate individuals, in ovum and sperm, long before they came together, and uniting, formed the individual. The half part that came from the mother existed in the ovaries of that mother when that mother was born, and was evolved by the grandmother. Thus, one part of each human being came into objective existence in the womb of the grandmother (214) ! We do not know what length of time the organic male half of the future individual being existed before it joined the mother half. We know that the male germs are not evolved until puberty is reached ; but whether they are weeks, months or years old when they enter an ovum is not certain, although the diverse characters of some ordinary twins indicate that the two fertilising germs may have been evolved with some effective interval of time between them.

140.—The sum of all that is, remains constant.

The energies of animate and sub-animate, in individual being, are as extensive, as universal and conserved as matter and energy. We cannot *create* movement, we cannot destroy it ; every mode of movement is a transformation from some other mode of movement. The movements that condition animate individual being or sub-animate individual substance always existed and will continue to exist when the individual combinations devolve and cease to exist. Every atom that enters into associated existence with other atoms in the evolution of individual beings has the same perceptions, energies and functions, the same essentials of living movements after entering into association as it had before ;

and it will have the same essentials of living movement after the devolution of the individual being. All this points unerringly to the conclusion that complex individual being evolves from the sub-animation of atoms ; and that in the evolution and devolution of all co-operative individual existences, from man downwards, the ultimate, and strictly definable individual existence, does not appear till the atom is reached. No vestige of animate energy has ever been lost since the first two particles of matter united in evolving a sub-animate substance. The evolution and devolution of individual mind and being are inviolably equal, simultaneous and continuous processes of mutual action. And as neither mind, matter nor energy can be created or destroyed, the evolution of anything whatever must be accompanied by an equal and simultaneous devolution of that from which it evolves.

From the grass at his feet to man himself ; from the rocks that are slowly crumbling away to the rocks that are slowly forming under ocean beds ; from the unceasing dance of invisible molecules to the sublime movements of revolving systems in space ; from suns that are dying to suns that are evolving from nebulae of incandescent gases ; all is perpetual movement and change in eternal cycles of evolution and devolution. And this eternally changing permanence is due to the continuity of mutual, equal and simultaneous action ; so that the sum of all that is, remains constant.

CHAPTER IX

STRUCTURE AND FUNCTION

141.—*Laws of structure and function.*

We have in the previous pages more than once drawn attention to the fact that range of mind function in evolution runs parallel with complexity in structure.

This could not be so if the material structural units—atoms—were not the dominant factors conditioning the character of structures. Thus, the continuously ascending scale in value of mind function in the continuously ascending scale in evolutionary complexity, from the most simple compound of two elements to the most complex of many elements in the brain of man, is, *per se*, sufficient evidence of the truth of our postulates.

No hypothesis regarding the immediate nature of mind can be true unless it is in harmony with the postulate that identity in structure involves identity of function; and we propose in this chapter to give evidence demonstrating that the dependency of function upon structure is an inviolable law throughout all presentations in nature.

In all phenomena we have the simultaneous evolution of presentations which widely differ in an irrational manner from the physical character of the presentations out of which they evolved. And we have learnt by experience that under the same conditions the same factors in a mutual action will inviolably and simultaneously evolve the same irrational results. If the elements chlorine and sodium are the factors in mutual action, the irrational results are common salt and transformations of matter and energy. Every movement in nature, whether it be in the animate or the sub-animate, is a part of some process of mutual action between the three inseparable basic factors—mind, matter and energy—each plays a part

Thus we are able to extend the laws of motion into the animate beyond the three laws of mechanical movement, and we tentatively advance the four following postulates :—

1. Every similar element, compound or structure under similar conditions will move or function in a similar manner.
2. Any alteration in structure causes an alteration in function ; and any alteration in function denotes an alteration in structure.
3. Increase of mass increases volume, but not complexity of function.
4. Increase of complexity in structure increases complexity, but not volume, of function.

Subject to some possible variation in the statement of them, these postulates, we believe, will be found to be basic truths without any possible exceptions.

In "isotopes"—which are elements having the same atomic number, the same spectra, and, as far as is known, the same chemical properties, we seem to have an exception to these laws of structure and function. But such isotopes *have* differing structure. This is indicated by a difference in function of gravity and a difference in function of radioactivity. And it is still possible—or even probable—that some further subtle difference in function may yet be discovered that will distinguish one isotope from its "twin."

142.—*Alteration in energy content an alteration in structure.*

We must, of course, give the broadest meaning to the terms "structure" and "function." Thus, as energy enters into the structure of all matter (626), any alteration in temperature becomes an alteration in structure ; increase in temperature lessens density ; added heat causes alteration in structure and function. Man and animal alike think more slowly if body temperature is reduced. Other things being equal, every rise of 10° Cent. in temperature doubles approximately the amount of material change chemically, and conversely.

The law of constant heat summation shows that the introduction of heat energy as an "element" in structures is as exact as to quantity as is any physical element. Exactly

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so much heat and no more is required to produce stable equilibrium in any substance. Thus, an exact amount of heat is necessary to transform ice into water or water into its constituent gases (21, 52, 85, 88).

Every star and planet in space is subject to influences in its environment. Gravity is a function of matter. Bodies in space move under the influence of gravity within a gravitational field which is a perpetually changing environment, and the constant mutual action between them is constantly changing the value of their functions of movement.

We must also take into account functions that, to us, are imperceptible, and which we only know of by the evidences of their effects. So far as human knowledge extends, we know of nothing whatever that is not in unceasing functioning with its environment. Structures that appear to us unalterable are slowly and imperceptibly undergoing changes—functioning with that which environs them. We have evidence of this in the vast masses of metamorphic rocks in the earth's strata. Even granite will continuously function with the elements until it ultimately devolves into its structural units. In pathology the photographic film will give evidence of alteration in the structure of the skin before it can be perceived, either objectively or subjectively, by the normal senses. This has been demonstrated in the diagnosing of incipient measles.

143.—*Arts and sciences dependent upon the inviolate relations between structure and function.*

We see evidences of the truth of the dependence of function upon structure in all branches of science, art and manufacture. All of original investigators' work is dominated by the basic truth that identity of structure involves identity of function. The science of chemistry, without the existence of this basic truth, would be nothing more than a bewildering chaos. When a chemist puts a drop of some reagent into a test tube, and watches for a change in colour, a cloudy appearance or the falling of a deposit, he is looking for that change of function which follows the change in structure of the liquid he is testing, caused by the intermixture of the reagent—the change in structure that must follow all mutual

action. The law of physical properties states that "the specific physical properties of a substance are constant in all specimens." The term "physical properties" may be read as "physical functions." Consequently, difference in physical function must indicate difference in structure.

Lord Rayleigh, in 1892, was led to the discovery of the remarkable group of monatomic gases by the fact that the functions of nitrogen obtained from the air differed from the functions of nitrogen obtained from ammonia. The function of gravity of nitrogen extracted from air exceeded that of nitrogen obtained from ammonia in the ratio of 251 to 250. This slight difference in function indicated a difference in structure; and the following up of this clue led Ramsay and Rayleigh to the discovery of the gases argon, neon, krypton, and xenon.

By differences in the functions of light, as exhibited by the spectroscope, we may determine the presence of elements that enter into the structure of the sun, or the structure of stars that are away in the unfathomable depths of space. The existence of the gas helium was thus discovered in the sun before it was discovered on the earth! The metal sodium is so universally diffused over the earth that it is almost impossible to obtain any substance that does not show evidence of its presence in the spectrum. Yet the quantity so diffused is so relatively minute that chemical analysis cannot detect it. The tinge of orange colour in the flame of candle, lamp or gas is due to the presence of sodium.

Every movement is a function of mutual action, for no one thing in nature—by itself—can evidence movement (16, 47). Differences in the movement of the planet Uranus, caused by mutual action between it and an energy from something unknown external to it, led to the discovery of the planet Neptune. By differences in function alone, indicating difference in structure, was it possible for Mme. Curie to track down the element radium. Every discovery and advance in practical knowledge has arisen through a recognition that difference in function necessitates difference in structure—and the converse. An infinite number of instances of this truth in the physical sciences could be given, but we shall confine ourselves mainly to biologic phenomena, as

being more directly related to the object of this volume—i.e., to demonstrate the immediate nature of mind and to point out the practical value of a recognition of that knowledge.

144.—*Effects of drugs upon living functions.*

It is common knowledge what a great difference in the functions of living organisms can be produced if the structure of the blood is altered by the administration of minute quantities of many drugs; yet the deep significance of this knowledge fails to impress us as it should do, because of our easy familiarity with it. For here we are in actual touch with the relations existing between molecular movements and mind.

One single grain of Strophanthin introduced into the blood stream enters into mutual actions with it, and produces a molecular movement that cannot function organic mind in man, and certain death of the entire organism follows. Strophanthin is the active agent of an equatorial West African arrow poison. And it is significant that it does not matter in the least how great an intellect a person may have, the poison is just as quickly effective. It must also be noted that the elements which structure this deadly substance constitute by far the larger part of the material of the human body and the larger part of the food that man eats every day.

It is not the presence of some unusual element in the blood that of necessity causes the effects produced upon the evolution of organic and conscious mind which may reach to an extinction of life. It is the presence of unusual combinations of elements that are always there. A very large number of violent poisons are combinations of the elements carbon, oxygen, hydrogen and nitrogen, which are always present in abundance in all our tissues, in the blood stream, and in the food we eat at every meal. And it is quite evident that neither the elements carbon, oxygen, hydrogen and nitrogen, by themselves, nor the molecular movements of these four elements in the structures of normal food, can be poisonous—for if so, any kind of food we daily eat would instantly kill us. It can therefore only be the specific character of the molecular movements in these

poisons that kill—the poisonous properties are properties of motion (18).

The elements which structure healthy food may be so arranged that the structure will function sub-animate movements that are incompatible with animate movements. Every change in structure involves change in function, and this is shown nowhere more convincingly and definitely than in the effects of drugs and poisons, which are structured of the same elements as the food we eat.

All this runs parallel with the fact that our perceptions—functions of mind—are conditioned by movements (18); and that no function of mind—conscious mind, organic mind or sub-organic mind—can be differentiated from movement (16, 26).

Derangement of mind function approaching insanity is caused by an insufficient supply of the normal secretion from the thyroid glands. This can be cured by the ingestion of thyroid glands from sheep, or the administration of the active principle—thyroxin! Only a few hours prior to presenting our script of this chapter to the typist, we read in the press that after five years of research, Dr. C. E. Harrington, of the University College Hospital Medical School, has produced synthetically this thyroid hormone from coal tar products and iodine! Thus we have an animate substance which conditions intelligence and conscious mind in man manufactured artificially from so-called "dead" matter. No stronger proof of the truths we are striving to establish in this volume could be conceived.

No matter how good may have been the normal character of a person who suffers from chronic morphine poisoning, he loses all sense of right and wrong; "he will lie and thief in a most degrading way, especially in his desire to obtain the drug; and absolutely no statement that he makes can be trusted." Morphine is an active principle obtained from the white poppy plant. Yet the minute quantities of the substance that produces such startling effects are structured of elements that we eat at every meal with our food! Such facts not only show that function depends on structure; they prove that conscious mind energy is physical, and

evolves from the physical. Such great alterations in the character of conscious mind could not otherwise be conditioned by simple differences in the molecular movements of physical structures.

145.—*Effects of hormones ; insulin ; thyroxin.*

Without the assistance of insulin, an active principle secreted by the pancreas, the body cannot make use of the sugar that pours into the blood stream from the digestive track ; it is not "burnt" up and transformed into animate energy, but accumulates in the blood stream, and has to be abnormally excreted by the kidneys, causing the fatal disease diabetes. Dr. Banting succeeded in isolating this active principle from the organs of animals slaughtered for food, and it was stated to have a beneficent influence upon the diseased condition.

The pituitary gland, a little thing normally not larger than a pea, situated in the brain, secretes active principles that have a subtle influence upon the organic mind concerned in growth and development. Hypertrophy of this gland causes the abnormal growth of the giants that are exhibited at shows ; and normally, it stimulates the secretions of other organs. Yet there is no other element present in the pituitary than is present in our daily food—it is a matter of differing structure evolving differing function.

These active principles secreted by the glands—termed hormones—are of a most complex structure, which is in perfect harmony with the invariable rule in nature, that complexity in structure runs parallel with complexity in function. The compound molecules in these hormones are structured of many thousands of elementary molecules. The production of thyroxin synthetically was a marvellous performance, for it actually is the artificial production of a substance having definite living properties (64).

146.—*Specific action of drugs ; Darwin, paint weed.*

In any textbook on pharmacy and therapeutics we find separate lists of drugs which act specially on various parts of the body ; drugs acting on the blood, on the white corpuscles ; drugs that alter its coagulability ; drugs that directly

or indirectly influence the heart ; drugs that act locally on blood vessels, on the skin, on the urinary system, on the bodily heat, on respiration, on the digestive track, on the salivary glands—and so on. But no two persons respond exactly alike to these drugs, which shows that no two persons are exactly alike physically. There are an infinite number of variations in the structure of the protein substances in animate beings, and no two persons can possibly be exactly alike, either in feature and outward form or in character of internal structure. For every difference in external shape or colour, every idiosyncrasy in habit or diet, all variations in physical and mental aptitude, and the differing effect of certain drugs upon different persons, indicate differences in structure and consequent differences in function. Scientists agree in estimating the probable intellectual capacity of pre-historic men by the structure of their fossil skulls.

In his *Origin of Species*, Darwin refers to a district in Virginia where all the pigs are black. Originally they were the usual admixture of black and white. But a weed grew in that district called "paint weed," which the pigs ate. This caused a disease in the white pigs ; their bones turned a pink colour, their hoofs dropped off, and they consequently died out. The black pigs were not at all affected by the plant. This shows that even the colour of an animal indicates some profound difference in structure.

147.—*Effects of diet.*

There is a constantly accumulating weight of evidence that the ingestion of too much of a kind of food with a certain molecular structure is responsible for the prevalence of cancer, and that the remedy is easy. Sir Robert Bell, in his *Conquest of Cancer*, tells us that in every instance cancer is the direct result of a faulty mode of life. Dr. Josiah Oldfield says that in cases of cancer, under no consideration should any form of flesh food or meat extracts be allowed. Many others have written to the same effect.

Prof. F. S. Lee, in his *Scientific Features of Modern Medicine*, p. 119, referring to cancer, says : "The conditions of the growth of cancers are probably very delicately balanced . . . and will not grow in the bodies of human beings unless

the nutritive conditions for such growth are exactly right"; and he cites the fact, demonstrated by experiments upon mice in Berlin and Oslo, that a tumour which is very virulent for mice fed chiefly upon protein and fat will not grow in mice fed on carbohydrates.

In cases of physical injury, when it is of importance to keep down inflammatory action, the medical attendant will usually prohibit the eating of meat. Dogs that are well behaved and quiet when fed on vegetable food become more aggressive when fed on raw meat. The nations that dominate over other nations are meat eaters. Any difference whatever in the average character of diet must produce some difference in the structure and functions of the living organism, although such difference may not be perceptible or definable (133).

The more numerous and serious departures from health are probably caused by the cumulative effect of but comparatively slight error in diet continued for years; and the subject becomes suddenly aware of some serious liver or kidney disease. It is a long way from perfect health to perceptible disease; and one may be far along that way without noticing anything that seems seriously wrong.

148.—*Effects of physical environment upon function.*

It is well known that the structure of air alters as we ascend to higher altitudes—it becomes more tenuous; the molecules of the gases of which it is composed move further apart with the lessening pressure, and the "orbits" in which they move are extended. This alteration in structure causes a weakening of its mutual action upon the blood in the lungs of air breathing animals. The more tenuous the air, the less the amount of oxygen per cubic inch; so that in breathing, the quantity admitted to the lungs decreases, and thus causes an alteration in energy of function.

To meet this decreased supply, the innate and wonderful intelligence of the organic mind of the individual causes an increase of the oxygen carriers—the red blood cells—so that the necessary amount of oxygen may be absorbed from the decreased amount of air inhaled by breathing. In human beings the normal number of red blood cells at sea

level is about five millions to the cubic millimetre. As we ascend to higher altitudes the number increases about ten thousand per cubic millimetre for every one hundred feet in elevation. At one thousand feet altitude, the number of red blood cells is three hundred thousand per cubic millimetre more than the normal number at sea level. The stimulus given to organic mind in this, and in other ways, is one of the basic reasons why persons in weak health derive so much good at times from a "change of air," which usually involves some change in altitude.

The amount of light in the environment of children and young animals has an important influence upon health and development. Children living on the sunny side of a street are healthier and better developed on the average than children living on the shady side—hence the saying "where the sun does not enter, the doctor will." If we lower young tadpoles to the bottom of a stream, confined in a cage constructed so as to keep out light, yet allow a free circulation of water, and pull the cage up and examine them when other tadpoles of the same age, living normally in the stream, have developed into frogs, we shall find that those who have been excluded from light are still tadpoles—but abnormally large ones! The absence of light has retarded the evolution into the frog and extended the function of growth in the tadpole; the difference of structure in environment has caused a profound difference in function.

The histologist, when he stains an object upon his microscopic slide, so that one portion of the structure which he wishes to examine shall be coloured so as to be objectively visible and distinct from the rest of the structure, clearly establishes the fact that even in the most minute parts of a living organism there are differences in structure and consequent differences in function. For the fact that the stain will be absorbed by one part of a microscopic structure, and with less effect, or not at all, by another part shows a difference in function—or mutual action—that must of necessity be referred to difference in structure. Thus, the smallest particle in a living structure must exist in an arena of constantly changing energy conditions, which could not be possible if the surrounding particles were structured simi-

larly to itself; and we again reach the conclusion that living activities are due to the mutual actions of the differing molecules of the elements and the infinitely variable substances formable by them (47). The immediate energy, mental and physical, in any living being is the sum of the energy of the mutual actions between the differing elementary and compound molecules in its structure.

Prof. Paul Ehrlich, in searching for a remedy for syphilis, tried experiment after experiment, 606 times, before he found a stain that would be absorbed by the micro-organism "troponema pallidum," but not absorbed by the surrounding tissues, and at the same time carry with it a toxin for the micro-organism. He thus discovered the drug "606" known as salvarsan, the complex structure of which is indicated by its chemical name—dioxy-diamido-arseno-bensol—which acts as a specific poison to the micro-organism, yet is claimed to be harmless to the tissues surrounding it.

149.—Sex gives differences in structure and function.

There are an infinity of variations in the structure of the substances that constitute the living body, and every minute difference in structure must give some difference in function. The sense of taste in women for bitters, sweets, acid or alkalies is more acute than in men in the proportion of eleven to nine. The sense of taste for common salt is less acute in women than in men in the proportion of nineteen to twenty-two (Lloyd Morgan).

These differences in functions of taste are indications of some subtle differences in the structures that condition gustation, and these differences must indicate still deeper and more fundamental differences in structure of the differing sexes.

Some time ago we read in the press that a Dr. Isaac Fried was reported to have discovered a method of determining the sex of a child four months before it is born by means of an analysis of the mother's blood. We do not know if this report has been confirmed, but, as at four months before birth the sex of the foetus has been physically determined for about three months, we can understand that it may be

possible to so determine the sex if a sufficiently delicate analysis can be obtained.

150.—*Subtile connection between structure and vision.*

A subtle connection between structure and function may be noticed in relation to conditions of the eye at birth. If the temperature of a newly-born puppy be taken when in the act of suckling, it will be found to be nearly equal to that of the mother. But if removed from the mother its temperature steadily falls, until, in the course of three or four hours, it may fall thirty degrees. The same phenomenon occurs with kittens and young rabbits; all are born blind.

The fall in temperature cannot be due to lack of food, for it commences as soon as separation takes place. If we take the temperature of the pup each day, we find the drop in temperature upon separation from the mother gradually gets less, until, in about a fortnight, when the eyes are opened, separation from the mother causes no fall in temperature.

Mammals born with the eyes open do not suffer this diminution of temperature when separated from the mother for the same length of time. Young guinea pigs maintain the same temperature, whether in contact with the mother or not. Mammals born with the eyes shut cannot maintain their temperature when separated from the mother, even though they are supplied with an artificial covering; mammals born with the eyes open can do so.

Thus the function of vision, though having no known connection with the production of animal heat, must have relations with an internal structure influencing that function. And the fact that providing an artificial covering for the blind young does not prevent, but only retards, the great reduction in temperature, shows that something more than simple heat is transferred from the mother to the young. This may explain why the incubator at its best and in the most experienced hands will not evolve chickens at so many per cent. from the same number of eggs, or so strong, as will the mother hen, if the eggs used in the incubator are of the same age as the eggs the hen sits upon. It is only when eggs not more than four days old are used in an incu-

bator that its effectiveness in evolving chickens approaches that of the natural method of the hen. The hen will raise healthy chicks from eggs two or three weeks old amongst the clutch when she commences to "sit"; the artificial incubator cannot do this.

151.—Wide range in structures and functions of carbon, hydrogen, and oxygen compounds.

If we put a piece of charcoal into a glass of water we have within that glass all the elements that are required to structure many hundreds of different substances. The charcoal—or carbon atom—has a wider range of atomic perceptions than the atom of any other element; it presents itself in three different allotropic forms; it is the "key" atom of a greater number of structures than any other atom; and it enters into the structure of everything that lives. The association of these facts cannot be coincidences. As we have previously observed, there are no coincidences in evolution—only mutual action. The wide functions of carbon are a necessary condition to the wide functions of living things. Out of the carbon and the water in the glass may be constructed alcohol, sugar, starch, fat, glycerine, lactic acid, acetic acid, tannic acid, camphor, gum, maltose, dextrin, cellulose, tartaric acid, citric acid, oxalic acid and hundreds of other less known solids, liquids and gases. This is one of the wonders of structure and function—how such a large number of differing substances, all having differing functions, can be built up out of only three elementary molecules—hydrogen, oxygen and carbon. There is no other possible explanation of this than that which we have already pointed out, viz. that every differing arrangement of the same elements in space gives a differing "pattern" of molecular movement, and that these differing movements condition our differing perceptions (18).

The multiplicity of differing functional activities that are possible with structures of these three elementary molecules in their so called "non-living" or "chemical" activities, is some help towards comprehending the range and variety of their "living" functions in the organic cells of which they always form structural units. And does it not seem un-

reasonable to credit these structures of cells with "living" movements and to deny "living" movements to essentially the same movements in structures outside of the cells? The translations and movements of energy in the mutual actions between atoms, which are termed "chemical reactions," cannot be other than the same movements of energy in the mutual actions between the same atoms in biochemical phenomena—for the properties of atoms are unalterable.

152.—*Action of chloroform.*

A man takes into his system in the form of food all the various atoms whose energies are required for the evolution of living activities, and transforms the structural energy (88) of the food into movements that condition the evolution of the conscious mind energy that evolves a poem, or solves a mathematical problem, and the organic mind energy that "regulates" and gives the animation of physical movements. Among these necessary atoms are those of the elements carbon, hydrogen and chlorine. Yet we can cause the evolution of conscious mind to cease by the introduction of chloroform into the blood stream. Chloroform is structured from these three elements, carbon, hydrogen and chlorine, that are present in the food we eat at every meal! So that it is not the elements themselves that bring about unconsciousness, but the specific character of the *structure* of chloroform, and the specific molecular movements that determine the specific character of chloroform. Carbon, hydrogen and chlorine, when associated with the food substances of which they form a part, have properties of movement that condition consciousness. But these three elements when structured as chloroform, have movements that counteract conscious movements; and when it is administered, consciousness ceases. If the amount administered passes a given quantity, not only conscious mind ceases, but organic mind also, and the subject dies—dies from the ingestion of a far less quantity of the elements carbon, hydrogen and chlorine than every healthy person eats three times a day!

If mind was metaphysical, a something apart from the material structure of the body, chloroform could not

possibly act as it does ; nor could man evolve intelligence in larger volume from sheep's glands than from mutton chops. But if mind is evolved as a consequence of the continuous mutual actions between differing molecular movements in blood and tissue and differing molecular movements in brain neurones, then the action of chloroform has a very evident and reasonable connection with those mutual actions, and we are able to understand why the immediate nature of mind alters when alcohol and other abnormal substances are added to the blood stream (144).

153.—Connection between mental and physical conditions.

In our everyday experiences are many minor facts that point indubitably to the inviolate nature of the connection between structure and function. Nearly every person must have some knowledge, and more or less experience, of the connection between physical condition and mental condition. A sluggish liver, for instance, is inducive of mental dullness and a tendency to pessimism ; a healthy active liver is associated with mental brightness and optimism.

The after effects upon physical structure in a proportion of cases of children who have suffered from sleepy sickness entirely changes the moral character. They become destructive and develop an extraordinary power of annoying their families. Some have been known to try and throw the baby in the fire ; some are subject to ungovernable fits of temper. Such abnormal functioning can only be due to some subtle change in structure caused by the disease.

We are yet far from appreciating the difference that may be caused in the immediate nature of mind by the ingestion of the different kinds of food, and we know practically nothing of their therapeutic value. We know and admit that certain drugs will powerfully alter the nature of immediate mind ; and it must be true that different foods will have a different effect in the evolution of it. For difference in food structure must cause difference in blood structure, and any alteration whatever in blood structure, however slight, will alter the character of its functions and cause some change in the immediate conscious mind and the immediate

organic mind. The fact cannot be too strongly insisted upon, that all our activities, mental and physical, are evolved from the food we eat, and must of necessity vary in energy or character of function with every variation in the character of the food ingested.

As the protein molecule has infinite variations in structure made possible by the large number of atoms it contains—the average molecule having about 2,200—all animals not only have molecules differing from those of other animals, but also differing molecules in all the various organs and tissues of the body.

154.—Different foods evolve different immediate mind.

If you have eggs for breakfast, the mind that is evolved from those eggs will not be the same as would have been evolved if you had eaten the breast of a fowl instead of the eggs. If you had sheep's tongue for breakfast, the mind that is evolved from that sheep's tongue will not be the same as would have been evolved had you eaten mutton chops. We cannot define what the difference would be—that would, in any case, depend largely on the particular structure of your own protein molecules, or your constitutional idiosyncrasies—but in every case, without possible exception, there would be some slight difference in mentality. When the character of the food has a wide divergence the effect is more pronounced, and a definite difference can be perceived and stated. Probably many a writer has discovered for himself that after eating certain food he can do better work than he could have done had he eaten some other kind.

A diet with certain items of food in excess—not excess in bulk, but excess in proportion—will induce a decided tendency to pessimism; whilst another dietary scale may have a decided effect towards optimism. The pessimistic tendency is usually associated with the ingestion of more proteid food than the system requires; or protein of an unsuitable molecular structure. Observations covering half a century have convinced us that the larger portion of the misery in the world is caused by the pessimistic tendency induced by eating foods whose structure is not readily transformable into mind energy. And we would undertake to

make a normal person pessimistic in a few days by the use of foods that are popularly considered easily digested, nourishing and harmless. Every alteration in structure of food ingested causes an alteration in the character of immediate mind.

155.—Digestion and assimilation.

The question is not one of digestion, but of assimilation, which is a very different matter. Digestive trouble comes soon after eating; assimilative trouble comes after the digested products have entered the blood stream, and may be felt the next day, not in the stomach, but by the mind. And it is due to the wide difference between digestion and assimilation, together with the fact that no two persons are structurally alike and therefore function differently, that causes so much confusion and the many contradictory opinions in regard to diet. A food may be easily digested but difficult to assimilate—eggs for example; or may be difficult to digest and easy to assimilate—lean pork chops for example.

One can easily discover what is difficult to digest; it is much more difficult to determine what is most easily assimilated. Many persons eat eggs because they are easily digested, who would obtain more energy from some other form of proteid less easily digested. The term "easily digested" is very misleading. The value of bran in brown bread depends almost entirely upon the fact that the human stomach *cannot* digest it!

156.—Universal dependence of function upon structure.

The cause of any movement or function in nature is fundamentally the same, whether we term that function mechanical, chemical, mental or physical. Its basis is a phase of movements in mutual action between the three inseparable factors; and each of the infinite and continuous series of movements conditions one of the infinite variety of presentations in nature. Alteration of molecular movement in any substance involves alteration in the properties and functions of that substance. Alter the structure of blood, brain or any sub-animate substance, in however slight a manner and alteration of function must inevitably

follow. This is as certainly true as any mathematical equation.

The character of the structure of even a sub-animate machine most surely indicates the character and extent of its functions. A clock that strikes the hours must certainly have a more complex structure than one that only indicates the time by the movement of its hands. And if two such different clocks were run down and inactive, a clock maker, by merely looking at the structure of each, could easily determine which clock would strike the hours and which clock would not when they were set going. A mechanician, by examining the respective structures of a foot power printing press and a modern newspaper printing machine, could determine, without putting the machines into motion, what extended range of function the one machine had beyond the capacity of the other by simply considering the complexity of its structure.

Throughout all phenomena in nature function is related to structure in the same necessary manner. It is proven in industrial operations, in medicine, pathology, chemistry, physics and astronomy. The washerwoman knows that hot water functions differently from cold water—it cleans clothing better. The cook knows she cannot cook potatoes with cold water. The functions of water always change when its structure is altered by the addition or subtraction of heat ; its molecules move with greater energy and in a larger area with the addition of heat ; its solvent functions increase with every rise in temperature. The structure and functions of the air we breathe are altered by differing temperature. Warm air will hold more water vapour than cold air ; when a current of cold air meets warm moist air, clouds are formed ; if the clouds drift into a warmer air, they disappear again. Thus, because of unceasing differences of temperature in the atmosphere, the clouds are perpetually forming and disappearing.

The functions of growing plants are altered by changes in the structure of the air. The carbon in the structure of plants is absorbed from the air. If the structure of the air is altered by an artificial increase of the amount of carbon dioxide, the plants grow more rapidly ; and this increase in

the intensity of function rises with increasing proportion of carbon dioxide, till about two hundred and seventy times the normal proportion in the atmosphere is reached.

157.—Effect of light and electric energies.

Practically all substances are known to be more or less affected in their functions by light ; all living movements are affected by it ; therefore the *structure* of all possible forms of matter—animate or sub-animate—is altered by any alteration in intensity of light. The functions of the photographic film are very sensitive to differences in intensity of light. So are the functions of the eye.

A bar of iron functions differently, if we send a current of electricity around it, for the structure of the iron is then changed from that of simple molecules of iron to that of a combined structure of iron molecules and magnetic energy. And it now possesses the added function of being able to draw other pieces of iron to itself in opposition to the energy of gravity—it has become a magnet. Electro-magnets attached to powerful cranes are in common use for moving heavy pieces of iron and steel, and are largely used for many other purposes. In metallurgy the manufacturer of steel knows the economic value of a minute alteration in the structure of steel ; he gives it more durable, tenacious or resistant functions by the addition of relatively small amounts of ferro-manganese, speigel, vanadium, ferro-silicon, tungsten or nickel, and by other means that are, for very evident reasons, kept secret.

158.—Properties of matter are "functions" of matter.

We tend to confuse ourselves by using different terms to indicate what is really the same thing. There is no reason why the behaviour of matter in the physical or chemical laboratory should be classed as the "properties" of matter, and the same behaviour within living organisms, as "functions" or "living functions." Why not "functions" of matter, instead of "properties" of matter, since atoms of matter must always "function" the same under given conditions ? The affinity of carbon for oxygen in the laboratory is called a "property" of carbon ; the same

affinity in our tissues is a "function"—a "*living function!*"

And why should water be termed an inorganic compound, when more than three fourths of organic living things is water? We cannot in the slightest degree alter the functions of water. Although under thousands of differing conditions water will function in thousands of differing ways in an exact and inviolable manner to meet those differing conditions, no power of man can in any way alter this. At sea level, and under the average atmospheric load, water will boil at 100° Cent., and freeze into ice at any temperature below 0° Cent. If the atmospheric load is increased or decreased, or if artificial means are taken to alter the pressure, this gives a different structure to the water, and it will freeze or boil at a differing temperature. Nothing known to man can change these natural "habits," "properties," or "functions" of water. It is not possible that the functions of water in physics and chemistry can differ from its functions in animate activities. It is so absolutely a necessity in all animate being that we might fitly term water the mother of life.

159.—*Living functions and chemical functions.*

Every element has atoms that differ in weight from the atoms of all other elements, and must therefore have its own specific structure and its own specific functions. The truth of this is demonstrated every day in every chemical laboratory. The functions of these atoms are inviolate. Under any definite conditions every atom and every molecule of atoms will function in a certain exact manner to meet those conditions, and in no other manner, whether this function occurs in the tissues of the living or in a chemical test tube.

The functions of albumen or of protoplasm are altered by altering the amount of water that may be present in the structure. Original investigators into the physical difference between normal and exhausted nerve tissue could find no difference whatever, except that the exhausted nerve contained less water!

Living protoplasm is different from dead protoplasm,

even before any physical sign of disintegration is perceptible. Carmine will not colour living protoplasm, but will brilliantly stain dead protoplasm ; this is because certain molecular energies have left the protoplasm and altered its structure. If the albumen of an egg be subjected to a rising temperature till it reaches 65° Cent., we perceive no change in it except the rise in temperature. Yet if we raise the temperature to 75° Cent., the albumen becomes a white solid, and also becomes insoluble in water ! If we subject gelatine—a substance closely related to albumen—to the influence of heat, we produce quite different results, for the gelatine will soften and become more soluble in water.

160.—Incomprehensible results of mutual actions.

We must keep clearly in mind the fact that the terms we use to indicate phases of basic activity in nature cover our absolute ignorance of the essential nature of those activities. The terms "chemical affinity" and "chemical reactions," equally with "consciousness" or "mind," are quite meaningless to us as regards the essential nature of the activities we indicate by those terms. We say that chlorine and sodium have an affinity for each other ; and we know that the mutual action between these two elements, which arises as a consequence of this affinity, causes the simultaneous appearance or evolution of common salt and a large amount of heat. But the nature of that mutual action which causes a white opaque metal and a greenish yellow, poisonous and most disagreeable smelling gas to combine together so as to form white transparent crystals, so totally different physically from the two elements that structure them, also to evolve a large amount of energy, is an absolute mystery to human mind. Such wonderful transformations of matter as occur when various atoms are mixed together in chemical combinations constitutes one of the most baffling mysteries presented to us in nature. The equally inexplicable wide transformations of function which follow such changes in structure are equally wonderful, mysterious and incomprehensible ; and the only manner in which we may even faintly conjecture their ultimate nature is by co-ordinating them as effects of atomic mind.

A person may swallow an ounce of mercury with no ill effect. John Wesley, the founder of the Wesleyan sect of religion, wrote a book on *Primitive Physic*, and amongst his cures for a certain ailment he gives: "Take an ounce of quicksilver." But if we add to that ounce of mercury less than one third of an ounce of chlorine—one of the elements of common salt—the chemical union of the mercury with the chlorine, by mutual action, evolves that violent poison "corrosive sublimate," or mercuric chloride; and the ounce of mercury thus becomes a poison sufficient to kill several hundreds of people! If we add to that ounce of mercury only *half* the chlorine that is necessary to produce "corrosive sublimate," we produce "calomel," or mercurous chloride, which is largely used in infants' soothing powders, and is a popular remedy with orthodox physicians for infantile disorders!

The air we breathe is more than three fourths the gas nitrogen; hydrogen is one of the two gases that form water; but if the two gases nitrogen and hydrogen are united chemically, we obtain the pungent suffocating gas ammonia! The water we drink is a chemical mixture of two gases, but how two gases can, by uniting, form a liquid, is unknown to human mind. We perceive the wide and astounding differences in function caused by the changes in structure that follow the mutual actions between differing atoms; but we have no clue, no conception whatever, regarding the nature of the activities that cause such unreasonable changes. And we have no more reason for denying the incomprehensible truths regarding the evolution of mind than we have for denying that a mutual action between two invisible gases with unalterable properties will evolve a visible liquid. Both facts are incomprehensible, and incomprehensibility is absolute.

161.—*Instinctive (?) movements.*

The laws of structure and function which we formulated above (144) give us a means of grasping some idea of the immediate nature of the many activities that are termed instinctive. Thus, similar organisms will, under similar conditions, always behave in a similar manner.

In man conscious mind is more dominant in the control of animation than it is in lower animals. As we go down in the scale of evolution the effects of conscious mind become less evident, and the effects of organic mind more evident ; until we reach the lowest forms of life, where organic mind dominates what must be a feeble state of consciousness, intermediate between human consciousness and the lowest expression of consciousness in the monatomic elements.

We see evidences of this increasing dominance of organic mind as we go down in the scale of complexity in structure, in the tenacity with which lowly forms hold on to life, and in their capacity to repair injury. A worm can grow a new head if its head is cut off ; a plant may be cut into a hundred pieces, and each piece will grow into a new plant. Man cannot do such things. Innumerable instances could be given of lower forms of life bearing, without evident injury, treatment that would kill any of the higher animals.

We also see, as a result of the relatively increasing dominance of organic mind, that as we go down in the scale of complexity in structure the less divergence there is from average type amongst the members of any particular species. The offspring of negroes vary less from parent type than do the children of white races ; the offspring of lower animals vary less than negroes ; and so on to the lowest forms of life, where we cannot distinguish one individual from another. Nor can we distinguish any difference in their animate movements ; they all behave in the same manner, as though they had no individual intelligence, but acted " blindly " in some mysterious manner which is termed instinctive.

162.—Instincts and affinities.

It is a mathematical truth that with a less number of differing factors less variations in function are possible ; and with organisms, as we descend in the scale of complexity in structure, the less the number of factors there are present to give possible variations in function.

And in the lowest forms of life, structural limitations to function so reduce range of movement that it becomes scarcely distinguishable from the sub-organic mutual activi-

ties in chemistry, where precisely the same movements always follow contact of the same two elements under similar conditions. In both cases they cannot behave otherwise. In the former case the term instinct is applied to them, in the latter case the activity is attributed to *affinity*. It is evident that all the so-called instinctive activities of both the highest and lowest forms of life are simply movements due to organic mind perceptions, over which the animal has no conscious control and no more power to resist than the chemical element has when conditions cause it to mutually combine with another element; or the human eye has to resist seeing that which it sees.

There are insects which kill their prey in a certain fashion, as though they had a perfect knowledge of the anatomy of their victim; and this is ascribed to some wonderful and mysterious "*instinct*." But the insect only acts as it *must*—as its organic mind makes it act—if we exclude any possible influence from its conscious mind. Yet its organic mind may be quite as conscious of what it is doing as we are conscious of what we are doing. Organic mind must have consciousness, for mind cannot exist apart from consciousness. It is simply impossible for anything to have any vestige of mind unless it has consciousness. The insect structure, as with all other structures, can only act or function in a certain manner under given conditions; and every animate structure that survives in the struggle for existence, which is so remorseless and unceasing on the earth, does so survive simply because it has some specific functions which enable it to continue its existence and procreate its kind.

When giraffes first appeared on earth they survived because they could eat the leaves off trees, and so sustain life. When the woodpecker first appeared he survived because he could live by extracting insects with his strong bill from crevices in the bark of trees. Nature did not *design* the woodpecker's bill for the purpose. If we assume that nature designed the woodpecker's bill we must also assume she designed the insects to live in the crevices of the bark; also the bark and the trees to accommodate the insects—and so on *ad absurdum*.

163.—*Forms of life not adapted for survival.*

There exist to-day many millions of varied forms of animal and vegetal life, including forms of almost every conceivable shape. All these represent forms of life that possessed features of structure which enabled them to sustain the struggle for existence. Of the much larger number of living things that nature evolved during the millions of years since living things first existed on earth and of which no trace remains, we do not give sufficient consideration in our popular theories of evolution. At the present time not a day passes without some form of life being evolved so abnormal or monstrous that it cannot live ; or if it lives, cannot reproduce its kind. And if we take a million years as the length of time that animate life has existed on earth, even this conservative estimate would give us 365 millions of futile forms of life which have disappeared because they had a structure unsuited to any function which would enable them to survive.

That an insect should kill its prey in a fashion that seems to endow that insect with a mysterious knowledge of the anatomy of its victim does not seem quite so hopeless a problem when we consider that there are *now* living more than two hundred thousand different species of insect, in each of which there is a something specific in structure and function which has enabled it to exist ; and that an infinite number of different insects must have perished, leaving no trace of their having existed, because they did not fit their environment sufficiently well to prosper ; because they did not have a structure that fitted exactly in function to some means of continuing their existence. We must remember that only *one* of each such types could have existed, and the chances are infinite that no specimens of these prehistoric monstrosities or failures of nature's fortuitous activities have ever been discovered—or if discovered, recognised to be what they really were.

164.—*Functions exact expressions of structures.*

Why nature's laws operate in the evolution and devolution of individual being ; why they or anything else came into existence, present problems that are beyond the scope of

man's reason ; and we cannot take seriously any metaphysical speculations regarding them. But from whatever direction we approach phenomena in nature, seeking a knowledge of their immediate cause, we cannot avoid the conclusion that all movements, functions, mutual actions, all phenomena that may be classed under the term *activity*, whether in the realm of the organic or the suborganic, are inviolable and exact expressions of some definite structure. And in tracking down the evidences of mind in its universal and unceasing activities, and its infinite variety of phases, we are greatly assisted in our efforts to arrive at the truth by a confident reliance upon the law that every one of the infinitely varying functions in nature is an unalterable expression of one definite form of structure amongst the infinite number of variations in structure possible to the physical elements.

CHAPTER X

MIND, MATTER AND ENERGY

165.—*Radiant energy ; slow co-ordination of facts.*

In this chapter we propose to survey some aspects of the relation between mind, matter and energy which do not come within the scope of other chapters, yet which have a value of their own in support of our various postulates.

Previous conceptions regarding the ultimate nature of matter were considerably modified in 1878, when Crookes produced the kathode-rays in his vacuum tubes, and rightly claimed that he had discovered a previously unknown condition of matter, which he termed "*radiant matter*."

The principles of the conservation of matter and energy as originally formulated were not strictly true in the sense in which they were first accepted by the scientific world. We now know, that although the *sum* of matter and energy may be constant, the individual amounts of matter and energy in all existences must be eternally fluctuating in cycles of evolution and devolution—energy evolves from the devolution of matter ; matter evolves from the devolution of energy.

Just as we cannot place a definite dividing line between organic and sub-organic, or place a line definitely separating that which we term "*living*" from that which we term "*dead*" (134), so we cannot place a dividing line between that which we term *matter* and that which we term *energy*. We reach a point in "*radiant matter*" where we are at a loss to determine whether we should refer to it as matter or as energy ; we reach matter that has no *weight* ; it has an energy that opposes or inhibits the energy of gravitation. This, as the reader will perceive, is in perfect harmony with the postulate that all phenomena in nature must of necessity be continuous. In *radiant energy* we seem to have reached

the arbitrary dividing line between our conceptions of matter and energy ; energy with its inseparable *minimum* of matter ; matter associated with its *maximum* of energy.

This correlation between matter and energy was for a long time prior to the discovery of radiant matter clearly indicated by the transformations of matter and energy which occur in nature, in physics, and in chemistry —ice in melting takes up heat energy, and the water that evolves has more energy in its structure than ice. And the converse is true ; ice has less energy in its structure than the water from which it devolves. Liquids devolve into solids by loss of energy. Solids evolve into liquids by the addition of energy. Much energy of structure is set free when we add water to strong sulphuric acid. In the process of solution of crystals energy is absorbed ; and in the formation of them energy is set free. Every mutual action in chemistry is associated with transformation of matter into energy or of energy into matter. The term "latent heat" which is applied to such disappearances and reappearances of heat energy is a misnomer. The heat is gone ; it is transformed into structural energy, just as energy from the sun is transformed into the structural energy of plants and fruits. It is only comparatively recently that it has become accepted as an unquestionable fact in science that matter and energy are correlated.

166.—*Professor Soddy ; repulsive energy of electrons ; absolute zero ; structural energy in water.*

But because matter and energy are inseparable the correlations between them can never be absolute under the present order of nature. It is not possible to transform any portion of matter entirely into energy, for energy is always, and of necessity, associated with some value of matter. Professor Soddy has made a calculation which indicates the inconceivably minute amount of matter which may represent the irreducible minimum which is inseparable from energy. He finds that if we took as many electrons as there are atoms in one gram of hydrogen, place one such quantity at the North Pole, and another such quantity at the South Pole, they would repel each other with an energy that would

require a steel cable capable of sustaining a strain of thirty-five tons to keep them from moving farther apart! No material bond could hold them a short distance apart; they would burst into fragments the strongest structure that man could devise! And all this with a weight of matter less than the weight of water a teaspoon would hold! (*Matter and Energy*, by Professor Soddy.) Nor is it possible to transform any measure of energy entirely into matter, for energy is always, and of necessity, associated with some value of matter. Physicists have not been able to reach zero in the scale of absolute temperature; some value of energy must always remain in the matter from which they are striving to abstract all heat. We learn from the press that a degree of cold about four-fifths of a degree Centigrade from absolute zero has been reached by Professor Onnes of Leyden. If matter and energy were not inseparable, would it not seem strange that 272.82° C. could be reached, but not— 273° C.? To obtain absolute zero it appears evident to us that we should have to take from the electron its irreducible minimum of matter. But electrons—as Sir Oliver Lodge tells us—“*appear to be the ultimate foundation stones of which the material cosmos is built*”; and if this is so, to separate energy from matter and so obtain absolute zero, it would be necessary to remove conditions which make all existences possible. At zero, matter would disappear into nothing, so far as our senses or any technique in science could determine. For without ordinary matter heat could not exist. Light from the sun is not heat; put yourself far enough away from the radiation of heat from the earth, and you will freeze to death in a few minutes, although you are exposed to the full glare of the unclouded sun. The inconceivably rapid movements of light waves are transmuted into heat when they are *stopped* by ponderable matter—in an essentially similar manner as the movement of a hammer is transformed into heat when it is stopped by an anvil. Light may be transformed into matter. Sunlight, falling upon snow and ice in arctic regions, is transformed into heat; the heat becomes incorporate with the snow and ice, and then becomes water, which may thus be considered as a *structure* of solar energy associated with ice or snow.

An infinite number of forms of structural energy in matter occur in the evolution of the substances of growing vegetation, which is eaten, and which in its devolution furnishes the energy which animates us, and all other living things—directly or indirectly.

167.—*Vacuum tube; radio-activity; Ramsey and Collie; Sir Oliver Lodge.*

The phenomena of the vacuum tube is the converse of the phenomena of radio-activity. The one is an activity in evolution, the other an activity in devolution. In the vacuum tube, matter is evolved by energy—it is a building up; in radio-activity energy devolves from matter—it is a breaking down. The emanation of the A, B and Y rays in radio-activity is accompanied by the devolution of a large amount of energy, which is discharged from the radiating elements originally evolved by primary evolutionary activities. The A, B and Y rays from radio-active elements are identical with the canal rays, cathode rays, and X-rays of the vacuum tube. To produce the rays of the vacuum tube we have to apply a current of intense energy, and the more intense this energy is, the greater the energy of the resulting rays. If the rays from radio elements are energy and particles of atoms broken away from the most complex of atoms, the rays of the vacuum tube must be energy and particles of atoms evolved as a consequence of the intense energy introduced; and the phenomenon is the exact reverse of radio-active phenomena—the one absorbing energy, the others emitting it. It has been demonstrated that by long continued action of the X-ray bulbs the gases helium and neon appear. Thus man has undoubtedly succeeded in producing or manufacturing matter from energy and protomatter!

The devolution of energy from matter in the breaking down of the atom in radio-activity indicates that the evolution of the atoms of the radio-active elements occurred in an environment of energy tension far more intense than that which exists under present conditions in nature.

It does not necessarily follow that because the atoms of the radio-active elements have such a relatively large amount

of energy in their structure that other atoms have equal energy, which may possibly become of economic importance. In the successive appearance of differing atoms in sub-organic evolution the constantly lowering energy of environment would, of necessity, give lowering energy content to atoms. The fact that the heaviest of atoms are radio-active, and Einstein's statement that the mass of a substance is the measure of its energy content both point to the above conclusions.

Every mutual action in chemistry deals with the energy of the atom. The union of hydrogen with oxygen, for instance, releases a large amount of energy ; but the infinite number of experiments that have been made—naturally in nature, and artificially by the chemist—with all the known elements, practically demonstrate that no possibilities exist that any serviceable energy may be derived from any atomic activities that it is possible for man to determine or control. For all such mutual actions amongst atoms balance each other—there is no surplus. The exact amount of energy set free in a chemical union of atoms must be returned to those atoms before it is possible to separate them again.

Man has no influence or power at his command that will in the slightest degree affect the energy of radio-activity. He has no more influence over the radiant energy than he has over the radiation of energy from the sun ; and the prospects of exploiting the energy of the atom for economic use are feeble to vanishing point. It is probably well for the human race that this is so. Statements such as have been made by Sir Oliver Lodge that :

"Atomic energy will be the future principal source of power—instead of burning one thousand tons of coal, they will take the energy out of an ounce or two of matter," have not even the shadow of a reasonable foundation.

We may perhaps be able to balance the energy of radiation by an opposing energy, and so apparently stop it. But it still will be exerting the same amount of energy in balancing that opposing energy. To take the energy out of an "ounce or two of matter" we shall always have to expend as much energy in doing so as we get out of that ounce or two of matter. We do not *take* energy from radio-active elements

—it comes out. The problem is exactly equal to the problem of burning water. Water is composed of two gases, oxygen and hydrogen, which will burn together and evolve an intense energy. But to get this atomic energy from water we have to expend exactly the same amount in transforming the water into the two gases. Of surplus energy we get none. The energy derived from radio-active elements became a part of those elements when they evolved, thousands or millions of years ago, in a more intense energy environment than exists to-day. This energy is now, as it were, slowly evaporating away under a less intense energy pressure, just as water will evaporate more readily into energy and vapour under a lower atmospheric pressure—which is actually an energy pressure. Radiant energy is energy which has been conserved as structural energy in the radiant atom, somewhat as the energy we get from coal is the conserved structural energy of vegetation that grew millions of years ago.

168.—*Mind, matter and energy correlated; "materialisations."*

The undoubted correlation of matter and energy, and the fact that mind is demonstrably a mode of energy correlated with the ordinary physical energies (80) lead us to the profound and somewhat startling truth, that the three basic factors—mind, matter and energy—are not only coeval and inseparable, but also correlated. We see by the phenomena of the vacuum tube that energy may be transformed into matter; we see from the phenomena of radio-activity that matter may be transformed into energy. That matter may be transformed into mind we each of us demonstrate every time we sit down to eat the food that is necessary to keep up our output of mental and physical energy—to keep us, individually, in existence.

It now becomes evident that we cannot, *a priori*, or rationally deny the possibility of what are termed "materialisations" at so-called spiritualistic seances. Here we have, on the authority of many reliable investigators, objective presentations coming into existence apparently out of nothing. Yet science can demonstrate that matter

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evolves from energy; and beyond the fact that such phenomena are unusual, we know of no reason why the radiations of energy coming from a circle of sitters whose radiant vibrations have been brought into approximate unison by the procedure usually adopted at such seances, should not aggregate together in mutual activities with environment, so as to transform more or less of this radiant energy into matter. We go further into this in Chapter XIV.

169.—Perpetual and ever-varying movement evolves an infinity of presentations.

Although every atom of matter and the whole bulk of matter in the universe is in constant movement in association with mind and energy, so that we only know of mind and energy as a consequence of that movement, in every system there are perpetual variations of movement caused by the never ceasing transformations of the three basic factors that give us perpetual cycles of evolution and devolution; so that any system may be associated with an infinity of variations. For variations in value, extending from the minimum to the possible maximum quantity of each factor, are infinite; and thus present the possibilities for that infinite variety of presentations we find in nature. But no maximum of one factor can reach up to a total exclusion of the other two; and no minimum can reach zero, for each entity is a necessary condition for the existence of the other two (130).

We encounter difficulties in our attempt to present a true picture of the immediate nature of phenomena through a common use of terms which do not express any real meaning; also by the inadequacy of any language to picture the depths to which mind may penetrate.

The term "latent" heat is applied to the heat which disappears when ice is melted into water, or water into steam; but the heat which so disappears has ceased to be heat; it is not heat, it has been transformed into matter. All forms of matter may be regarded as having structural energy—energy in the form of material structure. At the level of energy environment in the present order of nature,

there are universal and unceasing reciprocal transformations of matter and energy. This is most evident in such substances as easily oscillate between solid and liquid, or between liquid and gaseous. Add sufficient energy, and the earth would revert to the fire mist from which it evolved.

Radiant heat, light, electro-magnetic vibrations indicate the same thing. Vibrations of light, when retarded, are transformed into heat ; radiations of heat are transformed back again into light. All forms of matter and energy are universally in constant states of transformation, from the imperceptible changes in apparently imperishable rocks and metals to the sudden transformations of explosive compounds into energy ; from the thousands of years it takes to transform a grain of a radium salt into energy and other forms of matter, to the few hours it takes man to transform the structural energy in a crust of bread into the energy of mind ; all things are in a state of perpetual transformations. But only a small fraction of what occurs in the infinite variety of phenomena presented by these transformations can be indicated with any exactness by any terms in any language ; the deeper activities can never find expression or definition in words.

When we attempt to express the nature of the immediate activities of mind we feel to the full the limitations of language. The rush of the tide of deeper knowledge which has occurred in recent years by the light of which we must readjust our conceptions regarding the immediate nature of mind and the relations between matter and energy necessitates a wider scope of meaning for many terms in common use.

Just as every form of matter has three states—solid, liquid, and gaseous—yet remains the same matter, plus or minus some energy ; and as every definite volume of space has three dimensions, each one equally essential to the other two, so there are three basic factors to every presentation in nature, each one equally essential to the other two. And all presentations which we term *mind*, or *matter* or *energy* represent one of these factors, plus some measure of the other two. We may say that *mind* has a minimum of matter and an unknown measure of energy ; *matter*, a

minimum of mind and a partly known measure of energy ; *energy* an unknown measure of mind and a partly known measure of matter.

The conclusions we have arrived at are not based upon a few isolated facts, which might be ruled out as evidence when opposed to other facts. They are based upon the many facts which we have taken from practically all branches of science, and upon a host of facts within the common knowledge and experience of every person. And they all point more or less directly to the same conclusion, forming a cumulative weight of evidence which cannot with reason be resisted.

As a broad generalisation it may now be stated that all things—animate and sub-animate—have mind, matter and energy values proportionate to the necessities of the nature and conditions of their existence. The more stable the existence, the lower the mind value necessary to continue that existence ; the less stable the existence, the greater the mind values necessary to continue it. This agrees perfectly with the fact that mind values increase with increased complexity—and consequent increased instability in structure ; and it may be stated as a universal generalisation that mind values in structures increase in direct proportion with degree of instability. The human brain appears to have reached the possible limits of complexity and instability of structure consistent with the rational functioning of conscious mind ; and it is the arena of the most constant and complex transformations of the three factors. Further instability results in insanity, and thus has arisen the common saying that genius is akin to madness.

170.—*Nature of perception cannot be defined ; behaviour.*

The perpetually varying phenomena in nature flow from the perpetually changing relations between mind, matter and energy initiated by the perpetually active perceptions of the elemental molecules and aggregates of molecules which exhibit themselves as movements. But we cannot conceive the basic nature of these perceptions, which keep the universe in perpetual movement. We cannot conceive even the nature of our own perceptions, although we have been

using them constantly all our lives. We can only make blind guesses regarding the phenomena that occur in our tissues in the act of transforming the varied nature of our environment into perceptions of organic mind ; and, by further mutual action with neurones in the brain, into conscious mind. We perceive vibrations in the air as *sound* by a physical effect produced upon the mechanism of our ears ; we see, by the physical effects vibrations of light produced upon the retina. Our sense of touch is an effect caused by physical pressure upon the peripheral nerves ; but no explanation (?) of such facts can ever reveal the basic nature of any mode of perception. But we do know—and must hold fast to that knowledge—that to perceive there must be movement (16) ; that if there is movement there must be energy ; and, given perception and energy, these would be useless unless there was something that moved—matter. And we cannot define or explain what a perception is in terms of mind or in terms of consciousness. Here language fails us. A perception is an expression of mind ; it is also an expression of consciousness and of intelligence. No explanation or definition of anything can be given in terms of *itself*. We cannot define matter in terms of matter ; energy in terms of energy ; or mind in terms of perception, knowledge, consciousness, understanding, intelligence or any other terms that are used to denote activities of mind. There is only one possible way in which we may rationally deduce evidence of the manifestation of mind, and that is by observation of the " behaviour " of anything that moves (41). But the range of human observation is limited to the limited range of human modes of perception—so that it is impossible for man to detect by direct observation many modes of behaviour in the infinite range of movements in nature which would indicate the operation of perceptive activities. Man is thus led to unduly value, in a relative sense, his own qualities of mind, and to minimize, or altogether deny, the operations of mind in other things than himself. He is the victim of his limited senses of perception —five—upon the evidences of which all of his intelligence is structured (26, 59).

171.—*Incomprehensible perceptions and activities.*

No matter how much we may learn regarding the immediate conditions that are necessary to the exhibition of any mode of perception, we can never really comprehend its ultimate essential nature. Persons born deaf cannot be made to comprehend what sound is ; and it is not possible for persons born blind to form a conception of what " seeing " really means (31).

But though we cannot comprehend an ultimate cause, we can recognise the evidences of perception in the character of the movements we see, in the behaviour of things in relations to each other ; and thus we may determine the immediate causes of differing presentations—as we determine the immediate cause of gravitation to be due to a mode of perception that is incomprehensible to us (26). All the evidences we possess of the existence of the energy of gravitation, or of mind, or of any other form of energy, or presentation in nature have come to us by means of our five senses of perception, by considering the behaviour of things. Behaviour is the response in movements to perceptions, whatever be the mode or nature of the movements or whatever be the mode or nature of the perceptions which initiate the movements. Human knowledge is but knowledge of that which lies on the surface of basic mysteries. We can co-ordinate cause with effect, but we know absolutely nothing of the mutual, continuous, simultaneous activities which connect them. And it is of the first importance that we should give adequate weight to the undoubted existence of the many modes of perception in nature other than the few we ourselves possess (36). The fact that we cannot comprehend the nature of these other perceptions and the consequent movements and evidences of activities of mind in what is usually, but incorrectly, termed inorganic or inanimate matter, is no bar whatever to an acceptance of the truth that they do exist. If evidence and reason point to that conclusion, we must accept it, as we do so many conclusions in science, that are, in the ultimate, beyond human comprehension.

We know, and admit as a truth, that rubbing amber with a silk cloth will evolve electric energy ; and we may term the

rubbing the cause and the electric phenomenon the effect. But we are quite unable to understand the nature of the activities which transform our rubbing movement into electric movement. It is just as incomprehensible to us as is the transformation of molecular movements into mind energy. We know, and we admit as a truth, that water will run along a gutter because we have undoubted evidence that it does so ; yet we cannot comprehend the cause. We may think we explain (?) the fact by saying that water always will run "down hill," and will find its level under the compulsion of the energy of gravity. But there is no such direction as "down hill" ; there is really neither "up" nor "down" in nature ; what is "down hill" at any moment is "up hill" in a few hours ; and this relative direction is constantly changing. We have evidence, equally as clear as that water will run "down hill" (?), that there are an infinite number of varied perceptions in nature other than those of our five senses ; and we must admit the evidence of these perceptions, even though we cannot comprehend their nature. And as all forms and phases of matter and energy show evidences of perception, and have consequently some lowly form of mind activity by which they perceive (39), but which is beyond the grasp of our comprehension, mind, matter, and energy are thus inseparable through all presentations in nature ; and mind presents itself as a fundamental physical factor in the same sense that matter and energy so present themselves.

172.—Possibilities of the future never fully known.

The first man in prehistoric times who succeeded in firmly fixing a stone into the fork of a small branch from a tree, and so evolved a more powerful weapon for attack and defence than man had ever before seen, was no doubt considered by his contemporaries as a man of wonderful intelligence. The man who first made a fish-hook out of a piece of flint was most certainly a gifted man ; and his contemporaries must have considered that he had about reached the limit of human ingenuity.

At all periods in history men have estimated acquired knowledge in the same relative manner as we do to-day.

Future generations will be able to point out the errors of to-day. There is abundant evidence in the previous pages that present day conceptions regarding the relations between mind, matter and energy are not consistent with known facts. There are heaps that require removing and gaps that have to be filled in. We may, in some directions, see possibilities of further achievement ; but what is possible to the future can never be fully known. No man, however gifted, could by reason have foreseen many of the achievements we are familiar with to-day, and the same position is present now as it has been in every age. The future holds possibilities that man cannot anticipate.

You, my reader, are intelligent, or you would not be reading these lines. You have *mind* ; but if you have sufficient "intellectual grip," you are quite sure that you do not know what *mind* is—in exactly the same sense as that conveyed by the statement that no man knows what *matter* or what *energy* is. You *think* ; and you know quite well that you do not know *how* you think, any more than a tree knows *how* it grows, or a piece of iron knows *how* it rusts. You *know* that you are conscious ; but you can only *infer* that other people about you are conscious ; you may also infer from its behaviour that a dog or any other animal is conscious. But your inferences regarding the presence of consciousness in other people, or in other things or animals, are based solely on their *behaviour*. If they were perfectly motionless you could not infer that they were conscious—for consciousness can only *exhibit* itself as movement ; yet it may be acutely present and have movement that cannot be perceived by our senses. Man has no attribute that is not shared by lower animals. Kings have fought for supremacy and power over the people they led ; the males in herds of animals will fight to the death for supremacy and power over the herd they lead. The ultimate nature of the impulse is the same in both cases. Male animals will plume and preen themselves at mating time to attract the attention of females ; just as the human male tries to show himself to the best advantage.

173.—*We cannot place a limit to consciousness.*

If you try, by considering and studying the behaviour of low and still lower forms of animate and sub-animate existences, to determine how deep in nature consciousness extends, you will soon discover that you cannot place a limit to consciousness. You will get to a point in your observations where animate things and sub-animate things *behave exactly alike* in exhibiting their consciousness of the nature of the immediate conditions surrounding them (40); and your final conclusion should be that consciousness extends to everything in nature, animate and sub-animate; that consciousness and mind are expressions of the same ultimate factor—universal mind—and that everything which applies to mind equally and of necessity applies to consciousness. We may be allowed, with as near an approach to ultimate truth as is possible to human mind and so far as the inadequacy of language will permit, to define the term “mind” in terms indicating:

that ultimate intelligent energy which is associated with all movement, in simultaneous, continuous mutual actions; and which is perpetually changing in character and energy of movement, by the perpetual transformations occurring in correlation with its coeval and inseparable associates—matter and energy.

174.—*Erroneous conceptions regarding mind.*

It is commonly believed by many that mind is a “mere function of one part of the body, i.e., the brain” (Schopenhauer). This is utterly and fundamentally wrong. It is the body that is a “mere function” of mind. It is mind that expresses itself in the movements we term *living* (11). The body is an effect of mind; an effect of that organic mind which initiates and controls its evolution. The body is ephemeral; it dies; it passes out of co-operative existence; but the minds of the fundamental elements that animated it live on; they cannot die.

Of those who think that mind is but a function of one part of the body—the brain—we would ask: “What of the mind which animates every part of the body the—*organic mind*, upon which every differing structure and function of the

body, including conscious mind, and the very brain itself, depends, and whose activities initiate all animate movements in nature?"

Many are still of the opinion that mind is a metaphysical something, a special creation peculiar to man and quite apart in its basic nature to his physical system—as Kant taught. But this Kantian conception is shown to lack any foundation in fact or reason, if we attempt to determine when, where or how this immaterial metaphysical something becomes associated with the material and physical body.

A child shows not the slightest evidence of conscious mind when it is born; we cannot therefore conclude that individual consciousness entered the child before it was born (30). What is definitely certain is that we can see the evidences of the evolution of individual conscious mind in the developing child; we see it grow from zero to a full consciousness of itself as apart from its environment. This consciousness evolves from the activities of organic mind, which has greater energy at the time of birth than at any subsequent period in the life history of the individual. At no period in after life does the body *double* its weight so rapidly as at the first time after birth. It has then a most vigorous organic mind—but so has a kitten or a cabbage (60). Kant, the great man in futile metaphysics, had no conception of such a thing as organic mind—that mysterious intelligence and consciousness within us, of which our conscious minds remain for ever unconscious, which keeps our complex mechanism going, and in perfect order, whilst our conscious mind sleeps, and does all those subtle things within us also when we are awake, because our conscious mind is incapable of understanding how to do them, and cannot be taught to understand, because they are beyond the capacity of the comprehension of human mind.

How futile it must always be for man to attempt to understand the mystery of that control of organic mind over matter and energy which keeps the human body at a constant temperature of about 98.6° Fah.; which causes an increase in the production of heat when the weather is cold, and lessens the production when the weather is warm!

Watching the development of the child, we see by the

evidences of its *behaviour* that its conscious mind slowly evolves by the repeated influences of the external world upon its perceptive senses ; see it evolving hand in hand with physical development in such a manner that the conclusion is unavoidable that conscious mind is connected genetically with the physical system through the medium of organic mind (97).

We can easily understand, from the evidence we have already presented, in regard to the continuity of mind (61), its activities as a mode of energy (73), its coeval existence and inseparable union with matter and energy (77), and the similar behaviour of atoms, molecules and micro-organisms under similar conditions, why students in various directions have arrived at a "dead end" where all further progress was blocked, because of an inability to co-ordinate results, and to grasp what gave Verworn cause to inquire, "*Do we ask our questions of nature aright?*" (67), why Spillman, speaking of students of heredity says, they are "*like men lost in a wilderness, seeking to find a road*" ; why psychologists find a difficulty in defining the foundations of their science because they cannot define it in terms of consciousness (41) ; and why investigators in physiology, when they reach the phenomena of "*regulation*" in an organism, ask, as one writer (Jennings) does : "*How does it know what to do?*"

It is quite evident to observers that the organism knows what to do, whether it be producing more heat, when exposed to cold, or more red blood cells, when it climbs a mountain ; whether it be a worm growing a new head to replace one that has been cut off, or a crab growing a new claw. And the neglect of, or the inability to recognise, a very evident and sufficient reason or cause in this connection is but one more remarkable instance of the curious slowness or reluctance that man has so often shown to perceive and accept that which afterwards appears to be an easy and self-evident solution of a problem. For if an animal evidences in "*regulation*" that it knows what to do—and it is quite evident that it does so—it must have intelligence in order to be able to *know*. All processes in "*regulation*" are simply activities of the organic mind in the organism ; activities of a phase of mind which is beyond the range of

conscious mind, although it may have a consciousness of its own, just as our eyes have a consciousness of which our ears are unconscious, and our ears have a consciousness of which our eyes are unconscious. An organ has an organic mind, and it knows just as we know—because it has intelligence; because everything that exists must have intelligence, i.e., mind, to meet the necessities of its conditions of existence (24, 25).

Up to the present day practically all scientific thought and investigation have been based upon the erroneous assumption that phenomena of mind and physical phenomena of matter and energy are quite distinct and separate things. All co-ordinations of physical phenomena have excluded mind as not being an essential and fundamental factor. From this error arises the totally unwarranted limitation of the faculty of perception to man and animals, the faculty of reason to man, and the conception of mind as a comparatively recent addition to life.

The conception of life as a *thing* and its activities as preceding and evolving mind has a most confusing and baulking effect. Persons who would at once see the incongruity of speaking of the *origin* of crawling, walking, flying or swimming, see no incongruity in speaking of the *origin* of life. Yet all living activities, the sum of which constitute that which we term "*life*," are just as truly functions of some dominant factor in the organism as are "walking" and "swimming." And that dominant factor is mind. Mind expresses itself through the medium of matter and of energy and in all the activities we term life—crawling, walking, thinking, flying, and so on.

This is not a mere quibbling about terms, for it involves a profound fundamental difference in our conceptions of the ultimate nature of mind. The structures of things animate or sub-animate do not provide a basis for the *origin* or the evolution of mind; they are only mediums for its *expression*. For activities of mind evolve all physical structures, animate and sub-animate. Every atom of matter has at least one mode of perception; it perceives, therefore it has mind; and this is of sufficient intelligence for the necessities of its existence; the activities of the lowly yet immortal minds in

atoms are the fundamental causes of all activities in nature, mental and physical, animate and sub-animate.

175.—*Theories regarding matter; Berkeley; Leibnitz; Boscovich.*

Bishop Berkeley's hypothesis regarding the constitution of matter commences with : " *Matter apart from perception has no existence.*" Our postulates involve the converse of this—perception apart from matter has no existence.

The hypothesis of Leibnitz endows matter with " *unconscious perceptions . . . and with something of the nature of desire and sentiment.*" But the expression " unconscious perceptions " is a contradiction in terms, for the act of perceiving involves the presence of consciousness. We can neither be conscious without perceiving, nor perceive without being conscious. Leibnitz here exhibits that universal narrow and arbitrary assumption that the condition of consciousness is limited to the impressions that are evolved from the five senses of man and the higher animals—as though no other senses of perception or consciousness existed, or were necessary, in the infinite variety of activities in nature that go beyond the range of human comprehension.

Boscovich's hypothesis invests matter with " *spheres of attractive and repulsive force.*"

These and many other attempts to define matter show clearly how man has ever perceived in matter something of essentially the same nature as intelligence or mind ; and how curiously and unnecessarily reluctant—or incapable—he has been to co-ordinate this intelligence with the other evidences of the operations of mind in nature, and thus to demonstrate the existence of a universal mind or entity pervading all presentations. If matter has *spheres of attractive and repulsive forces*, these spheres must exert a perceptible effect upon each other, or how could they possibly attract or repel ?

176.—*Matter may become tired.*

Whatever may be the ultimate nature of matter *per se*, it is quite evident that as it exists to-day there is a something *in it* that is not consistent with the popular conception of it as being " dead " and inanimate. There is, as a matter of

fact, a something in its complex structure that *perceives*, a something that we cannot express in words except by such terms as sub-animate or sub-organic mind. And we have but recently acquired a knowledge that this sub-animate mind in matter may get *tired* with too much labour, even as our conscious mind may do. Every experienced barber has amongst his razors one that takes a keener edge, and keeps it longer than any of the others. Of course, he makes the most use of this, and he finds that after a long spell of duty the razor gradually loses its superior quality ; it becomes *tired*, and will not keep its fine edge as usual. So he puts it aside for a *rest*, and after a while it recovers its quality again. Engineers to-day are much concerned regarding *fatigue* in metals. They have found that metals, like human beings, get tired after prolonged exertion. Many large and important structures are causing uneasiness in this respect ; testing for fatigue has become necessary, and it has been found that a metal which has been fatigued with constant vibration will recover its tone if it is allowed to *rest* for a time. This is quite comprehensible when we consider that the orderly molecular movements in a metal—movements which are conditioned by its lowly sub-organic *will* or *mind* to move in a given manner—are, by the strain put upon its molecular structure by the load that it carries, bound to move in the normal ordinary manner in *opposition* to the energy of the strain that is put upon them ; and an undue prolongation of this strain gradually impairs the strength of the molecular mind ; its normal structure alters ; the metal weakens and ultimately breaks. Many serious accidents have resulted from exhausted energy in metal ; particularly by the breaking of exhausted railway carriage axles, where the strain is the more severe because it changes from pressure to extension with every revolution of the axle.

177.—*Spencer's and Kelvin's definitions of matter include energy.*

Of the many classic attempts to define matter, not one that is fully satisfactory appears. The two most notable of modern definitions—those of Spencer and Kelvin—*include energy*. Spencer's hypothesis includes the following expres-

sion : " . . . elementary atoms identical in nature and differing only in position, arrangement and motion."

Kelvin's hypothesis runs : " *The rotary parts of an inert, perfect fluid, whose motion is absolutely continuous, which fills all space, but which is, when not rotating, absolutely unperceived by our senses.*"

This hypothesis of Kelvin clearly indicates that matter is energy, and that energy is matter ; for if the rotation—that is, the movement of energy—ceases, matter also ceases to exist ; the matter and the energy both disappear from existence—so far as man is concerned.

The phenomena in radio-activity have practically demonstrated that matter and energy are inseparable and correlated ; matter may radiate away as energy, energy may be congealed into matter (167). Wherever there is energy there is matter ; wherever there is matter there is energy. We demonstrated in our fourth chapter that mind is a mode of energy associated and correlated with the ordinary physical energies. Every time we sit down to eat the " fuel " which keeps our mental and physical energies going we demonstrate that matter and energy are transformable into mind—conscious mind and organic mind. Every time we *will* to and execute any physical movement we demonstrate that conscious mind is transformable into ordinary physical energy ; and every beat of our hearts transforms organic mind into physical energy. Thus we see that mind, matter and energy are not only coeval and inseparable, they are also correlated ; and this opens up possibilities of achievements to the human race of a nature far in advance of anything that man has yet conceived. And we venture to predict that when science shall have given two thousand years to the study and development of the possibilities in the energy of mind—such years as it has given to the study and development of electric energy—results will have been attained such as we cannot to-day even imagine. And some of these results will probably evolve from some yet unknown methods of controlling and determining hereditary influences through the continuity between conscious and organic mind (100).

178.—*The origin of life; Butler; Haeckel; Fechner; Bergson.*

Samuel Butler's statement, that there is "*no mind without matter, no matter without mind,*" may, in the light of recent knowledge, be extended to—no mind without matter and energy, no matter and energy without mind. Haeckel's conviction that there is "*no substance without sensation and force,*" and Fechner's accordance of consciousness to the entire universe and everything in it (3), reveal true conceptions regarding the immediate nature of natural phenomena.

We can now easily understand why all attempts to discover the *origin of life* *subsequent* to the existence of matter and energy, and all speculations regarding the first appearance of life on earth, are absolutely futile. For *life* or living activities are but expressions of mind (174). To discover the *origin of life*, involves the discovery of the origin of mind, matter and energy ; this brings the problem practically to an explanation of a first cause—a task beyond the grasp of human mind. The sum of all the labour in science and philosophy, from prehistoric man to the present day, may be stated and limited by the following sentence : There are three coeval, inseparable and correlated factors in existence—mind, matter and energy ; and all phenomena in nature are due to perpetual mutual actions and transformations of varying values of these three factors.

The problem of the origin of living activities—"life"—has attracted the attention of the thoughtful and philosophic mind in all ages ; but no fully satisfying theory or explanation has ever been arrived at, for the simple reason that all conceptions of its basic nature have been erroneous.

For thousands of years the belief was generally held that "pneuma" or spirits were the cause of life. These pneuma were conceived as being matter in an extremely tenuous condition, which permeated the body and directed its living activities. About two hundred years ago the doctrine of "vitalism" became prominent—a hypothesis that all living activities are manifestations of a specific energy, differing from ordinary energies and peculiar to living things. This belief is still strongly held by a large section of students,

amongst whom is Bergson, who in his *Creative Evolution* refers the activities of life to what he terms an "élan vital."

But all conceptions regarding the ultimate nature of "life" or living activities, no matter what terms are invented to express them, are inadequate if they are confined to the movements of what we *arbitrarily term living things*. For the movements of the animate cannot be differentiated from the activities of the sub-animate. Any true conception of the essential nature of living activities, or of life, must be capable of reconciliation with the fact that we cannot differentiate between movement and mind (37); the fact as stated by Rutherford that atoms, being the most fundamental things presented to us, must carry their properties with them into all more complicated structures (3); and with the fact that the first particles of matter which came into existence must have had the same fundamental structure as living things of to-day—were organised particles of mind, matter and energy; they *perceived*, therefore had mind. And having mind, they must have had some lowly phase of sub-organic life (III). Our postulate, that mind, matter and energy are three coeval, inseparable and correlated factors in the evolution of all presentations in nature—meets all these varied requirements.

Bergson has been extremely popular with a certain section of the public, and for that reason we have mentioned his "élan vital." The very title of Bergson's *Creative Evolution* is a subtle phrase that vastly pleases some people, because Bergson is supposed to have deeper and truer ideas of evolution than Darwin had. But all evolution is creative, the converse is devolution. The difference between the "pneuma" of the ancients and Bergson's "élan vital" is really only a matter of terms. The ancients did not know exactly what they meant by "pneuma." Bergson evidently does not know—or anyone else for that matter—exactly what he means by the term "élan vital." There are passages in this work of which not even Bergson himself could give a rational interpretation. They would disgrace any of the lesser lights in ancient philosophy. His philosophy is retrogressive, not progressive.

The great advances made in modern times in physics and

in biochemistry are to-day constantly disclosing the weakness of the conception of "vitalism" or of "*élan vital*," as covering the phenomena of living activities ; and investigators in growing numbers are now turning their attention to chemical and physical phenomena, in which they are beginning to recognise attributes of life ; and with this new departure we are getting nearer the truth. It is an easy step from the movements we term animate down to the movements of the sub-animate ; easy to comprehend that the movements we term animate are essentially the same, and are evolved from activities of the same three basic factors as all the other forms of movement which have been termed inanimate, but which we prefer to term sub-animate.

But here is the wonder of it. In all the maze of speculations regarding the origin of living activities, there is no hint whatever of the possibility of mind being the potential basic factor ! Good reason indeed, had Verworn to inquire : "*Do we ask our questions of nature aright ?*" And well might Spillman describe students of heredity as being "*like men lost in a wilderness seeking to find a road*" (67).

179.—*Matter neither lifeless nor inert.*

Man's extreme slowness in extending the limits of knowledge is largely due to the use of terms which merely cover ignorance ; terms within whose arbitrary boundaries of meaning men have always tended to restrict phenomena that are continuous and have no boundary. Matter, for instance, is termed *lifeless* and *inert*. But every atom of matter has activities of a relative and perpetual intensity beyond our comprehension ; every possible system, from the atom upwards, is the arena of perpetual change and movement. And beyond the perpetual movement of the atom as a whole—movement compared with which a bullet shot from a rifle only crawls along—it is internally a scene of the most intense activity and energy ; its electrons are revolving about each other with an *animation* compared with which our own bodily movements, our *living activities*, are comparatively dead. So that matter, instead of being *dead*, has an intensely vivid and perpetual energy of movement, a *vitality* with not an attribute of deadness about it.

All the countless millions of atoms of matter in your body, my dear reader, possess this marvellous vitality. They possessed it millions of years before you came into existence ; they will still possess it millions of years after you cease to exist. The properties of the atom are as enduring as the atom itself. All animate things are built up or evolved from and owe all their energies, mental and physical, to the eternal energy in so-called *lifeless* matter.

Ask any person if a piece of iron is *living* or *dead* matter, and he will answer "*dead matter*," with perfect confidence that, in the popular meaning of the words, he is quite correct. But the term *living* is comparative ; a man lives, so does a fish, a micro-organism, or a blade of grass ; and it cannot be determined where life ends. Is it not going beyond actual knowledge to say that anything is dead, when it cannot be determined what is living ? (61). *Dead* is absolute ; but nothing exists that does not show evidence of animation. There is iron in your blood ; your very life depends upon the specific activities in the atoms of that iron. Can that iron, then, be dead ?

The "radium clock" ingeniously constructed by Strutt (138) with a motive power of only thirty milligrams of radium bromide—less than the weight of half a drop of water—radiates sufficient energy to keep the "clock" going for more than two thousand years ! Is it reasonable to consider that particle of radium bromide *dead* matter ?

In modern science we have accumulating evidence that there is a dim but widening comprehension of the truth, that nothing can be absolutely dead. Thus Benjamin Moore, in his "*Origin and Nature of Life*," remarks :

"The atom is really characterised by the amount of energy it contains, and it is not to be looked upon as a dead mass with fixed motionless structure."

What we have stated in regard to iron applies equally to every elementary atom that is necessary to living activities ; to every physical element in every physical structure. The chemist of to-day builds up substances having properties which we term *animate* (64) from elements having the simpler activities and functions which we term *sub-animate*. He transforms the sub-organic into the organic simply by

adding to complexity of structure. Every step upwards that the chemist achieves in complexity of structure in sub-organic compounds is an approach to that complexity of structure and consequent complexity of function that constitutes animation in living things. Every step in this process is continuous with the one below and with the other above it. The chemist to-day is really manufacturing animate substances (64); but he does not create life, for that already exists in all the things he manipulates. The city of Rochester, in the State of New York, acting upon the generally accepted fact that goitre is largely due to a lack of iodine in the system, is adding one part of a solution of sodium iodide to every fifty millions of the public water supply, in order to reduce a prevalence of goitre—a disease of the thyroid—that is troubling the city. To water is being added a more animate function.

The cumulative effects of the varied specific properties of atoms, as they gradually evolve into more and still more complex molecules, thus building up *batteries* of atoms in seried connection (just as we build up a battery of electric cells in seried connection by adding cell to cell (118), each addition giving increased electric energy), ultimately furnishes or evolves the mind in all individual structures, sub-animate or animate. The practical truth of this conception is demonstrated when the biochemist builds up the large complex molecules containing thousands of atoms which constitute the substance thyroxin, which has the potential energies and functions of a living substance that is essential to the individual existence of man.

Those modern investigators, who have turned their attention to chemical and physical phenomena as involving the genesis of *individual* living things, must ultimately come to see that the difference between objective living activities in the individual, which become less and less evident to our senses as we descend in the scale of structure, till they merge into the imperceptible in the sub-organic, the activities of sub-organic radiations, and the mutual actions between elements or substances, is simply one of difference in mode or complexity of movement—not one of difference in essential nature. And that the radio-activities of an element, the

translation of energy into matter in a vacuum tube (167), an osmotic growth, a mutual action in a test tube, the development of a crystal, the movements of a micro-organism, a growing plant, or those of a higher animal, are all modes of living activity, of varied intensity, quality or range, initiated and controlled by universal mind, conditioned solely by differences in complexity of structures of atoms, which are the fundamental units of all presentations in nature.

180.—*Changing the environment of atoms cannot alter their properties.*

There are sixteen or more different kinds of atoms known to be always present in the human body. But how can it be possible for these atoms of matter, which are *unchangeable* in their properties and functions and which constitute our whole being, to be *dead* matter outside of the body, and vividly *living* matter when structured into an individual? Changing the environment of atoms cannot alter their properties, cannot make them living if they are dead! If a structure is built up of *dead* matter, it cannot be a living structure, any more than a house built of wood can be a marble structure. If atoms had no mind energy or life, it would not signify how many billions were aggregated together in any structure, there could be no mind or life in that structure. There is something beyond environment; and that something is the innate and primal life in the atom itself—sub-animate life—universal and immortal life; and the sum of the sub-animate life in the many millions of complex molecular structures of atoms that build up the animate constitutes the *life* of the individual, mental and physical, from the individual molecule to the individual bacterium; from grass to man; from protozoon to whale.

The deeper we penetrate into the immediate nature of any phenomena presented to us, the more obvious it becomes that the three factors, mind, matter and energy, are inseparable and continuous under the existing order of nature. At the depth of the electrons we are doubtful what of energy and what of matter we are dealing with. In pathology we have presentations so illusive—in hormones and in opsonins, for instance—that we are doubtful whether or not we should

term them animate or sub-animate matter. And in nutrition, having got down to vitamins, we appear to have got down to the molecules that merge the sub-animate into the animate.

*181.—*Changing order of Nature.**

The expression "existing order of nature" in the above paragraph should not be understood as meaning conditions of existence which are stationary, or that have remained unaltered for any period of time; for such conditions are impossible. The order of nature is unceasingly altering, but so inconceivably slowly that one is led to think and speak of "the existing order" as though it had stability in time. The air we breathe seems the same to us year after year; yet it is slowly congealing into solids under the influence of lessening energy environment. The atmosphere was far more extensive in space before the coal period than it is to-day. The extraction of nitrogen from the air for commercial purposes and the oxidation of iron and other elements are hastening the day when the air will not support animate life as we now know it.

*182.—*The most animate atoms enter into animate structures.**

In the evolution of the animate from the sub-animate the most versatile and energetic of the sub-animate elements would, as a matter of course, play the leading parts.

Structures having notable and continuous energetic activities, such as are associated with the animate, could not evolve from atoms with restricted perceptions, and consequent low range of activities. They must—and they do—naturally evolve from those atoms having large range or intensity of perceptions (120), and consequent large range and intensity of activities.

The activities of the animate individual are the activities of the atoms of which it is structured. Every mode of energy, every mode of activity or function the atom possesses outside of the living organism are available to the necessities of that living organism when within it. But only such activities as are necessary to the normal activities within the organism are called into action; and then only just to the extent

necessary to its well being. The influences of the other various atoms in the molecular combinations in the immediate environment prevent any degree of activity that is injurious coming into play—except under abnormal conditions in disease.

For instance, the atoms hydrogen, oxygen and sulphur are not called upon to form sulphuric acid ; nor are the atoms potassium, carbon and nitrogen allowed to form potassium cyanide. Hydrogen and chlorine are called upon to a limited extent to furnish the hydrochloric acid present in the gastric secretions—and so on.

During the millions of years that animate life has been evolving from the sub-animate any animate structure in the process of evolution which evolved inimical combinations would consequently cease to exist ; and only such structures which evolved what we may term "normal" mutual actions would survive. The molecules of atoms in the food we eat are naturally free from toxic combinations, and this freedom continues in the re-assemblage of molecules presented for assimilation.

The atoms of potassium, sodium, calcium and magnesium carry with them into the organism their unusual capacity for intense activity ; they are all metallic atoms, *and their intense activities in chemical reactions outside the body are with elements that are present in the living tissues.*

Thus, their unusual energies are available for living functions to the extent that such animate functions may demand. Animals—men included—are but atoms in bulk, and the animation of the animal is but the cumulative effect of the atoms of which that bulk is structured.

183.—*Continuous evolution and devolution of animate life.*

We have demonstrated in Chapter V that mind is a mode of energy ; in Chapter VI that conscious mind is continuous with organic mind ; in Chapter VII that organic mind is continuous with atomic mind ; that there is no break in this continuity and that it is essential to any reasonable conception of evolution. Thus we are led to a relatively easy conception of the transformation of the sub-animate life in the atom into the animate life of the individual.

Throughout all phenomena in nature there is a perfectly continuous scale of activity, from the most simple and feeble to the most complex and energetic ; we term the higher phases of activity "living or animate" ; the lower phases "sub-animate" or "dead." But these terms are only arbitrary ; there is no essential basic difference between the two. The sub-animate is continuously evolving into the animate, and the animate is continuously devolving back again into the sub-animate. For millions of years countless millions of living things have every day evolved from the sub-animate ; and every day countless millions of animate beings have devolved back again into the sub-animate.

184.—Atoms and electrons.

The latest achievements in science have determined that the units of which atoms of matter are structured—electrons—are the smallest fundamental and indivisible units which build up the universe ; but, as Rutherford remarks :—

"We may reserve in our mind the possibility that further inquiry may some day show that these units are complex and divisible into even more fundamental entities."

Yet again the electron may be the structural unit of the inseparable trinity of mind, matter and energy, and thus impossible to be further divided under the existing order of nature.

That electrons have mind is determined by their "behaviour," and by behaviour alone can we determine activity of mind (41). Our very limited consciousness is useless for the determination of mind function, for we have abundant evidence that operations of mind extend far beyond the popular sense of what is included in the word consciousness. For we may fairly assume some phase of consciousness to be present wherever behaviour indicates perceptive function. In an atom the electrons move in regular balanced orbits about a central dominant electron ; their behaviour indicates that they have perception for position relative to each other and to the dominant centre ; and such faculties of perception are undoubtedly faculties of mind, for nothing can perceive unless it has mind to perceive. Electrons have

units of perception ; perceptions are the functional units of man's conscious mind.

All activities of mind, however simple or complex, are evidenced by perceptions, as we demonstrated in our second chapter. These evidences in things sub-animate are referred to in various terms, i.e., attraction, repulsion, affinity ; but these are merely terms that cover our ignorance of the basic nature of the phenomena indicated. Electrons could not perceive anything unless they had mind to perceive ; nor could man perceive anything unless he had mind to perceive ; and mind must be universally limited in any individual thing or individual to the range of perceptions in that thing or individual. In the atom it is comparatively small, because its range of perception is small ; in man, it is wider, because his range of perceptions is wider. But all mind is essentially the same in all things, animate or sub-animate—just as all kinds of matter and all modes of energy are everywhere essentially the same.

CHAPTER XI

MEMORY, SLEEP, DREAMS

185.—*Memory not an intellectual faculty.* Buxton; *Blind Tom; Inandi.*

We obtain further evidence of the truth of our conclusions by a study of the phenomena of mind in connection with memory, sleep and dreams.

Memory cannot be regarded as an intellectual faculty, without an undue extension of the sense of that term as popularly used. Mind has an infinity of phases or modes, which, although continuous with each other, are distinct in quality of effect. Just as with cool, warm, hot, in temperature; the varying velocities in movement; varying intensities and qualities of sound; and the varying effects of electric energy.

Memory is the mind function which simply reproduces previous mental impressions of all kinds. Intellectual faculties originate abstract mental impressions. Dogs, horses and other animals have very good memories; but we do not consider them "intellectual," although we may admit that they have some modicum of reason. If memory were an intellectual faculty, what intellectual beings some animals would be!

A person may have a good memory, yet be below the average in intellectual ability; or have a bad memory and be above the average intellectually. Yet this does not nullify the great advantage that a good memory gives to a man of intellect; it enables him to make a fuller practical use of that intellect than he could have achieved with but a poor memory. And, on the other hand, a good memory enables many a man with an inferior intellect to pass scholastic examinations with greater credit than his betters, and gives us too many "professors" with insufficient ability for the position they occupy in our educational institutions.

There are many recorded instances of remarkable memories—particularly for figures, and for music—arithmetical prodigies and musical prodigies. Buxton, for instance, for figures ; “ Blind Tom ” for music ; but with no corresponding development in intellectual faculties. A genius, having an extraordinary memory in one particular direction as the basis of that genius, may be below the average in general intelligence.

These facts indicate that memory is a function of organic, not of conscious, mind. Jacques Inandi, the most recent calculating genius, stated that figures came to his mind as a matter of course—*he made no effort*. That reminds one of the fact so commonly known as a matter of personal experience. We sometimes cannot think of a word or of a name that is quite familiar to us. No conscious effort to remember will bring to our consciousness that word or name. But whilst we are thinking of something else some time afterwards, and have for the time quite forgotten our effort to remember, the word or name flashes unsought into our consciousness *without effort*—we remember. This well-known fact has a most important and profound bearing upon the immediate nature of organic mind. *It demonstrates that within the brain there are continuous movements of which we are quite unconscious that represent mental concepts, and that we only become conscious of them when they intrude into the part of the brain which functions the immediate consciousness.*

186.—All our five senses subject to memory impressions.

One particular fact regarding Inandi is that he had a remarkable *aural* memory. He informed a commission of the Academy of Sciences of France that when he tried to recall to memory a series of numbers that had been given him as a problem he heard them *repeated aloud* in the tones of his own voice, and that he could hear them for the greater part of the day. Yet Inandi at that time was unable to read or write. This remarkable aural memory has an extreme significance when we consider such “visions” as those of the Berlin bookseller (239). Both aural memories and visual memories must be evolved from similar modes of

molecular movements to those that evolved the original perception ; and if, in Inandi, aural vibrations could be reproduced by memory "aloud in the tones of his own voice," there can be no reason to doubt that visual memories may also arise sufficiently distinct as to take the form of actual experiences. When Inandi made his statement he could not possibly have known that it might possibly be co-ordinated with the subjective visual memory impressions which evolve the apparitions or ghosts seen by visionaries. One single genuine instance of a subjective memory perception by any one of our five senses most certainly indicates that each one of our five senses may be subject to such illusive impressions. We may see (?) the ghost of a dead person ; hear (?) a person speak who is dead or a hundred miles away ; taste (?) a something that is not in the mouth ; smell (?) a something that is not in the air ; or feel (?) a something that is nowhere near us. And, as a matter of fact, all kinds of such sense memory impressions come directly or indirectly within the experience of nearly every person. Most persons have felt a sensation of heat or cold on some part of the body when they well knew that neither heat nor cold were really there. Such illusive impressions are organic memories of the sense of feeling. Illusive impressions of smelling and tasting are quite common ; illusive impressions of sight and hearing are more rare.

All such perceptions are memories of organic mind. In some manner which we cannot determine, the molecular movements in the organs of perception take the same character that condition normal objective perceptions (18) ; and when these movements reach the area of consciousness in the brain by means of the sensory nerves they appear to our consciousness as real objective impressions, although they are but organic memories.

Such memories play strange freaks.

Hoffman said : "*When I compose, I sit down to the piano, shut my eyes, and play what I hear.*"

Mozart stated that his compositions came "*involuntarily, like dreams.*"

Goethe stated that his "*Werther*" was written "*somewhat unconsciously like a sleep walker.*"

Tartini dreamt that the devil took up his violin and played a sonata. He wrote it out from memory when he awoke. It is known to-day as "The Devil's Sonata."

187.—*Memory a function of organic mind.*

The connection of such instances with memory becomes evident when we consider that every organic mind impression that merges into conscious mind when we are asleep or when we are awake is a memory or a structure of memories of previous actual impressions upon our senses (30).

We have seen that a perception is a mode of motion (18), that movement is inseparable from mind (16), that mind is a mode of energy, and must therefore have movement (77), and that molecules of substances are incessantly in inconceivably rapid movement. The neurones of the brain that constitute the physical basis of the transformation of organic mind movements into conscious mind movements are structured of elementary molecules that are in unceasing movement in an infinity of directions in forms or patterns of movement exceedingly complex, but every instant changing. Every differing movement gives a differing mental concept, and every differing sequence in movement gives a differing sequence in thought.

These two movements from differing sources constitute our actual consciousness when awake. And the more concentrated is our consciousness upon the direct organic movements from our sense organs the less we perceive of the intrusive organic memory impressions. But when we sleep, and the direct movements from our sensory organs are almost entirely inhibited, then organic memory impressions exert an almost complete influence, and we have, uncontrolled by conscious intelligence, those confused and disconnected organic mind memory impressions which we term dreams.

Differing combinations of electric magnetic movements give us a consciousness of the infinite variety in all that we see ; differing air movements give us the consciousness of the infinite variations in all that we hear (29) ; all of conscious mind in man is built up from the impressions he has received from the differing organic movements of his five senses of perception (30), and must therefore be built up from

movements ; and it is a very pertinent fact that the two senses from which man's intelligence is almost exclusively evolved—the senses of sight and hearing—are so easily and conclusively referred to, and co-ordinated with, phases of physical movement external to the organism.

188.—Infinite variations of movement : effect of heat.

In the structure of the smallest particle of matter visible to the eye there are many millions of atoms, and the varied forms and patterns of movement possible to the millions of cells in the brain, structured as they are of an infinite variety of molecules built up from sixteen or more differing atoms, must be infinite in number and extend far beyond the possible perceptible variations of states of consciousness.

There are other factors than mere numbers of elementary molecules that give possibilities to variation of movement. Although the average temperature of the human body, as a whole, may be about 98.6° Fah., yet the phenomena of heat in chemical reactions indicate that within any animate organism there must be always some areas where the mutual actions which are both the cause and effect of mind presentations involve alterations in local temperature not registered by the thermometer, which must cause alteration in mutual actions. These local variations will give associated varying organic mind movements. Directing conscious attention to any part of the body will cause some alteration of organic mind function in that part ; and any alteration in function must be associated with some change in temperature, just as any change in temperature involves a change in structure (142).

Not all the heat added to a substance is utilised in adding to the temperature of that substance. Some may be transformed into differences of movement of its molecules in relation to each other—"wobble energy" ; some may be transformed into "spin energy." These transformations of heat into molecular movement are well known to the modern physicist. There is a change in mutual action, adjustments of movements, and consequent change in mind presentation, in every substance with every variation in temperature.

Water, as we have already noted, absorbs more of heat which does not raise its temperature than any other substance (244); this heat, therefore, must be transformed into differing molecular movements in animate beings with every slightest variation in temperature. Thus we get delirium, or abnormal activity in the movements which condition consciousness, with blood temperature a few degrees above normal. This large capacity for what is termed "specific heat" is not a coincidence in relation to the large percentage of water in living things; it is a fundamental necessity to their animate movements.

Such a wide latitude for change is possible in the character of the movements of the molecules that structure the brain that if an individual could perceive a differing mental presentation every second of time, from the moment he commenced individual existence until he died—even though he lived a hundred years—the number of possible differing presentations would be far from being exhausted. Hence the apparently limitless variety in forms of thought and mental character, and the infinite variety—fantastic, weird, and otherwise—of the presentations of organic mind impressions in dreams.

Differences of molecular movement in the brain neurones, and also in every organic unit in our bodies, with consequent variation in character of organic and conscious mind, is demonstrated by the well-known effect of the introduction of the alcoholic molecule, whose specific character of movement influences the normal movements in the immediate mutual actions which condition consciousness. The specific molecular movements in many drugs and substances used in medicine (71) alter the specific movements that condition the immediate nature of consciousness in many various ways; and observers are even beginning to acquire a knowledge of substances which, when introduced into the system, have a specific influence upon the character of dreams.

We read of a Dr. Finley, who gave a patient a grain per day of an extract from a mucous swab, with the effect that, after a few days, her terrifying dreams gave place to bright and cheerful ones. Upon altering the treatment to the

administration of adrenalin—another glandular secretion—the dreams changed, and were filled with quarrels. Insulin, if administered in excess, at once causes feelings of fear to possess the patient, who trembles and ultimately collapses with dread.

According to Dr. E. A. Slosson, of Washington, some day, instead of going to a theatre for excitement or pleasure, we shall go to a chemist for a shilling's worth of pleasant dreams, and be able to banish nightmare by merely taking a synthetic compound manufactured for the purpose. We may discount such statements as much as we please, but the solid fact remains that they rest upon a sound basis of easily demonstrated truths.

189.—*Dominance of organic mind. How memory comes.*

When we are awake we are continuously receiving in the area of consciousness in the brain direct impressions of the movements which arise in our organs of perception. But we are also continuously receiving organic mind movements, repeating previous direct impressions—memories. These organic memories are beyond our direct control ; they structure our dreams when we sleep, they intrude when we are awake and our conscious mind is engaged with direct impressions. We may be thinking or speaking, when a thought of something quite foreign to what is engaging our attention will be forced upon us by the unceasing urge of organic mind, which, it seems, never forgets. When we try to remember something, we are practically calling in the assistance of organic mind.

Thoughts arise in the brain without conscious effort, but we may consciously lead organic mind to reproduce thoughts in any desired direction. This requires *conscious effort* in the control. When that effort weakens, vagrant thoughts intrude that represent the particular form of molecular movement organic mind may be evolving at the moment in the brain neurones. This movement is unceasing ; we cannot stop it ; we may partly control its character by effort of conscious mind, and the more perfect this control, the better we are able to concentrate the mind at will upon any subject—we have a well-trained mind. The power of concentration

is practically the power of conscious mind to call the energy of organic mind to its assistance, instead of its playing about outside and interrupting thought with its vagrant activities ; and, be it noted, we have as yet but a feeble conception of the range and powers of organic mind (96). We see erratic evidences of these powers in hypnotism and in psychic phenomena at séances, when it becomes dominant over the dimly conscious mind of the medium—just as it is dominant in our dreams.

When we try to recall something to our memory what happens may be represented somewhat as follows :—

We may suppose an infinity of definite forms and sequences of molecular movements to be incessantly changing amongst the countless millions of molecules in the infinitely complex structures of neurones and nerve fibrils that constitute the cortex of the brain. The tendency of these forms and sequences of movements have all been impressed upon the molecules by the movements of previous operations of perceptions ; and the more frequently, or the more vividly, any of these perceptions have been repeated during life, the greater the ease and the tendency they acquire, by habit, in recurring back to consciousness, and thus reproducing a mental picture—a memory—of any perception that was impressed upon it, days, months or years before ; very much after the manner of a gramophone : when the needle runs in the same groove that a previous movement has impressed upon it days or years before, the groove will faithfully reproduce the impression—the memory—of every word, note or sound. And it will do this as often as we please, till the record becomes imperfect through deterioration ; just as man may continue to call an incident to memory as often as he pleases, until memory becomes imperfect through deterioration of the cortex of the brain—senile decay.

When we try to remember and cannot, the "needle" of consciousness is vainly groping about to find the required record. And as the records cannot cease operating, the sought for record, sooner or later, by habit comes under the needle of its own accord, and, like a flash, we remember.

These "habits" of organic mind, when well trained by such influences of conscious mind as we are able to impress

upon it during the evolution of the full powers of conscious mind from childhood to mental maturity, determine the value of the well-balanced mind during the after years of full and influential mental activity. Hence the importance of good early training.

Organic mind apparently never sleeps, never tires, never ceases its wonderful activities, so long as the organism remains normal ; and sooner or later, if any record that has once been impressed upon the brain has not become obliterated by more recent and vivid impressions, organic mind will present to conscious mind the movements that record it as a memory. When we advance in years we may be for months unable to recall a particular word or name ; yet it will, suddenly and unsought for, be presented to our consciousness as memory almost as vividly as ever it was.

190.—Association of ideas ; the training of organic mind.

The influence of association of ideas upon the facility of bringing to consciousness the memory of some temporarily forgotten word or incident has been known for thousands of years, and we need but briefly refer to it here.

The molecular movements, also the constant changing of actual structure in the brain neurones, caused by the mutual actions between them and the blood supplying them with energy, are constant activities of purely organic mind, just as the normal beat of the heart, or the secretion of digestive juices in the stomach, are activities of purely organic mind. And "habits" of molecular movement throughout all the varied activities of the individual are acquired by organic mind. Habits of physical movement in co-ordination are acquired by the organic mind of voluntary muscles, so that when certain movements are commenced in obedience to conscious mind certain other movements in regular sequence are sure to follow, controlled by organic mind. Physically, such necessary co-ordination and sequence in movement is termed "automatic." We maintain our balance when walking in an automatic manner, without any conscious effort. But the young child cannot do this ; it has to patiently and consciously train the organic mind of the muscles concerned until it can attend to the business of co-

ordination in walking without conscious effort coming to its assistance.

We see evidence of this training of organic mind quite definitely in the pianist when any piece of music has been memorised. It would be difficult for most players to start anywhere in the middle of a bar at any place in that piece ; it would require a decided effort of conscious mind ; but start at the beginning, and the piece is played through faultlessly, with scarcely a consciousness of the moving fingers—they move automatically by organic mind influence. Any one can easily repeat the letters of the alphabet, beginning with "A" ; but very few can repeat them beginning with "Z," and continue the sequence correctly to "A."

The same thing occurs in the presentations of organic mind to conscious mind—memories. One thought invariably leads to another that has become associated with it by habit of conscious mind ; or, in other words, a certain form of molecular movement, representing a mental concept, is invariably followed by another particular movement, which represents another mental concept associated with the preceding one. This is the physical basis of memory. We make use of this habit of organic sequential molecular movement when we try to remember a word. We consciously start thinking of something we dimly remember to be associated with that word. The molecular movements in the brain cells, being brought into that particular movement, then initiate a train of associated movements that lead to the movements representing the word sought after—and we remember. This is the basis of memory cultivation schemes.

191.—*Molecular instability ; Verworn ; consciousness in sleep.*

"*Every living system alters as long as it exists, although this alteration is very gradual. The progressive alteration of the system is such that every state of living substance conditions another by which it is followed. No state can permanently exist as such.*"—Max Verworn.

This constant transition in molecular structure is expressed physiologically by the term "molecular instability" ;

and this very instability is the essential necessity to all phases of organic and conscious mind ; it is the reason why we cannot stop thinking whilst we are awake nor stop dreaming when we sleep, and the reason why unbidden thoughts are constantly presenting themselves to our consciousness.

In sleep the presentations of organic mind continue, but they are then nearly totally unchecked by the conscious mind, and thus arises the phantasmagoria of dream concepts. They are the irresponsible effects of the molecular movements of organic mind in the absence of the steady influence of a sufficient consciousness—for even in sleep absolute unconsciousness is never attained.

When we are awake, sitting quietly, thinking of nothing definitely or particularly—day dreaming—all sorts of thoughts will rise unbidden to the mind, sent up by organic mind. This condition seems to be midway between sleeping and waking. But even when consciously occupied in earnest thought upon some definite subject, in some corner of the brain the unceasing molecular movements of organic mind will force a thought upon the attention quite foreign to the subject we were thinking about.

Besides the constant influence of the flow of impressions upon conscious mind, brought to the brain by the complex network of nerves connecting it with every part of the body, the changing movement in brain substance is affected by the function of assimilation. The unceasing flow of the blood stream carries to the brain an unceasing supply of structural energy (88) derived from the food we eat. This structural energy, in mutual action with the brain neurones in the processes of assimilation, evolves free mind energy, which is constantly being expended in mental functions and in the evolution of heat energy, which is radiated away. And as this assimilation of structural energy by the brain cells cannot entirely cease, even during the deepest sleep, we can never be absolutely unconscious, although such absolute unconsciousness may be induced by the influence of drugs, which temporarily inhibit assimilation. So that within a brain cell we have unceasing movement and change of structural substance whilst life exists ; a constant stream of

structural energy flows into it, which is in unceasing mutual action with the elements of the cell ; and the product of this mutual movement is mind energy, which gives unceasing presentations of both organic mind and conscious mind, both when awake and when asleep.

192.—*Every movement and every thought represented by molecular movement.*

Every definite and exact muscular movement represents a definite and exact range and energy of molecular movement ; and every varied thought or memory just as certainly represents an equally definite and exact range of molecular movement. For the essential nature of all movements in a living organism must be the same.

Physical scientists to-day are practically unanimous that the differences between the various atoms are simply differences in the number and modes of motion of the electrons that structure them. Properties of atoms thus become modes of movement. Consequently all substances formed by combinations of atoms must simply represent differences in the modes of movement of those atoms. And, naturally, the more complex the substance, the more complex must be the movements. An abstract thought must be represented by the most complex movements of the most complex substance so far evolved by nature—the substance of the human brain. But, as we have previously remarked, we cannot comprehend *how* these movements can evolve mind energy, any more than we can comprehend *how* the mutual movements of silk and amber upon each other can evolve electric energy. Every basic fact in nature has a cause incomprehensible to man (19).

193.—*Necessity for sleep ; consciousness expends energy.*

During our waking hours we normally expend on the average more energy than we evolve. At every instant of time the immediate energy evolved is, on the average, less than the immediate energy we are expending. This is why it is a universal necessity for all the higher animals and to some extent lower organisms, and even plants, to have regular periods of repose from the more active conditions of

full consciousness. During sleep we accumulate that reserve fund of energy which rouses us to the waking condition when our "batteries" are fully charged ; and which enables us to sustain the following conscious period of excess in the expenditure of energy.

And we not only have a general rest for the whole body during sleep ; various parts have, at varying intervals, periods of rest necessary to their particular functions. The heart rests between each beat. There is a short period of rest in normal breathing after every expiration of a breath. The glands of the stomach rest from their work of secretion when the stomach is empty. The muscles of the limbs rest when we are not using them, and so on. But notwithstanding these periods of rest of parts, the system as a whole loses energy during the day, and sleep is necessary during the night.

The very fact of our being awake, even if we are sitting still and apparently doing nothing, self-evidently demands a greater expenditure of animate energy than is necessary when we sleep, for all impressions upon consciousness—simply looking at something, being spoken to, thinking of anything, hearing a noise, feeling heat or cold, a pinch by fingers, the prick of a pin ; anything whatever that we are conscious of or that attracts our attention demands an expenditure of energy ; and the more vivid or intense such impressions are, the greater the expenditure. For the animate energy expended in the mutual actions within our organs of perception, when they encounter the energies that environ them, such as the impact of light energy upon the eyes and the impact of air movements upon the ear, must of necessity be equal to the energy of those movements. The stronger the light, or the louder the noise, the more of animate energy is expended in merely seeing and hearing. For the same reason, many repeated sights and sounds take more energy from us than a lesser number. This explains why, when persons from the quiet of the country and the usual surroundings to which they have become so accustomed that they attract but a minimum of attention, visit a busy town, they usually become very tired before the day is out ; because the vividness of their conscious attention to

what is about them is so much greater in the busy streets—not because they have had any more than usual physical exercise; very often they may have had less.

The condition of consciousness *per se* involves an expenditure of energy. This is particularly evident in pathology. When we are in normal health the usual sights and sounds about us do not trouble us; but when the reserves of energy are low, as in a serious illness, we do not allow a bright light to fall upon the eyes of the patient; members of the household are cautioned not to make a noise; and in some cases even the street is covered with tan bark or other soft material, so as to prevent all sound that can be avoided from reaching the ears of the patient. The object is to attain, as nearly as possible, the rest that consciousness gets when we sleep. Noises that pass unheeded when we are in good health irritate us when we are "out of sorts."

Every physician appreciates the recuperative value of normal sleep as a rest from consciousness; this clearly indicates the expenditure of energy by the mere state of consciousness, and incidentally demonstrates the truth of our postulates that mind is a mode of energy.

All this agrees quite well with the fact that during sleep the brain becomes anaemic; less blood flows through it, less structural energy is thus supplied to it, and less energy, as a consequence, can be expended by the activities of consciousness, and a reserve of energy accumulates in the body as a whole. When we awake from sleep, a stronger current of blood—and therefore energy—flows through the brain, giving it the sufficient output of energy demanded by the state of consciousness. And even when we are awake, if we concentrate our thoughts in mental effort, a still larger flow of blood to the brain supports the greater output of conscious energy. The relation of the blood supply to the brain, to the activities of that organ, is thus simply proportional to the conscious energy expended.

Sleep is not a total extinction of consciousness. In the deepest sleep there always remains some modicum of consciousness. The young mother will wake from the soundest sleep at the faintest cry of her child, though many much louder noises would not disturb her rest sufficiently

to rouse her to full consciousness. The engineer of a steamer will usually wake up instantly if his engines stop running, although the much greater ordinary tremors and movements of the ship disturb him not at all. Some persons can pre-determine that they shall wake from sleep at a certain hour, and when the clock strikes that hour they most certainly wake up. Such facts indicate that some degree of consciousness, too feeble to stay the recuperative powers of sleep, is always present and that during sleep we are never wholly unconscious.

From the deepest sleep to full conscious wakefulness there are an infinity of intermediate conditions, many of which present phenomena that are apparently beyond reasonable comprehension, and thus give rise to superstitious beliefs. The relations between conscious mind and organic mind (100) as experienced in dreams, in somnambulism, hypnotism and at psychic séances, have the same essential basis in fact, and are not evidences of anything supernatural.

We always have some consciousness of the presentations of our organic mind from the perceptive organs when asleep and dreaming. A loud noise may awaken us, but when we awake we have no clear consciousness of having heard a noise; or the noise may be instantly woven into the texture of a dream. The impression of a touch, or a pressure upon any part of the body may be transferred to a happening in a dream. Everyone has had experiences of such transferences of actual impressions upon consciousness into the realm of dreamland.

The influence of the impressions from the organic mind of our sense organs upon the modicum of conscious mind that remains during sleep varies in a very subtle manner. You may make a noise with a given intensity without waking a person from sleep, but if a "noise" with similar intensity gives utterance to the person's Christian name it will wake him.

We remember a most significant instance of this. Our mother was subject to attacks of nightmare, which terrified us children; and on our first experience, we shouted "Mother" repeatedly with no effect. We were told afterwards that we must not call out "Mother," but "Martha,"

because, although she could hear us calling "Mother," she could not waken ; but when we called "Martha," she could wake up at once. And always afterwards we called "Martha" with satisfactory results.

This is a noteworthy instance of the effect of "habit" upon the evolution of conscious mind. During development from childhood to maturity she had been trained to promptly obey a call for "Martha." Her conscious mind got the "habit" of responding quickly to the impression produced by the authoritative call for "Martha." And this habit continued into later years, so that it enabled her to wake up when no other word could do so.

From the deepest sleep to full conscious wakefulness there are an infinity of intermediate conditions. We are conscious of presentations of organic mind from our senses of perception when we are asleep and dreaming, but we may also have such distinct impressions of organic mind memories when apparently wide awake, that such subjective impressions affect us as if they were realities—and we have hallucinations (237-8) which present phenomena that are apparently beyond reasonable comprehension, and thus give rise to superstitious beliefs.

The relations between conscious mind and organic mind (100), as experienced in dreams, in somnambulism, hypnotism and at psychic séances, have the same essential basis in fact, and are no more evidences of a supernatural agency than toothache or rheumatism ; they are simply unusual, or abnormal, natural phenomena of organic mind, just as toothache and rheumatism are.

All of consciousness in the conscious mind of man, from the almost imperceptible in deepest sleep to the most energetic in our waking hours, is inseparably associated with the operations of organic mind. Conscious mind, of any phase or degree, is absolutely impossible without the source of origin from which it arises, i.e., the sustaining basis of organic mind, and exactly in the same sense as that it is impossible for a steam engine to work when the steam is cut off.

194.—*We always dream when asleep, though we may not remember doing so.*

When we have dreams that produce a vivid impression and we remember them distinctly for a long time after we awake, there is more than usual of conscious mind still functioning in our sleep. Such consciousness in a dream may be so vivid that we may be deceived when awake to the extent of believing that the dream was an actual waking experience (233). Dreams that impress us less vividly occur when less of conscious mind is active in our sleep. Dreams that we can remember for a few brief moments after we awake, but can never call to memory again, occur when there is approximately a minimum of conscious mind evolving in our sleep. So do dreams that we do not remember when we awake, but which are brought momentarily into our consciousness a short time after by some incident of thought or memory. A still more feeble conscious mind may be present in dreams that we never remember at all when we awake. We are thus led to the conclusion that we always dream, but that sometimes they impress the conscious mind so feebly that we cannot remember that we have dreamt. We may arrive at this conclusion *a priori* as a natural consequence of its being physically impossible for the brain neurones or any part of them to absolutely cease their molecular movements. We cannot differentiate between conscious mind and molecular movements (16).

We find this conclusion sustained—we might even say demonstrated—by the facts in somnambulism, where what is dreamt is acted. In this abnormal condition persons will do things that are impossible to be so done in the absence of some conscious mode of perception ; yet when they awake to normal life they have no recollection of anything that happened when in the somnambulistic condition, though in some cases there is a faint memory as of an elusive dream. The operations of the neurones of the brain that function conscious mind seem to be totally suspended in most cases, yet the consciousness of organic mind is most conspicuously evident.

The somnambulist can *see* without the act of seeing producing any perceptible impression upon conscious mind.

His organic mind *sees*; and the organic mind controlling his muscular movements responds intelligently to what his organic mind sees, without the usual intervention of conscious mind.

195.—Impressions upon organic mind distinct from impressions upon conscious mind.

We know that, physiologically, we do not consciously see with our eyes; nor consciously feel the touch of anything with the finger tips. The impressions upon the organic mind of these sensory organs have to be transmitted to the brain before we become conscious of the impressions made upon them. The length of time that elapses between the impression of a perception upon the organic mind of a sensory organ and its arrival and transformation in the brain into a conscious mind impression has been approximately determined; and the velocity of an impression or an impulse along the nerves has been stated—just as physicists state the velocity of the transmission of an electric impulse along a wire.

No proper comprehension of mind phenomena in abnormal conditions can be attained unless it is thoroughly understood that impressions upon organic mind and impressions upon conscious mind are physiologically distinct phenomena, and that these two modes of perception being continuous (100), each may merge into and take upon itself the character and functions of the other. A movement in one direction may transform organic into conscious mind; one in the opposite direction may transform conscious into organic mind. Organic mind moving towards the central nervous system is there transformed into conscious mind; conscious mind moving from the central nervous system towards the periphery is transformed into the organic mind of the voluntary muscles; and when it moves back to the organs of perception it produces those illusions of the senses which give rise to beliefs in the supernatural.

196.—Infinite variety in abnormal conditions; mediums.

There are an infinity of abnormal mental and physical conditions during sleep, from somnambulism to hypnotism

and trance, where an infinity of presentations occur as irrational and incomprehensible as the presentations in the dreams of normal sleep ; yet, strange to say, these incomprehensible phenomena, so closely allied and continuous with the phenomena normal to sleep, are by many believed to be due to supernatural intervention. Many persons make a profession of falling into these abnormal conditions, and publicly exhibit the weird phenomena associated with the conscious mind and the organic or " dream mind," as we may term it. And, since the varied effects possible to the association and correlation between the conscious mind and the dream mind are practically inexhaustible, the entertainment they afford " believers " is usually interesting. And these effects are broadened and made more mysteriously complex by the radiations of mind energy exchanged between the " medium " and the sitters. We deal with these matters in another chapter.

197.—Memory registers the most energetic of conscious mind impressions.

From what we have previously said in regard to the inseparable association of organic molecular movements with memory (189), it is evident that for such movements to appear to us rational they must represent in definite sequence such concepts as will appear to our conscious mind as rational sequences. But it is very evident that memory does not register *en bloc* all the details of our waking experiences, but almost exclusively the prominent factors in those experiences as individual concepts ; and the daily additions to the stores of memory add either to the strength of individual factors already there or increase their number without any regular reference to sequence.

For, as individual concepts come to us in our dreams, usually in an irregular and unconnected manner, so we may assume concepts are thus stored in the memory. When we are fully awake we consciously sort out the irregular presentations of organic mind and place such as will fit in an orderly and rational manner. That this is the case is evident from the fact that any event noted by memory is " punctuated," as it were, with the most impressive factors therein.

Just as a person almost speechless with excitement about a tragic event will gasp out : " Man drowning ! River—boat upset," stating events in a reversed sequence, so does organic mind register as memory, not the whole factors of an event, but the main features of that event without reference to sequence, but as they strike most forcibly upon conscious mind ; and thus the last factor in actual sequence may be most easily remembered and come to memory the first when the event is recalled, because it produced the strongest effect upon consciousness. Thus we have irrational sequences of concepts in our dreams.

In photography it is the brightest spot in that which the camera looks upon which is perceptible first upon the photographic film, and the lesser bright spots in sequential order. Thus it is easy to comprehend the irregular nature of the memory impressions given out by organic mind during sleep when we are dreaming, or in any of the many varied conditions from sleep to trance. The irrationality of these memory impressions in our dreams is carried yet further by the influence of the functions of the immediate structure of the blood, which is always a factor in the mutual actions within the brain neurones, which condition presentations of mind. We perceive this in the nightmare effects of certain foods, which profoundly affect, directly and indirectly, all the molecular movements of animation.

198.—*From every direction we come to movement as the basis of mind.*

No matter from what direction we attempt to get down to the immediate nature of mind, we sooner or later come to movement. We find that mind is not an isolated something of which we can but attempt to form a metaphysical conception, but a universal movement, having energy of a nature peculiar to itself, which is exhibited in all the movements, mental and physical, which we term " living " ; and equally so in the molecular movements in that which is erroneously termed " dead " matter. We find that conscious mind in man is a constant stream of ever-changing movement flowing through the brain, the necessary energy

for which is supplied by the structural energy in the food ingested. The ever-changing stream of movement conditions the ever-changing stream of our thoughts, and memories are but recurrences of previous phases of movement.

We take photographs of scenes and objects with a camera ; the photos produced represent the varied electro-magnetic movements that fall upon the sensitive film. We register impressions of scenes and objects in the brain ; these impressions represent the same electro-magnetic movements impressed upon the brain neurones by impressions received from the eyes. When we look at a photograph we look upon a reproduction of the same kind of electro-magnetic movements which evolved the original photograph. When we mentally remember anything whatever we are mentally looking upon the reproduction of the original molecular movements which registered the impression or perception.

That differing movements do so evolve differing sensory impressions is amply proven by the facts of polymerism, isomerism and allotropism in chemistry (51) ; by the fact that the two senses of perception which are absolutely essential to man's mental predominance in nature are conditioned by movements (29) ; and by the well-known fact that many drugs, and even foods have molecular structures with movements which influence in a most evident manner the character of conscious mind by the effect they produce upon organic mind.

We know of no other manner by which the immediate nature of mind can be satisfactorily explained in all its infinite phases, normal and abnormal, in memory, sleep and dreams, than by admitting as a truth that mind is conditioned by movement, and is therefore a mode of energy correlated with every other mode of energy.



CHAPTER XII

MIND IN HEREDITY; THE FUTILE QUEST FOR A MATERIAL (?) BASIS

199.—*Misdirected effort; Weismann; material in development.*

Probably the most notable instance of misdirected effort resulting from basic misconceptions is the quest after a material objective basis in heredity, in the elemental structures within the fertilised ovum. For this is, *a priori*, a something which cannot exist ; because, no matter how soon in the embryonic individual any physical structure may indicate any hereditary trait in the individual or the sex of it, that sex or trait is already determined. The basis of trait or sex is that which determines the primary physical evidences of it. And that which determines what form the first physical evidence shall be cannot be other than that intelligent energy which we term organic mind in the molecules of the substances available, *prior* to any definite form of structure being evolved. And, although the moment of fertilisation is the moment that commences full individual life, yet that moment is neither the commencement nor the conclusion of the influences which operate to form any individual character or to determine its sex. The matter of sex is made a prominent feature by investigators, because it is supposed to be more easily determined and definite in connection with hereditary influences.

Weismann—whom we quote because he is popularly esteemed as a great authority—was of the opinion that the influence of sex was the most potent in the production of variations. If this were so, there would be in the human species but slight variation prior to the determination of sex, which in man is not definitely decided till about the ninth week after conception. At this stage of development

the Müllerian ducts and the Wollfian bodies become differentiated in the embryo into male or female organs. Prior to this the embryo has no sex, but an almost evenly balanced tendency towards either sex. Weismann is twice wrong in the above opinion. For sex itself is the result of the same essential dominance that also determines variations ; sex *per se* cannot be dominant as an influence in variations. If it were so, most variations would arise after the embryo was two months old. We show further on that the most fundamental differences in character are determined before the individual being comes into existence at the moment of fertilisation ; before the chromosomes, which have been so laboriously investigated in the futile search for a material basis, have even made their appearance.

To get down to the basis in heredity, we must go deeper than anything visible can take us. It becomes a question of pure deduction from all the known facts surrounding the evolution of individual being. Results in heredity arise from the most complex aggregate of influences that it is possible to conceive— influences that have been operating for thousands of years, mingled with influences which are operating at the present moment, whose values are impossible to estimate except in a most vague and unsatisfactory manner.

For instance, the character of the material immediately available to developing sperm, ovum or embryo is dependent upon what the parent eats. There are instances in low forms of life where character of food not only influences character of sex, but actually alters species (204-6) ; and if character of food can do this, how can it be possible to discover a material basis in the structures within a fertilised ovum ? For it must be possible for similar influences to vary character in higher forms of life. In the development of sperm, ova, or even embryo, only low forms of life have as yet been evolved ; and it may be that many of the monstrosities which come into existence amongst the higher animals and man are the results of abnormal nutrition during their development. The functions of organic mind, whose activities are evolving these foundations of individual being, must of necessity change when the material available for development changes ; for from this material organic mind

itself evolves, and all alteration in structure inviolably causes alteration in function.

200.—*Influence of changing conditions; tendencies to variation.*

We can see, broadly, how the character of most living things on earth has been constantly changing for millions of years as a consequence of slowly changing physical conditions and environment. Changes that occur in a few generations are too slight to be noticeable. We can only say that individual character is determined by all the influences that operated upon ancestors, immediate and remote; and we can only attempt to estimate upon a basis of known facts how far the influences of the immediate parents may go in determining variation from the mean of the influences which would otherwise be impressed upon it by its more remote ancestors.

Speaking generally, offspring are more or less like parents, because like influences have operated upon the evolution of both. In any part of the world the influences of environment and of habit and customs are practically constant for generation after generation; and the operation of like influences produce like results. Departure from type or divergence in mental or physical character in a positive direction cannot occur unless there is sufficient divergence in influencing factors, strong enough not only to stay the usual tendencies, but strong enough to impress their influence upon the subject *after* they have expended the energy necessary to stay the usual tendencies; otherwise there would be but a stay in development—a something lacking in the individual. An influence, to be effective as a positive departure from the ancestral mean, must be strong enough to cancel, and yet have energy enough left to build afresh in a new manner. It is therefore but rarely that such influences are of a nature sufficiently intense, or sufficiently persistent, to cause perceptible positive variation from ancestral qualities.

If we place a pound weight upon one pan of a pair of scales, and an ounce weight in the opposite pan, the ounce weight has a *tendency* to lift the pound weight; but it does

not move it. If we add another ounce weight to the first, the tendency to lift the pound weight is twice as strong—but does not move it. As we add ounce after ounce the tendency grows stronger, and when we have placed sixteen ounce weights in the pan the pound weight is balanced ; the sixteen ounces negative the pound. If we add another ounce to the sixteen, the pound weight loses its dominance in the function of gravity and the seventeen ounces become dominant. Any number less than sixteen ounces would remain definitely inactive ; nothing would happen, although the tendency to a happening would be constantly present.

It is the same with hereditary character. A tendency to some definite mental or physical variation may exist for an indefinite period, yet never show a sign of its existence. But when conditions are such that the tendency grows stronger, and a certain value of potency is reached, then a variation appears ; the tendency is resolved into actual variation.

And it is with variations in heredity, as it is with the weights in the pan, the addition of the last small weight causes the lifting of the large one ; but it only does so with the assistance of the other small weights previously added. And in hereditary variation the cause of them may be undetected in the many small influences that may have tended in the one direction. The cumulative effect of such small pre-natal influences upon parents is indicated as the cause of the differences in children from the same two parents ; and these differences appear to have no immediate cause. Yet if the immediate nature of parents was not constantly changing *their offspring would all have the same character.*

Sometimes it happens that a powerful immediate influence of short duration will cause a variation of character or structure in a most definite manner. We give instances of this in the following chapter.

The effects with weights above alluded to are in line with the necessary stimulus required for a motor impulse along the nerves to the heart or the skeletal muscles—the “*all or none*” law. Every stimulus applied to these nerves produces the maximum contraction possible at the moment, or—

nothing at all. So with the weights ; either the maximum weight—the pound in this case—must be lifted or—nothing at all.

201.—*No traceable beginning to individual character.*

The properties of atoms are unalterable ; they must be the same in the organic molecule as in the chemical molecule ; and the changing of hereditary values by changes in organic molecules must have the same essential factors of causation as the appearance of the different physical properties in the substance that evolves from the mutual action of elements in a test tube. When H₂ encounters O, it is "all or none" ; all three must disappear in water or nothing happens.

It would be but a tedious waste of labour to the writer, and an unnecessary infliction upon the reader, to critically survey the confused mass of hypotheses and arguments published on the subject of a physical basis in heredity ; or even more than mention Weismann and his theories superposed upon theories regarding germ plasm, body plasm, idants, ids, biophores, determinants, unit factors, linkage, and germinal variation. Anyone may read the works of authorities (?) on the subject and see for himself abundant internal evidence that the whole problem is riddled with their contradictions and useless theories. They are—as Spillman puts it—"like men lost in a wilderness, seeking to find a road" (67). We shall merely state the facts from which we may logically deduce that hereditary influences come from beyond the purely material, and that organic mind is the dominant initiative.

There is no traceable beginning to individual character and structure unless we reach down to the properties of atoms. Remote influences reach back indefinitely, more or less modified by influences impressed upon the immediate progenitors by conditions of environment and by experiences acting upon both the conscious mind and the organic mind of both parents ; but more particularly the dominant influences affecting the mother from the moment of fertilization of the ovum to the day of birth. For, other things being equal, the more recent any influence affecting the embryo, the more immediately evident that influence will be.

Developing ovum and sperm are organically connected, each with its parent, and moving molecularly in unison and sympathy with all the rest of the cells throughout the body of every parent ; and any possible influence affecting mind or body of parent must have some influence upon developing progeny. Whatever variations may appear objectively under the microscope, in the structures or activities within the fertilized ovum are equally results and causes, as all mutual actions inviolably must be, and any feature that might be proven to indicate with certainty any particular character in the offspring would simply prove that that particular character was already determined.

202.—No child can be exactly like a parent ; influence of parental differences.

Mutual actions in biology are strictly analogous to mutual actions in physics (48). Every mutual action evolves a something that is different in character to the factors from which it arises ; therefore mutual action between ovum and sperm must of necessity evolve something that differs in some respect from either of them. It is impossible for any individual to be alike in every part and in all respects to either one of its parents. It may be " alike as two peas " to either one, but there must of necessity be some difference. *No two things in nature can act mutually upon each other and evolve a something not differing in structure from both.*

No two persons are exactly alike ; their structures differ ; the spermatozoa and ova they evolve differ. The spermatozoon cannot enter in to mutual action with the ovum without evolving a structure differing from both ; and the more divergent in character they are—within the same species—the more energetic the mutual action will be and the greater the physical energy and difference in structure they evolve. This explains why, in man, the tall and short, the dark and the fair, the vivacious and the sedate, so generally pair ; why near relations, when paired, have offspring on the average below the normal—there is less difference in structure and less energy of mutual action within the fertilized ovum ; and why the union of persons of different countries, English with French, Irish with German, and so on, have

offspring on the average above the normal—there is a wider difference in structure and more energy in the mutual action each upon the other of sperm and ovum.

Incidentally, it is interesting here to note that the same basic influences operate amongst the elements in chemistry. Too closely related elements do not unite in mutual action upon each other. The elements from the monatomic to the radio-active, as they rise in molecular weight, form at regular intervals "families" of elements having closely related properties—the so-called Periodic System. The elements sodium and potassium are closely related members of the same family of elements, and they will not unite in mutual action to form a chemical compound—they are too alike in structure—although they will *associate* with each other as an alloy. But they both will enter into mutual action and evolve chemical compounds with other elements outside their own particular family. The same inability to form chemical compounds by mutual action marks other members of other families of elements. And from the viewpoint that energy in mutual action is proportionate to difference in structure, we may yet find data for a satisfactory explanation of the problem presented by the Periodic Law of the elements.

203.—*Influence of grandmothers. External and metabolic influences.*

As we demonstrate in our eighth chapter, the evolution and devolution of the individual constitutes a continuously repeated cycle. Every individual unit of the millions of generations of living things that preceded those of to-day has been a complete cycle of individual life; and not one of all preceding generations but has an influence still active in the present generation. There cannot be any definite material point of commencement of the hereditary traits of any individual. Even the ovum which evolves into a human being makes its first objective appearance in the grandmother—not the mother (214). And from this fact we might reasonably deduce that mothers have a more potent influence than fathers in heredity. We do know that many eminent men have attributed their qualities to the good

influences impressed upon them by mothers of exceptional intellectual and moral strength. All individual life and character is a cyclic phenomenon, having no definite or conceivable beginning or ending, for atoms never die. The energies of the atoms are the genetic energies of the individual (62).

204.—Frogs; beetles; P. C. Mitchell; Professor Schäfer.

There are accumulating and irrefutable evidences of influences external to the organism that affect developing life from germ to foetus to an extent that may cause variation in structure, sex, and in mental character. In the case of many animals it is known that staleness of the ova causes alteration of the sex ratio, usually by increasing the proportion of males. Delay in the fertilization of frogs' ova causes a preponderance of male offspring; so that we can with certainty say that the direction of the wind at a certain time of the year will determine the sex of a number of frogs! A low temperature of pond or stream produced by a cold wind will retard the fertilization of the ova and cause a preponderance of males. If a factor so apparently remote as the direction of the wind can determine the sex of an animal, what possible value can we attach to any mere theory of "determinants," "gemmules," "germ plasm," "body plasm," "idants," "ids," or "biophores?" And does not this alteration in the sex by external influences point directly to the fact that determination does, and must, precede any structure or physical basis in heredity?

It is now admitted that metabolism is a factor that has a decided influence in heredity. It has been found that there are important metabolic differences between the sexes that may be determined by chemical reactions; and the belief is gaining ground that the fundamental difference between the sexes is really a difference in metabolism. It has recently been announced that Dr. Isaac Fried has discovered a means of ascertaining the sex of a child four months before it is born by an analysis of a little blood drawn from the mother. Whether this announcement be substantiated or not, we may, *a priori*, deduce from the laws of structure and function that there must be a difference in the metabolism of the

sexes. Miss Helen Keller in her book, *The World I Live In*, tells us that in children there is a difference in the "scent" of the sexes that she can distinguish. This would not be possible unless there were differences in metabolism. The structures of the sexes are different, and this of necessity gives difference in function and metabolism. Medical men can now determine the sex of a child a month before it is born by the rate of its heart beat.

In the instance of frogs' ova given above, the fertilization is delayed by a lower temperature, and slower biochemical or metabolic changes result. All chemical reactions vary in energy by variation of temperature ; and the biochemical are equally subject to its influence. In the publications of the Carnegie Institute, Washington, Towers tells us that in nature he found about one variation in six thousand specimens of chrysomelid beetles. When bred in captivity the variations were more frequent. If full-grown beetles were exposed to extremes of heat and humidity during the maturation of the eggs, the offspring included a much larger proportion of variations—up to 80 per cent. Here we have direct proof—not theory—that pre-natal influences upon the parent during the development of ova will increase the ratio of definite variation from 1, to 4,800 in 6,000 ! This is not an isolated fact. Other instances could be quoted quite as definite in results. So with human character, the ova that are forming within the grandmother may be affected by influences that will modify the character of her grandchildren (214). It will be seen that neither education of parents nor acquired character in parents are questions that touch this large amount of variation in beetles ; nor do they touch the increasing number of males in frogs above alluded to. The cause is external—variation of energy in environment.

" Normal female ova have been induced to develop, not by the entrance of a spermatozoon, but by artificial stimulation with a chemical salt... As growth proceeds the external is constantly becoming the internal ; the results of influences, which were in one stage part of the environment, are in the next and subsequent stages, part of the embryo." (P. C. Mitchell—*Heredity*.)

Professor Schäfer stated in an address that the scientist may presently create a living thing. He is winning a wonderful mastery of life.

"He can take the female germ of a starfish, and develop it without the aid of a male germ. He can tamper with the embryo of a jelly fish, and make it take the most weird and wonderful forms. He can so act on the germs of butterflies as to change the colour of the species. He can make the sea-anemone grow a new mouth, and eat at its side."

205.—*Dr. O. Kiddle; Dr. Crew; Luther Burbank; effects of food.*

Dr. O. Kiddle, of the Carnegie Experimental Hospital, at a meeting of the American Society of Zoologists, after giving an account of the changing of a female dove into a male, as a result of tuberculosis infection, stated that he thought it probable that all hereditary characteristics of every organism were capable of reversal and modification by scientists. We may not go quite so far as Dr. Kiddle, but his statement is impressive, as indicating that the extent of control that may be exercised upon developing animal character is far wider and of vaster importance than is generally supposed. If the reproductive organs are removed from a young male rat and the ovaries of a young female rat are grafted into the abdomen in their place, that young male grows up into a creature resembling the female, not only in size and form, but also in instincts. Dr. Crew demonstrated before the British Association that a female frog could become male enough to be father of a family of female frogs. We may reasonably take the marvellous achievements of Luther Burbank with plants as forerunning what progress may yet be made in the determination of animal character. For we must bear in mind that all individual life—animal and vegetal—is continuous, and has its immediate origin in the protoplasmic cell.

Panam, in Berlin, 1860, and Dreste in Paris, 1877, produced

"monstrosities artificially in birds eggs by varying the temperature in the hatching oven."

The carefully cultivated Lop-eared English Rabbit
"will not breed true, except if housed in warm, damp
hutches."

Amongst the protozoa, when sex first appears,
"there are all kinds of varied asexual, hermaphrodite,
and sexual development."

In higher animals good nourishment is potent in evolving
males in some instances, in other instances it is potent in
evolving females.

Starved moths produce males; well-fed ones produce
females. When feed is poor, sheep will have up to twenty
per cent. more female lambs; when feed is good, males are
more numerous; and with man, more males are born
amongst the poor when food is dear.

206.—*Max Verworn; change of species; external influences
affect character.*

Max Verworn demonstrated that if "amœba limax" bred
in a hay infusion are stimulated by adding a faint trace of a
diluted solution of caustic potash, they first contract in
length, assuming the shape of a ball, and then after a time
stretch out long pointed pseudopods, which give them the
characteristic form of "amœba radiosæ." They remain
permanently in this form so long as the solution of caustic
potash is contained in the solution. If they are transferred
again to pure water, the "amœba radiosæ" are retrans-
formed into the limax form.

The same fact was demonstrated by Verworn in regard
to the "atemia salina," which, on being placed in fresh water,
changes into "branchipus stagnalis"; and when put back
again into sea water becomes once more "atemia salina."
In these cases it is evident that the presence or the absence
of certain sub-organic molecules—dead (?) matter—may
even determine a variation in species!

We have in fact overwhelming evidence that influences
external to the organism impress effects upon the character
of offspring, producing variations of structure and deter-
mining sex. And if in any case where some feature of
structure would evolve a normal offspring or a given sex,
external influences operate to divert that offspring to a

variation from normal or to the opposite sex, then it cannot be said that any material structure in ovum or embryo is primarily a determinant of either structure or sex. Such determination must *a priori* operate before such structure or sex has any physical existence. Hence the futility of the labours if those who have striven, and are yet striving, to discover a material basis in heredity.

207.—*Doncaster ; erroneous conclusions.*

A large amount of evidence (?) has been published regarding the influence of parents in heredity that has no value whatever ; and erroneous conclusions have been based upon it. L. Doncaster in his *Heredity in the Light of Recent Research* (Cambridge University Press), reviews the effects of environment and habits of parents. He also refers to Galton's observation that identical twins remain alike during life, despite differences in environment. He concludes from the evidence that

"the habits of the parents are relatively unimportant, compared with the nature of the stock, in determining the character of the children."

Neither Galton nor anyone else can say that identical twins, living in different environments, remain alike during life. Difference must arise from differing environment, although that difference may only be a *tendency* (200), and we are not able to perceive it. It is foolish to expect a definite perceptible variation to be effected by some slight variation in environment, especially in identical twins. For everyone has some influence in determining their environment ; and identical twins, having the same propensities, would naturally exert what influence they had in an identical manner upon the character of their environment, and thus lead it to have at least some resemblance.

But even if the environment were widely different in the two cases, we should not look for perceptible effects in the twins themselves, but in their progeny—if it was possible to make enquiry into a sufficiently large number of cases, which is very improbable.

On page 114 Doncaster quotes, in support of his conclusions :

"From a study of over seventy thousand school children, classified according to the employment or non-employment of their mothers in work outside the home, it was found that the relation of their height and weight to the employment or non-employment of the mother was almost negligible, compared with the relation between the physical characters of the mother and child."

In this case also there is no proper data upon which to base any conclusion regarding hereditary effects. There is not sufficient difference between employment at home and employment outside the home to cause any appreciable physical difference in one generation. If those seventy thousand children had been examined as to their aptness to understand and employ themselves at the work upon which their mothers had been engaged outside their homes ; and the results compared with seventy thousand other children in the same social scale, born of mothers who were only engaged in household duties, some definite and reliable data in hereditary influences might have been discovered.

208.—Advance in knowledge regarding the influence of conscious mind upon organic mind.

We have ample and convincing evidence that conscious mind is continuous with and has influence upon organic mind (100) ; organic mind that does the wonderful things within our bodies that are beyond the grasp of conscious mind, and which possesses that mysterious energy and intelligence by which alone individual existence is possible. And herein lies the supreme value of a deeper knowledge of the relations between mind, energy and matter. For organic mind energy is the genetic initiative of every movement, sensation or impulse within all living things ; and the influence that may be exerted upon its activities by conscious mind opens a vista of possibilities that is most encouraging to contemplate. What we have to learn is how to use conscious mind so that we may obtain a maximum of good by its effects upon organic mind.

We are learning something in this direction by the attention now being given in disease to the effects of auto-suggestion, which are simply the effects of conscious mind

upon organic mind. These effects indicate what may possibly be accomplished by conscious mind upon the developing embryo, whose organic mind is in such close touch and sympathy with the organic mind of the mother. They also indicate that something could be done to improve the character even of the ova and sperm before the appearance of the embryo.

We are probably also learning something of which no practical use has yet been made, from the mysterious happenings of psychic phenomena at "séances," where the massed effect of a number of conscious minds influences the mysterious powers of organic mind in the "medium," and things happen which are ignorantly believed to be supernatural.

It will be noted that in the investigations above referred to (207) there is no mention of "mind" as a factor of influence. It is practically the same in all works upon heredity. They all deal mainly with physical appearance and activities within the fertilised ovum—a method of procedure in attacking problems in heredity that is absolutely futile. And if in such works abnormal character in offspring is referred to, it is explained (?) as coincidence, and not correlated with definite prenatal influence.

209.—*Organic mind determines structure; no two living things alike.*

If we look upon a heap of bricks intended for use in a structure we do not see in any individual brick a "determinant" that indicates the character of the intended structure. The architect who planned the structure "determined" that it should be of brick, and not of stone; he "determined" also the general form and character the structure should take. So it is with hereditary influences; it is organic mind, the architect of all living things, that determines, under all given conditions, what the character of the living structure shall be. All physical appearances and activities within the fertilised ovum are the results of the determinations of organic mind. Any material unit visible under the microscope no more "determines" the particulars of the finished structure than does any individual brick "deter-

mine" whether the wall it enters shall be long or short, or **what** thickness or shape it shall have. And even as the architect is influenced in his "determination" regarding the character any structure shall assume by the person for whom **he** designs, so organic mind is influenced in its "determinations" by the conscious mind with which it is associated in such an intimate manner.

Heredity is probably the most important, complex and subtle problem presented to philosophy and science. We have to include in the factors of influence the differences in basic structure, not only of opposite sex in the same species, but also differences in the same sex and species. There is some subtle difference in structure in every individual, which distinguishes him from every other individual; no two living things are structurally alike. Many animals can distinguish one individual from another by scent alone. Practical use has been made of this fact in the tracking down of criminals by means of bloodhounds. And this difference in individuals of the same sex and species can only be in the structure of the physiological units just as is the case in the difference between the sexes. But the difference in structure between opposite sexes will be greater than that between individuals of the same sex.

These differences involve some differences in the phases of the organic mind which conditions them; also some differences in the phases of the conscious mind that evolves from organic mind and is inviolably continuous with it; and so must produce an infinity of variations in offspring. We see that the genesis of hereditary influences is beyond the range of the histologist. The biological chemist will find it involved in the mystery of universal mind and incapable of being differentiated from the varied affinities and properties of atoms as exhibited by their "behaviour" in mutual actions.

210.—A material basis impossible; a material medium necessary.

Yet a certain section of writers and investigators still adhere to the conception of a material basis in heredity; and even take Weismann seriously. Doncaster, the writer above quoted, says that:

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"Modern work seems to support Weismann's hypothesis that the chromosomes are the physical basis of inheritance."

Chromosomes, whatever variations may appear in structure, movement or number, are merely a part of the necessary physical *medium* of inheritance ; they are the result of a determination that has already been exercised. There is a wide difference between a physical *basis* of inheritance and a physical medium. There must be a *physical medium*, but there cannot be a *physical basis* in heredity.

The physical medium transmits the immediate character of the organic mind energy of the parents ; the sperm is the physical medium of the father, the ovum that of the mother. And it is organic mind energy which determines the character and variation in sperm and ovum. Organic mind dominates the structure of all things that live. And when we speak of organic mind dominating the activities within the ovum, we do so well knowing that our conscious mind cannot grasp the mystery that is involved in any phase of mind activity.

We have been thinking all our lives ; but we do not know how we think. Mothers have been bearing children for unknown thousands of years, but no mother knows how she constructs her child. These things *are*, and that is the extent of our knowledge. We must accept organic mind as the dominant factor in heredity, if facts and reason demand that conclusion, even as we accept gravitation, chemical affinity, electricity, radio-activity and electrons, although the ultimate nature of these activities are incomprehensible to us. What we have learned of the laws and modes of manifestation of these incomprehensible activities has been of great service to humanity; and what we may yet learn regarding modes of activity of incomprehensible organic mind may benefit us to an immensely larger extent.

All the molecules of substances that enter into the structure of a fertilised ovum must of necessity carry with them a changing character, impressed upon their co-operative activities by the varying conditions of the parent ; dominant units to-day may not be dominant units to-morrow. There is no necessity to study the ovum under a microscope to arrive at this conclusion. One cannot see any reason for the

hypothesis that chromosomes are the physical basis of inheritance.

It is self-evident that sperm and ovum, with all the physiological units they contain, are the only possible *medium* of inheritance. It would be as reasonable to conclude that metallic wires were the physical basis of electricity because they are *mediums* for its transmission ; as it is to suppose that chromosomes are the physical basis of inheritance because they are simply mediums for its transmission. Every mode of energy must have a medium through which it can evidence its existence. The energy of hereditary influence must have a medium through which it can express itself ; otherwise we should be ignorant of its existence. And when we reflect upon the wonderful activities within the fertilised ovum, the evolution of the chromosomes from the nuclei, and their orderly and systematic behaviour, it is not possible to believe that the phenomena are "controlled" by any one objective element of structure within the ovum. Nothing can be clearer to the thoughtful observer than that there is some unseen influence at work ; and that influence cannot be other than organic mind—that wonderful intelligent energy about which we have yet all to learn.

211.—*Pre-natal influences must operate, or children from the same parents would be all alike.*

The immediate physical mediums of inheritance in sperm, ovum, chromosome, embryo and foetus are constantly changing in value of potential by influences affecting the organic mind that evolves the varying structures ; and the result of these influences causes the children of the same two parents to vary considerably in mental and physical character. Were it not for the influences affecting the organic mind of the parents, and consequently the organic mind in the immediate physical medium of inheritance, *all the children from the same two parents would be as much alike as identical twins.* We press this self-evident truth upon the attention of the reader. As conscious mind has normally a constant influence upon organic mind, we have thus a means of pre-determining to an extent yet unknown the mental and physical character of offspring. It is not the education that

father or mother has *received* that influences the mental character of offspring ; it is how the father and mother are using their mental faculties at the time sperm, ovum, embryo or foetus are developing. And this much may already be said with certainty—we can exert more influence upon a child's character before it is born than we ever can afterwards ; and we may also probably pre-determine its sex.

212.—*The "wise" woman of China.*

We are reminded here of a custom in China, where most towns and villages have their "wise woman," to whom the young wife goes immediately she becomes aware she has conceived, and asks if it be a boy or girl. The wise woman tells her—and she is nearly always right ! But she cannot possibly have any physical data upon which to base her decision, and is probably as much mystified as the prospective mother herself as to the source of her apparent knowledge. But in the light of our knowledge of the influence of conscious mind upon organic mind, the wise woman's success is easily understood.

A human embryo has no objective indications of sex until about the eighth or ninth week, and it is possible for the mother's conscious mind to so influence the embryo as to determine what sex it shall be. Most mothers may, about four weeks after, know that they have conceived, and they have still four or five weeks—sometimes longer—to go before the sex is finally determined. And as the birth of a child is the most important event personally that ever engaged her attention, the mother's mind is almost constantly engaged in thinking about and *picturing* her baby as of the sex indicated by the "wise" woman. The result of this constant trend of her conscious mind for a period of about five weeks influences the organic mind of the sexless embryo to evolve into the sex she had already imagined it to possess, exactly as in auto-suggestion, when conscious mind influences the organic mind in an unhealthy organ, so as to cause it to become healthy. Normal influences upon the mother are nearly balanced for or against boy or girl ; this is evident from the fact that the total number of the two sexes are nearly balanced. And it is quite evident that, understand-

ing the nature of the influences upon the mother that determines the sex of the child, we could quite easily pre-determine the sex we wished, for but a slight influence is necessary—if of a correct kind.

But we have yet to learn the precise nature of such influence. Simply *wishing* for a boy or a girl we know is not a sufficient influence. But we have some evidence that the picture of a naked boy, so hung that the prospective mother can look at it from her pillow night and morning, also the washing and dressing of a boy during the first two months after conception have an influence in the desired direction. We have direct evidence in some cases (219) that *looking* with unusual intentness at anything has a powerful influence upon prenatal development; and frequent observance of the mental concept, or the actual picture, of such a concept—boy or girl—must have some influence in the determination of sex during the first two months. No doubt most of the young mothers who visit the wise woman firmly believe in her powers; and this very belief helps the prediction to become true, for the prospective mother will then constantly picture a boy in her mind. The rationale is exactly the same as in the many cases of the influence of conscious mind upon organic mind mentioned in our sixth chapter.

213.—*Influence of mothers more potent than influence of fathers.*

Basing our reasoning upon the postulates that mind is the dominant factor in heredity, and that conscious mind is continuous with organic mind, we are led to conclude that the influence of mothers is more potent, on the average, than the influence of fathers in the determination of hereditary character. The influence of the father is only direct during the time he is evolving, and to some extent during its stay within him, of the spermatozoon that ultimately becomes a part of the embryo. Even during this interval the man's varying physical condition must have some effect, for every cell within the body varies to some extent with variation in the physical condition of the individual, this physical condition being but the general expression of the physiological units that constitute the individual. The

strength of the organic mind impulses of the heart, for instance, vary with the varying conditions of bodily health. Thus the mental and physical condition of the father immediately prior to conception may have a most important effect upon his offspring and be a dominant factor of his potency in influencing the differences in character between children of the same two parents.

214.—*Grandmother develops ova of her grandchildren.*

On the other hand, grandmothers evolve the potential ova that ultimately develop into their grandchildren ; for in the female child, when it is born, the ova of its future children are already in physical evidence within its ovaries—usually about two hundred thousand of them ; and these are weeded out, as it were, by a process analogous to the survival of the fittest ; until when she reaches puberty there remain only about seventy thousand of them. The direct influence of immediate mothers thus embraces two generations. We have seen eyes of the grandfather on the mother's side unmistakably evident in the granddaughter. In this case we have irrefutable evidence that the character of the child's eyes were determined in the ova that evolved in the grandmother, and that no influence in father or mother operated to counteract that influence. One single undoubted instance of this nature is sufficient to prove that any characteristic trait or even the sex of a child may be determined before it begins its individual existence at conception, when other influences are not sufficient to cause alteration. The eyes of the child above alluded to were unlike those of either father or mother, in colour, form, or expression, and the similarity to the maternal grandfather's was exact in these respects.

The hereditary character of children thus depends to an important extent upon the manner in which both the grandmother and the mother are reared to the age of puberty ; the more vigorously healthy the training of girls from childhood upwards, the more likely they are to bear vigorous children. We can also see that the *manner* of the mother's mental development by education must have an effect upon the mental tendencies of her offspring. If her education is made as pleasant as possible, her children are

more likely to take kindly to their lessons than they would have done had the education of the mother been a harsh and unhappy process.

When the influence of the mother has dominant potency over the influence of the father, the intellectual pleasure she may take in any subject will most certainly be an intellectual, and yet more pronounced characteristic of her child. And the value of this potency will be proportionate to her healthy and vigorous physical condition. The dominant influence of mothers during gestation explains why such a number of noted men and women have had mothers of an exceptional character.

215.—Influence of education of parents has no perceptible effect. Hereditary value of doing things.

Most writers on the subject of heredity have come to the conclusion that we can do nothing in improving the mental character of offspring by the influences of education upon the parents. The children of succeeding generations of educated parents have to start at the beginning on the same level as the children of uneducated parents. Doncaster states (207) the position thus

"The father may educate his children because he himself was educated, but the mental powers of his children will be the same, whether he had a good education or not."

This pessimistic note is misleading; for it apparently makes it final that nothing can be done pre-natally to improve mental character. It is quite true that education in the sense implied by Doncaster and other writers has no appreciable influence upon the mental capacity of children; for such education is largely a process which exercises the memory; and memory, as we have already pointed out (185), is not an intellectual faculty. Learning the alphabet and to read; learning grammar, geography, history, botany, and so on, are mainly exercises of memory. Intellectual capacity is inborn, and cannot be taught. We have personally known those who could neither read nor write who had more than average intellectual capacity; and there are many "professors" in our schools of learning who, to put the

best face upon the matter, are not above the average in "intellectual grip." Education, together with a good memory, enables those born with unusual intellectual powers to make the best practical use of those powers.

The parents must be mentally exercising their minds upon something unusual, or upon something that has acquired an unusual interest for them, in order to be able to unusually affect the organic mind, when sperm, ovum or embryo are evolving. And the keener the interest and pleasure in so doing the more effective their influence will be, no matter whether they are educated persons or are unable to read or write.

Experience has shown that education, as represented by mere book learning, has no appreciable effect in raising the "intellectual grip" in progeny; but the doing of things, or the making of things, may have such an effect.

If a boy with his toy tool chest, or a man with his kit of tools, attempts to do something or to make something he never did before, the first attempt is usually more or less of a failure. The first clock, the first sewing machine, typewriter, or locomotive engine, were very crude attempts compared with later achievements. The faculty of causation is vigorously exercised in trying to arrive at the exact reasons why the result is not equal to the preconceived idea of the thing intended. When, satisfied that the cause of failure is understood, a second attempt is made, something more like just the thing required is produced.

The point of value in all practical work is that the faculty of causation, the noblest faculty of human mind, the faculty that determines the strength of that "intellectual grip" which cannot be taught, is being constantly exercised. Practically nothing of this occurs in the mere reading and memorising of lessons or of facts in textbooks. These may add to the list of facts we have already stored in the brain, but they are useless unless they are made practical use of—they merely lumber the brain. To make a practical and proper use of facts we require intellectual grip; a healthy and vigorous activity of the faculty of causation; and nothing equals doing things with our own hands for stimulating the development of this faculty.

As illustrating just what we wish to convey to the reader

in this connection we may draw attention to the fact that the three men who have had probably the most influence upon the conditions of modern life—George Stephenson, Thomas Alva Edison, and Luther Burbank—were born of poor parents, and were not “educated” in the sense given to the word by writers upon heredity.

They were all doing things when they ought, in popular opinion, to have been at school: Stephenson working in a coal pit, Edison selling newspapers in street and train; Burbank as a young man worked in a factory, and did things in a back garden. The inborn intellectual grip that these men inherited from their parents—who also did things—could not be kept from evidencing itself. If they had been obliged to muddle their brains in a school from the age of five till fourteen by lessons in grammar, geography, history and so on, stunting the natural bent of their minds by wearisome tasks of memory, the world to-day might have been the poorer for it.

It is a notable fact that George Stephenson had a son—Robert—during the time in his twenty-fourth year when his hands and his brains were busy devising the travelling engine for use on the tramroad between the Killingsworth colliery and the shipping port. This son Robert became a famous engineer, the inventor and constructor of tubular bridges; became president of the Institute of Civil Engineers; was decorated by several royalties, and was honoured by burial in Westminster Abbey. We may reasonably attribute Robert's skill to an hereditary effect of the immediate influence of his father's conscious mind upon developing sperm. Some effect may also have been added by the mother during gestation by the immediate effect of conscious pride and interest in her husband's ability and work.

It is also a notable fact that the first Napoleon's mother followed his father through army camp life during years of war prior to the birth of Napoleon. She must have been much attached to her husband, and no doubt followed the strategy of the engagements he took part in with an intense interest. Here we have years of an accumulating weight of tendency. We know the result.

Sufficient weight is not given in our educational systems

to the value of doing things. Lord Harberton in his humorous, but serious and deeply suggestive work, *How to Lengthen our Ears*, clearly indicates this failing. On page 10 he remarks :—

" For all practical purposes it has been established by the law of England that not to know where Blenheim is, and who won it, is ignorance ; but not to know how to repair a pneumatic tyre, or mend a gaspipe, is not ignorance. . . . Hence Blenheim is made compulsory from the age of five to fourteen ; while gaspipe mending is, between those ages, an offence at law during school hours ; at other hours if done for money, it is a crime visited by heavy penalties on all concerned. Consequently anything practical, or likely to be of use, in other words, manual labour, stands condemned as something low, and better omitted, and rather resembling sin, which we may be well left to pick up for ourselves, when and how we can."

216.—Internal evidence of weakness in the " material basis " problem.

There is scarcely a page in the many volumes dealing with a material basis in heredity, with the phenomena of fertilisation, and the physical structure and movements of chromosomes, but contains some internal evidence that no such thing as a definite material basis can have any existence as the ultimate factor in heredity. The seekers after this " will-o'-the-wisp " are indeed " like men lost in a wilderness " (67). Please consider the following paragraph in Doncaster's review above quoted (207) :

" Evidence of this kind, while not proving that the chromosomes are directly concerned in the transmission of inherited characters, makes such an hypothesis very plausible. Much unnecessary confusion, however, has arisen, from stating the hypothesis in the form—the chromosomes are probably the bearers of inherited characters. Evidence has been adduced that cytoplasm plays some part in determining these characters, and it has therefore been maintained that the statement is disproved. No one, however, would suppose that the chromosomes could act alone ; they must act in and by their relation

with the cytoplasm, and if the cytoplasm is that of a different species, the total effect must necessarily be different."

Average readers will probably better appreciate the value of such language if we paraphrase it in relation to things they are better acquainted with—thus :

"Evidence of this kind, while not proving that rivers are directly concerned in the transmission of water, makes such an hypothesis very plausible. Much unnecessary confusion, however, has arisen from stating the hypothesis in the form, 'the rivers are probably the bearers of water.' Evidence has been adduced that the banks of rivers play some part in determining the waters, and it has therefore been maintained that the statement is disproved. No one, however, would suppose that the rivers could act alone ; they must act in and by their relation with the banks, and if the banks are of different material the total effect must necessarily be different ! "

No breeder of animals or cultivator of plants has ever yet been in the slightest degree assisted in improving type or in developing new species by any knowledge acquired from character or behaviour of chromosomes. All the knowledge we possess in regard to means whereby we may modify the character of animal or plant, or develop new species, has been derived from observing and comparing the character of offspring with the character of parents—not from microscopic examination of the activities within the fertilised ovum.

Mendel did not know that chromosomes existed. Luther Burbank, "the wizard of the garden," who has made his name immortal by his unique and wonderful work in the development of improved varieties and new species of plants of immense economic value, never looked for guidance to the structure and activities of chromosomes.

From the time of their discovery to the present day chromosomes have been studied with unceasing attention from every possible point of view, in the vain hope of finding a physical basis in heredity ; but up to the present time all this labour has resulted in what might have been determined *a priori*—nothing.

CHAPTER XIII

INFLUENCE OF MIND IN HEREDITY ; EUGENICS

217.—*Interpretation of organic mind impressions.*

On the outset of any investigation into the influences of mind in heredity we are met with the incomprehensible mystery of presentations which are both cause and effect. The very facts—that all forms of energy are correlated, and may take any form which energy is capable of assuming ; that nothing can be created or destroyed ; that the sum of all that is remains constant ; that these facts are necessary conditions to the permanence of the universe—prove that all presentations in nature must have an inviolable dual function as cause and effect, and that every presentation must of necessity be perfectly continuous with that which precedes it and with that which follows it.

In man, organic mind and conscious mind are so continuous, and present activities having this dual character of cause and effect. Organic mind merges into conscious mind ; conscious mind into organic mind—just as heat merges into light, light into heat ; electric into magnetic energy, magnetic into electric energy. But we cannot follow the transformations of mind energy movements in a living body as we do the transformations of other modes of energy in the chemical or physical laboratory. Consequently there are effects of mind activities which seem apart from natural activities, and have been explained by or attributed to metaphysical or supernatural cause.

All of conscious mind in man arises from and is conditioned by the mutual actions which occur in brain cells between the molecular movements in those cells, and the molecular movements which come to them from the organs of the five senses and from the various organic structures of the body. These movements, which are continuously arriving at the centres of consciousness in the brain, are conditioned by

organic mind movements, of which we remain unconscious until the mutual action in the brain cells transforms them into consciousness. Our consciousness of being well or ill, every thought and mental operation, everything we see, hear or feel, whether it be normal or abnormal, real or imaginary, is first of all organic mind, of which we are unconscious. And as a consequence of the continuity of all mind processes and the mutual influences which organic and conscious mind exert upon each other, it is possible to correctly interpret the impressions organic mind makes upon the conscious mind.

We usually and correctly interpret the most familiar impressions of hunger and thirst as a demand of our organic cells for a further supply of food or liquid, and we eat or drink in response to them.

In pathological conditions organic mind is sometimes distressed because, in the limited supply of energy presented as food, there are lacking some molecules of a structure that is essential to an improvement of the condition of the body ; and the only means of making the fact known to the patient is by medium of the influence of organic mind upon conscious mind.

Patients sometimes long for an article of food or a kind of drink prohibited by the medical attendant ; obtain it without his knowledge, and enjoy it with very evident advantage. It is a matter of common knowledge how physicians used to misinterpret the impressions of organic mind upon the conscious mind of fever patients, and prohibited them from having the refreshing drink of water which they longed for.

The sick person cannot possibly have a conscious knowledge that the particular food or drink he longs for contains certain molecules of a structure that would benefit his nutrition and cause him to gain strength ; he simply and only knows that he would like some of that particular food or drink. This longing is an impression of organic mind, translated by his consciousness into a desire for that particular food, just as the normal impression, when immediate supplies of energy are running low, is translated by conscious mind into the sensation of hunger and a general desire for food.

Organic mind knows by experience, which it never forgets, what class of food or liquid contains molecules of the structure it requires ; it communicates this knowledge to the conscious mind cells of the brain, which transform it into a conscious desire for the particular food or liquid indicated.

In heredity, all *effects* must be co-ordinated with mutual action between conscious, organic and sub-organic mind, as *causes*. If a prospective mother, in consequence of the lack of some particular molecular element in her diet necessary to the vigorous growth of the developing child, longs for a particular item of food, and that longing is not satisfied, the child, when born, is likely to be restless and unsatisfied until it gets a little of the food the mother longed for. Such cases are known, directly or indirectly, to nearly every mother. The following instance the writer can personally vouch for :

Shortly before the birth of her child a mother longed for lobster, which was not procurable, and her longing went unsatisfied. The child immediately after birth commenced and kept up a constant feeble, miserable whimpering—not a real cry—which continued for several days, and nothing the mother could do would stop it. At last the mother mentioned to her husband the fact that she had been longing for lobster, and suggested that it might be the cause of the child's whimpering. The husband at once saddled his horse, rode to a store about ten miles away, and procured a can of tinned lobster. The mother, when the tin had been opened, placed a finger in the liquid in the tin and allowed a couple of drops to fall into the child's mouth. The whimpering immediately ceased and the child throve well.

We could reasonably conclude, *a priori*, that such cases were possible and probable, from the fact that the mother and foetus are *one*; and that, consequently, the organic activities in the foetus must be influenced in the same manner as the organic activities in the mother. The conscious mind of the mother was influenced by her organic mind in the definite choice of the particular food she longed for. Only the organic mind of the mother *could know* that lobster contained some necessary elementary or compound molecules that her daily food was deficient in. What the mother wanted was translated from organic mind into conscious

mind as lobster. In common language it would be said that the mother *instinctively* felt that she wanted it, but we avoid that term, because it is used so largely to cover ignorance.

The organic mind of the foetus, equally with the rest of the organic mind in the mother, wanted those particular molecules which were necessary to more satisfactory nourishment ; the organic mind of the child still wanted them, because the longing of the mother had not been satisfied ; and, lacking conscious mind (34) through which to interpret its wants, its organic mind expressed them in a miserable whimper, which immediately ceased when it got what its organism required. It is a reasonable result following from a reasonable cause.

218.—*Remarkable influences of iodine.*

A known fact is a sound foundation upon which to theorise, and there are many facts which point in the direction we have taken in this matter.

The thyroid glands, situated on each side of " Adam's apple " in the neck, produce a secretion that has a marvellous power over growth and development. A failure of this secretion at birth, due to defective glands, results in a retardation of both mental and bodily development and the evolution of the dwarfed and feeble-minded cretin. We now know the exact chemical composition of the thyroid secretion, and we know that it is rich in iodine. If there is any lack of necessary elements in the blood supply of the mother and developing child, no part of the body is so likely to feel that want as the thyroid gland, the secretion from which has so dominant an influence upon growth and development. And as the thyroid requires for this dominant influence an unusual percentage of iodine, we can readily conceive that a shortage of iodine in the blood supply might cause a longing in the mother for some kind of food rich in iodine. Although " rich " in iodine relatively, the actual quantity of iodine in the thyroid secretion is an extremely minute quantity. The powerful influences exerted in biology by infinitesimal quantities are as yet practically a blank in our knowledge.

Now, sea water is rich in iodine ; all iodine comes, directly

or indirectly, from sea water, from ashes of burnt seaweed, or from deposits of salt left by the sea. Lobster is evolved in sea water, and we know that in the evolution of individual being, vegetal or animal, any element required for development, that is in quantity, sufficient or in excess, in the food, soil, or medium upon or in which that being evolves, is made use of fully to the extent required.

Iodine is very likely to be deficient in land grown plants, and more deficient in some places than others; and animals bred on this land, or cereals or vegetables grown upon it, will have insufficient in their tissues. In such places, disorders of the thyroid are prevalent; but a deficiency insufficient to produce objective evidence of disease might affect the organic mind in a prospective mother to the extent of making her long for some food rich in iodine. We recently read in the press of a town in America where diseases of the thyroid are unusually prevalent, that the authorities are placing a minute amount of iodine in the general water supply of the town (179).

Recent developments in knowledge of facts increasingly impress upon us the possibility of infinitesimally minute quantities of substances which may defy quantitative analysis, yet have a profound influence upon living organisms.

It is now recognised as a fact that cretinism is due to a lack of sufficient iodine in the soil which grows the food eaten in the districts where cretinism is prevalent. Many instances in pathology could be cited where exceeding minute quantities cause profound effects.

Until quite recently the minute quantities of inorganic salts, such as iodine, manganese, and fluorine, of which only mere traces are found in living things, were thought to be accidentally present, but they are now coming to be regarded as essential.

"In fact, the 'chemistry of traces' both in organic and inorganic chemistry is assuming a position of the first importance."—("Chemistry of grasses," *The Times*, Aug. 27, 1927.)

So we may reasonably formulate the theory that in the case mentioned the mother's longing for lobster was due to a lack of iodine in her food. The astounding intelligence of

organic mind, to which we have so often called the reader's attention, knew it wanted iodine, and instructed the conscious mind of the mother to eat lobster (104).

If the longing of a prospective mother for a particular kind of food can be transferred to the organic mind of the child—and we have abundant evidence that this is so, for even in the smallest village you may find some mother who can give first-hand information regarding the fact—is it not equally possible that a mother's appreciation in music, poetry, pictures, history, if *actively and pleasantly exercised*, may be transferred to her unborn child, and be the means of ultimately leading that child to be a musician, poet, artist, or historian? If the influence of conscious mind can operate upon the organic mind controlling the beat of the heart, the secretion of the digestive juices, the very "brain" of organic mind in the vasomotor centre—as evidenced in the simple act of blushing; and upon weakened health in disease by auto-suggestion (100)—can it not also operate upon the organic mind in embryo or foetus, and cause variation in development and character of hereditary traits? For, as Baudouin correctly observes (96):—

"There is no radical difference between the action of suggestion, when its results are purely functional, and its action when its results are organic."

All activities of mind are phases of movement, whether they be such as condition a growing organ or such as condition the functions of the developed organ.

219.—*Changing hereditary values; instances of pre-natal influences.*

We see from facts in many directions that hereditary values must always be changing, or subject to change, right up to the moment of birth. And even after birth there is evidence that the ultimate values of hereditary influences are not definitely fixed; that they still remain mobile, and may be strengthened or depressed to some variable extent from childhood right up to full physical development. For, so long as basic structure is evolving, immediate mind must have an influence.

We often hear such remarks as "he grows more like his

father every day." When this is spoken seriously, it is in cases where the more immediate influences of the mother are giving way to more dominant influences from the father. There are in some cases definite changes in character between youth and middle age, due to ancestral influences outcropping as a result of contributing *tendencies* derived from immediate parents (200).

Many striking instances of the influence of pre-natal conditions have been published by various writers, and probably a much larger number have not been so noticed. We shall mention only five. In the first two cases we have personally obtained the evidence from the mothers and have seen the children. In the third case, the evidence came from a person who was acquainted with the mother and had seen the child. The fourth is quoted by Baudouin, in his work on Auto-Suggestion. The fifth case is from evidence given at an inquest in England upon a man who had committed suicide.

Case 1.—Mrs. E. I. Godwin, when a young married woman about two months pregnant, went out one day with her brother, who wished to get a platypus—*ornithorhynchus*—to send to a doctor, to whom he had promised a specimen. By the side of a stream the woman sat down to fish, whilst her brother went after the platypus. He saw one in a pool a little above where the woman sat, fired at it, wounded, but did not kill it. It floated down stream, and the man jumped in, caught it, and threw it out upon the bank near where his sister was sitting. The platypus in its struggles at last sprang fairly into the woman's lap; and she was terrified lest it should wound her with its sharp spurs, which are believed to be highly poisonous. The platypus has a perforated spur connected with a secreting gland on each side of its hind legs, and it has webbed feet. She was afraid to touch it on account of its spurs, and it struggled some time in the hollow of her lap, she *looking at it* the while with fearful intensity; till her brother, coming out of the stream, relieved her of her trouble.

When the woman's child was born its toes and the four fingers on each hand were webbed together, the thumbs short of natural length, and a small extra finger was at-

tached, like a spur, to the outer finger of each hand. He had six toes on each foot—two big toes—and the outer big toe on each foot projected inwards like a spur, so widely apart from the other toes that he could not get ordinary boots or shoes on his feet. Up to the time we saw him, when about sixteen years old, he had never worn boots. There were gaps a little more than an inch across between the extremities of his two big toes and the two second ones.

Case 2.—Mrs. Bancroft, when about five months pregnant, saw an Angora goat eating young fruit trees which her husband had planted, and wishing to save the trees, she approached to drive him away, but the goat charged at her. She caught him by the horns, and a severe struggle ensued; eventually she managed to secure him with the lash of a stockwhip, and fastened him to a stump. By this time Mrs. Bancroft was nearly exhausted, and commenced to wring her hands—probably verging on the hysterical. The boy that was afterwards born had a deformed left hand. Development of the hand is normal as far as the knuckles; these are absent, and the tips of the fingers are on the part where the knuckles should be, each tip being about the size of a garden pea. The boy is bright and otherwise normal.

Case 3.—Mrs. Fred. Wells, newly married, and whose husband was a butcher, sometimes went to see him when at work. One day when he was dressing a sheep, and his wife was near and behind him, he threw the sheep's "pluck" over his shoulder, towards a corner where he usually threw the offal. The "pluck" struck the wife behind the head and neck. She uttered a horrified scream as the thing fell down at her feet, and *looked at it* as if fascinated. The child when born had a mass of loose fleshy tissue attached to the back of its head and neck; the mass used to hang over the mother's arm as she nursed it. The child lived about two years and was apparently idiotic.

Case 4.—Recorded by Artault; quoted by Baudouin.

"During the second month of her pregnancy a young woman was visited by a friend of her husband. She had never seen the man before (your readers are so sceptical, that I must be precise on this point). She was

greatly struck by a malformation of the nail in his left forefinger. The nail was thick and curved, so that it was like a lion's claw. The deformity was the sequel of an ordinary accident, in which the terminal phalanx of the forefinger had been crushed. The young woman's mind became obsessed by this deformity. The friend was staying in the neighbourhood for several months, and every time he came to dinner the expectant mother was *unable to take her eyes off the finger*, for she was terrified lest her child should be born with a similar finger nail. She was haunted by the fear to such an extent, that her husband in the end begged his friend to wear a glove when his wife was present. But, alas, the impression on the foetus had already been made, and when the baby was born at term (once more I am precise), the left index finger had a claw like that of the unlucky visitor.

"The child was a girl, whom I see very often. Whenever I look at her clawed finger, I compare it mentally with that of the model, whom I have also seen. Before the experimental certainty of this instance of maternal impressions, which is on quite a different plane from old wives' tales of birth-marks, I smile at systematised incredulity. I am unable to explain the occurrence, but I record it."

Case 5.—From evidence at an inquest—we quote from memory—an English soldier during the great war was wounded severely in the back, injuring the spine. After he recovered a scarred depression that might be termed a "hole" was left in his back, also some spinal weakness. A daughter was afterwards born to him, who had an exactly similar depression in the same place, also a serious weakness there. The trouble caused by this affliction of his daughter, and probably other troubles, caused the man to take his own life. This case is unique, in that it evidences the possibility of the father having in his own person a means of pre-determining to some extent abnormality in the character of his offspring.

In case No. 4 it is reasonably certain that it was the unusual attention which the mother paid to the deformity

on the finger that caused the same deformity to appear on the child. She looked at it too much, and thought about it too much. Under similar circumstances many mothers would have caused no malformation on the child.

Because many prospective mothers see unusual sights, and no related pre-natal effects are seen on the children, is no argument that such things do not occur sometimes. The mother must be either peculiarly susceptible to such influences or she must purposely look long, earnestly and often ; also think much about it, in order to make pre-natal influence become apparent.

220.—Coincidences? Identical twins and ordinary twins.

To say that such instances, connecting malformations with pre-natal influences, are coincidences is not reasonable. They cannot be admitted as such by the law of probabilities. Yet L. Doncaster (207) thus sums the authoritative attitude :

"In the light of recent research, the belief in bodily marks or malformations being due to corresponding injury to mother, or to her attention being strongly attracted to that part, is almost certainly based upon coincidence."

We see by the evidence in the above cases, and in many other authentic cases recorded by various writers that pre-natal influence affecting parents is an important and powerful factor in determining the character of offspring. It cannot be other than this influence which causes the wide differences in the character of children born of the same two parents (211). We see evidence of the correctness of this conclusion also in the notable difference there is in the character between identical twins and ordinary twins.

Identical twins are so much alike that acquaintances and friends sometimes cannot distinguish one from the other ; only the mother can do this with certainty. Ordinary twins vary as much in character as children born singly—or nearly so. They may differ in sex and differ widely in mental and physical character. We are personally acquainted with twins, one of them a well-built man, six feet five inches in height ; the other, a sister, a small woman below the average in height and weight !

The similarity of identical twins and the dissimilar

character of ordinary twins is explained as follows : Identical twins evolve from a single ovum, fertilised by a single spermatozoon. At the first division of the fertilised ovum the two cells, instead of remaining together and forming one embryo, as is usual, separate, and each of them is evolved into an embryo. Thus both of the identical twins are evolved from the same identical ovum and the same identical spermatozoon, and they cannot be other than identical in mental and physical character, excepting in such minute differences as enables the mother to distinguish one from the other. These minute differences are accounted for by the fact that the two embryos cannot possibly occupy the same place at one time in the uterus ; and these differences in position make some slight differences in the process of development—possibly by slight differences in local pressure affecting circulation.

In the case of ordinary twins, two ova are fertilised by two spermatozoa, and as the male in sexual intercourse discharges millions of them, it is very unlikely that the two were evolved in the male at the same time. He may have been engaged, mentally and physically, in quite a different manner when one was evolved than he was when the other was evolved. And in any case, there must have been some difference, for constant change is a fundamental attribute of living things. The hereditary qualities of the two sperm would consequently differ, and cause that difference to the extent of their dominant potency in the mental and physical character of the twins, making them vary as do children born singly.

The mother, too, discharges many ova each month prior to conception, and these, too, vary in hereditary values with the variations in the immediate conditions that operated on the mother when they were developing or ripening. And thus arise the differences in mental and physical character of ordinary twins ; they vary as widely as children born singly, because they evolve from differing ova and sperm, as do children born singly. And identical twins are identical because they both evolve from the one ovum and the one sperm, and thus are impressed with the same hereditary values.

We thus see that the immediate manner of life of father and mother when ova and sperm are evolving has a pre-natal influence upon offspring of a value and range that far exceeds anything that may be impressed upon them after birth. And we are led to think that the first fourteen years of a girl's life, when the two hundred thousand ova that she was born with are being culled out after the manner of the survival of the fittest, until only about seventy thousand are left at puberty, must be an important period in relation to the effect of pre-natal influences possible to the future mother.

There are thousands of mothers to-day who can see in one of their children some effects of an unhappy period that affected them before those children were born. And any intelligent observer of the children of families may often see and determine from the expression and behaviour of a child that the mother was unhappy when bearing it.

221.—Varying physical conditions must evolve varying results.

Similar forces acting upon similar things produce similar results. This is as absolutely true as any mathematical equation. And in the study of any problem in heredity, if we start with a full recognition of this truth, and at once refer differences in hereditary effect to constantly varying mental and physical conditions in parents, we shall arrive at the truth without introducing a multiplicity of useless hypotheses regarding the functions of chromosomes. If we consider the results in the development and ripening of fruit upon a tree or a vine, we see, and we can taste, that the fruit are not all alike. But we know that the conditions operating are not alike for each fruit. There are differences in the amount of sunlight they receive, differences in the circulation of air about them. The roots that supply the sap to one part of the tree may be in a richer patch of earth, or earth of a different physical character than other roots. In some cases quite distinct flavours can be detected in fruit from the same vine. But it is quite certain that if an entire tree or vine with similar parts could be kept in similar conditions during fruit bearing, we should not be able to distinguish one fruit from another. And if any two parents

could possibly keep themselves in the same mental and physical conditions during the reproductive period, the children from those parents would resemble each other as closely as identical twins.

The more complex the structure and functions of a living being, the more variation is possible as a result of immediate influences. The variations in character of the same quite normal person are much greater than we are aware of from day to day, or even from hour to hour. We can see differences in immediate temperament, such as between bad and good humour, quiet or lively, lazy or energetic, but everyone hides as much as possible the subjective experiences that would lower one in the estimation of others. Dual personalities, unknown to each other, may occur in the one individual, and even multiple personalities are possible (235). These distinct personalities in the one individual are due to some temporary difference in structure—usually pathological—and consequent differences in function of cerebral neurones. A man drunk has a different personality from the same man sober, more or less distinct, for it is a common experience for the sober man to have no knowledge of the things he did when drunk. The cause in such cases is quite evident—it is the introduction of alcohol molecules into the brain neurones, causing difference in structure and consequent difference in function.

However moral a man may be, his thoughts may at times take a direction such as he would not on any account disclose to his friends. Whilst he is in that mood, that mood is an active factor in his immediate character, and that factor may be impressed upon a germ then evolving, and carried onwards as a hereditary trait. At another time, his thoughts may take a direction and a tone such as he would enjoy recounting to his friends, and this mood is then a factor in his immediate character, and may be impressed upon an evolving germ.

If both these germs fertilised two ova at the same time, two ordinary twins would result, who would differ in character as widely as the two differing moods—if the father's hereditary traits at this time were dominant. Or if each one of such two germs fertilise each an ovum, giving single

births a year or two apart, under like conditions of potency, the two children will differ mentally in the same manner. This gives us the rationale of the wide difference sometimes seen between the character of a child and either of its parents which makes one wonder how such parents could have such a child. It is the result of a mental mood in one of the parents such as is not detectable in any manner of outward behaviour.

222.—*Variations in offspring must have a cause. Manitoba wheat.*

The cases of departure from normal, such as we have instanced (219), and all other such departures must have been caused by pre-natal influences unless we admit the unthinkable possibility that an effect can be produced without a cause. We are bound to admit that abnormalities are due to some cause. Will any disciple of Weismann kindly inform us what other rational cause there could be, other than a pre-natal one? Abnormalities are developed before birth—not after it—therefore the influences determining them must be pre-natal; and they cannot operate otherwise than through the medium of the parents. When the unusual or abnormal appear in any other connection than in heredity, do we not look for a cause in the conditions that preceded their appearance? If there is a variation, or abnormality, in a child at birth, what more reasonable than to attribute it to some unusual or abnormal parental condition or experience? We have such abundant evidence of the constant influence of conscious mind upon organic mind that we cannot think it to be ineffective during gestation. So strong is this influence that purely mental effects upon the mother may cause the death of the child by premature birth. We cannot find any rational explanation in any other direction. The idea that something physical in the chromosomes *determines* the character of the individual is simply absurd.

Mantitoba wheat is famous for its high percentage of gluten. Bakers will pay a higher price for it because they can make more bread from it than from an equal quantity

of any other kind of flour. It has come into existence by growing ordinary wheat upon soils rich in nitrogen. Plant it in soil poor in nitrogen, and its high percentage of gluten will gradually disappear. Changed environment changes the plant ; the *plant changes its germs*.

223.—*Environment ; internal and external.*

Food is internal environment in relation to living things, just as air is external environment. The external skin is perfectly continuous with the internal mucus membrane which covers the internal channel of the nutritive track ; both are structured of epithelial cells. The food passing through it is not a part of the body ; it is practically the environment of the internal mucus membrane, just as air is the environment of the external skin. The internal surface is in constant mutual action with the food we ingest, just as the external surface is in constant mutual action with the air it is in contact with. Organic mind in living processes can only operate upon the material that is immediately available to the organism ; and the character of the contents of the digestive track is the character of the material that is immediately available for living functions—the internal environment which is absorbed into and becomes an actual part of the living being.

Feed a dog that has been accustomed to vegetable food on raw meat, and you alter the functions of both its organic and its conscious mind—it becomes more savage. Everywhere throughout the world of living things we find that alterations in the conditions under which they live alter in some way the functions and character of them. And any alteration of function in any living thing must perforce carry with it some modification of the germs or ova that are being developed in that living thing ; and the character of the individual developed from them must likewise be modified.

In the evolution of hereditary qualities the organic mind of the individual that is being evolved is perforce obliged to work upon the material presented to it, and be influenced by the mind of the parent from which it is evolving. And as variations in food provide a constantly changing energy environment, as influences operate upon parents in all sorts

of conceivable and inconceivable ways affecting nutrition, and as the unceasing effects of the ever varying conscious mind of parents are always operating upon organic mind, there must arise at times, as a result of rare combinations of influencing factors, individuals, on the one hand, much superior or inferior intellectually to ancestral type, or, on the other hand, of superior physique or grotesquely debased. Thus arise infant prodigies, idiots, geniuses, two-headed calves, armless men, pig-headed ladies, Siamese twins, and so on.

224.—Multiplication of the unfit; Eugenists; selective breeding.

In seeking to develop happier conditions for the human race it is not necessary to strive after anything which does not now exist in human character. It will be sufficient to eliminate that which is bad and hold to the good which already exists. And, above all, it is necessary to put some check upon the multiplication of the unfit. This, more than any other factor, is the cause of so much misery in the world. Good men and good women, bad men and bad women, are existing facts; it is not necessary to create anything new. It is not necessary to know whether chromosomes are structures of "determinants" or not; for such knowledge would be useless if acquired—we should still require the knowledge of that which determines the determinants. We only require the conviction that character of germ and ovum may be modified pre-natally and act upon that knowledge. That this is so is admitted by all seekers after a material basis—even by Weismann—by the admission of the fact of germinal variation!

Our reference to the question of the multiplication of the unfit brings us into touch with the efforts of eugenists. But however laudable the intentions of these good people, who are trying to improve the race by selective breeding, we cannot shut our eyes to the fact that they cannot reach the desired effect by the means they advocate. The means are not practicable, and do not cover the necessities, even if they were so. They postulate that permanent progress is a question of breeding, not of pedagogics or of training; that

no degenerate or feeble stock will ever be converted into sound and healthy stock by the accumulated effects of education, good laws and sanitary surroundings; that whatever environment may do for the individual, its effects are not embodied as part and parcel of the heritage of the progeny; that we cannot elevate the character of progeny by these influences upon parents; and they proposed to do so by selective breeding.

It is very evident that the conclusions we have already arrived at do not harmonise with the postulates of the eugenists thus laid down, which are undoubtedly based upon conclusions drawn from observations, statistics and experiments that did not touch the real nature of the influences at work which cause variation in progeny. Did these good people never know of a debased moral character in the progeny of moral parents? Are they of opinion that one of Shakespeare's immediate ancestors had equal poetic genius? Can they be aware that children from the same two parents widely differ? The good child in a family of degenerate children; the bad child in a family of good children, the genius or the idiot in a family of ordinary children, the dwarfs, giants and monstrosities the progeny of normal parents—did these arise from selective breeding?

225.—The "dregs" of society. How shall we define them?

There is one phase of eugenics which appeals at once to our sense of the fitness of things and about which there would seem to be no question regarding the advisability of bringing it into operation, no matter what views one may have upon the subject of heredity. It is that the dregs of society should be prevented from propagating their kind. The only trouble about this preventative method arises in the difficulty of defining the "dregs."

Professor Thomson, a eugenic authority, lays down the following eugenic rules:

"That the best general constitutions should be mated, is the first rule of good breeding.

That a markedly good constitution should not be paired with a markedly bad one, is a second rule, a disregard of which means wanton wastage.

A third rule is that a person exhibiting a bias towards a certain specific disease should not marry another with the same bias."

These rules are admirable enough as regards physical conditions, but how can they be made operative? It is impossible that laws could be enacted that would be practically operative in preventing such persons from marrying; and the sex impulse is so irresistible that constitutional character or tendencies will not, when outward form and mental character harmonise, prevent young persons from marrying. Such rules might influence exceptionally cold blooded, cautious and far-seeing young folks, but these exceptions would be rare. And even so, such pairing would not be desirable. We do not love such cold, calculating creatures. They do not tend to happiness, as do the warm-hearted.

Despite the undoubted harm which results from injudicious mating it appears that selective breeding offers a much narrower scope for improvement in the human race than is presented by making it physically impossible for the confirmed criminal and the morally unfit to propagate their kind, added to the good results that must follow a general knowledge of the possibilities of yet unknown extent that are available in pre-natal influences.

It must be noted that Professor Thomson's first rule of good breeding says not a word about moral and intellectual character; yet it is a very open question whether these qualities should not be regarded as more important than physical qualities.

226.—Professor Dubois; the morally insane; the Kaiser; Napoleon I.

As Professor Dubois so well puts it (*Influence of Mind upon the Body*):

" Much more often than we think, the most brilliant gifts of intelligence are united to a total absence of moral sense. The morally insane, or rather the morally deficient is a real type. He can dominate by the brightness of his cold intelligence, by his indomitable energy, by his imper-turbable sangfroid; but his intelligence is partial, frag-

mentary, it will not allow him to see the difference between good and evil. In spite of all education, these notions are strange to him. As there are persons entirely destitute of all musical feeling, for whom music is only a most disagreeable noise, there are also beings who have never felt the impulse of goodness, whose heart has never beaten with a noble idea."

It is just this type of man, whose moral deficiencies exhibit themselves as an intense selfishness, who mostly succeeds in that struggle to "get on" in the world, which marks industrial and professional competition. They care not a jot as to the means or the methods they use to rise; they do things which more conscientious men would not do; they have no scruple whatever about the misery they cause to others; they have the keen intelligence which keeps them within the letter of the law and outside the prison walls, whilst doing deeds causing more misery and suffering to others than is caused by thousands of others of less intelligence, who break the law and suffer ignominy in prison. Persons with such moral deficiencies may not show evidences of it in their features, or in social behaviour, and eugenists would select such men because of their physical vigour, as well suited for the propagation of their damnable species!

We had personal knowledge of one such notable character—that of a man who rose to be the highest legal authority in his country, yet who did things in his progress upwards that would be equal to anything done by a burglar or a garrotter.

A man of good physique—physically fit for "selection" for breeding purposes, who was prominent in the civic life of the colonies, was recently convicted of bribery and corruption. The president at the commission of inquiry into the case—Mr. Lamb, K.C.—in delivering judgment, said :

"The evidence discloses that Alderman Walker is a man with no regard for the sanctity of an oath, and is entirely without scruple in money matters."

Such men should not be allowed to propagate their kind after their character becomes known. Selection for that purpose by eugenists would have an opposite effect to that which is desired.

Take the case of the man who some years ago loomed more

largely in the world's eye than any other man—the late Kaiser of Germany. Would such a man—considering him to be physically sound—possessed as he was of such dominant selfishness, vanity and aggressiveness—would eugenists account him as being amongst the "dregs of society" and unfit to propagate his species? Would they place Napoleon the First amongst the "dregs," who, when his attention was called by Count Metternich to the waste of human life caused by his wars, exclaimed: "*Human life be damned, what's human life to me?*"

227.—*Metchnikoff; inadequacy of eugenics.*

Take another instance, more subtle, but reasonably debatable. Professor Metchnikoff, speaking "ex cathedra," as the world's greatest authority, from his position as director of the Pasteur Institute, states in his work on *Human Nature*, that in order to retain health we "should not eat any raw fruits or vegetables!" If we estimate a man's unfitness to propagate his kind by the amount of harm he does in the world, we may fairly question whether Metchnikoff should have been allowed to do so after publishing the above statement. For we cannot estimate the amount of disease and suffering that must have resulted, directly or indirectly, from that authoritative utterance, coming from the highest living authority (?) on bacteria.

On the other hand, there are many who have lived, and many now living, although physically unfit, from the eugenists' view-point, whose lives have been, and whose lives to-day are, a benefit to their kind. Should we not allow such to marry, and by means of pre-natal influences and physical therapy learn how to train their constitutional weakness into constitutional health?

The present aims of eugenists do not reach far enough in the form they have been presented to us; but we have reason to hope that their worthy efforts may be modified, so that good and definite results may follow them. It is very probable that moral and intellectual qualities may be found more important in heredity than physical qualities. It is certain that moral and intellectual strength will be more effective in the influence that conscious mind may exert

upon the operations of organic mind, with intent to cancel any physical weakness; and the practical results might very reasonably have greater value than could be achieved by the limited practicability of selective breeding.

228.—*Hereditary tendencies must be governed by natural law.*

Hereditary character is the average of the results of all influences that have impressed themselves upon ancestors; and as the *average* influences operating continue from generation to generation indefinitely, with but infinitely small difference in value, so generation after generation of individuals evolve that have no perceptible difference in average character. Human nature is the same to-day as it was thousands of years ago. Yet probably no individual comes into existence that has not some *tendency* to variation, due to immediate pre-natal influence. It requires something forcibly unusual, or less forcible, but prolonged effect upon immediate influence, before the deeply rooted hereditary tendencies impressed by many generations can be altered in a manner that is notable. But when some quite unusual influence does so operate—as often happens by accident or otherwise—we are told by authorities (?) that this distinctive departure from ordinary hereditary character is a *coincidence!* and not the result of the immediate pre-natal influence to which it may reasonably be referred. This conclusion is really absurd, when we consider the great number of cases where some unusual trait in a child can be traced to a known unusual cause that operated during gestation.

Every observant and experienced mother has knowledge, direct or indirect, of such cases; and to class them all as coincidences, because certain futile inquiries have been made, such as we have mentioned above (207), and erroneous conclusions drawn from them by persons evidently quite astray regarding the true nature of hereditary genesis, is decidedly moving in the wrong direction. For even if one case only out of a large number of departures from average ancestral influences that have occurred and are constantly occurring, can be determined to be due to immediate pre-natal in-

fluence, then such influence is a proven fact, no matter how many coincidences (?) occur.

We cannot do other than regard it as a fixed law in nature that all variations in hereditary character are impressed upon the influences of ancestral values by the immediate influences upon sperm and ovum from the moment the first two molecules in their structure come together; and upon embryo and foetus during every moment of their progress in evolution. Nothing can be more certain than that conditions in the parents influence the character of their progeny. As we have already pointed out, the varying character of children born of the same two parents is irrefutable evidence of the influence of pre-natal conditions upon hereditary character.

229.—Possible happier conditions for future generations.

The knowledge that organic mind is inviolably continuous with conscious mind, that no impression can be made upon any part of an individual without its having an influence upon both conscious and organic mind, that organic mind is the genetic factor in the evolution of all organised beings, and that parents can exercise an influence of inestimable value through the influence of conscious mind upon the organic mind of children yet unborn, clearly shows the way to the evolution of possibly happier conditions for future generations.

Instead of being pessimistic regarding the non-value in heredity of mere routine education, we have reason to be grandly optimistic regarding the value of the pre-natal influence of conscious mind. We must acquire a wider knowledge of the conditions that determine its influence upon organic mind, and make use of it with understanding.

CHAPTER XIV

MIND IN SPIRITUALISM

230.—*Individual "spirit" cannot exist after death of the individual.*

The belief that spirits of the dead exist and are somewhere moving about in space ; that they can communicate with, counsel and direct the living, and impart a knowledge of conditions of existence in another "sphere," is but a continuation into modern life of the beliefs or the superstitions of ancient and prehistoric man. And the very wide and popular continuance of such belief down to the present day arises from the fact that man has not advanced in "intellectual grip" in any perceptible degree beyond that enjoyed by the ancients of thousands of years ago. We give good reasons for this statement in the following chapter.

Average intelligence is to-day—as it always has been—of a much lower value than is commonly believed, and as one is led to imagine from the utterances of those anthropocentric writers and orators who are so popular with the multitude. Their estimates of man's intelligence are greedily absorbed—they are a subtle and satisfying form of flattery, a mutual self-admiration. The average man is thus easily led into the error of believing himself vastly superior in intelligence to the people of ancient times. He is also led astray by the mistake, so easily made, of confusing "*knowledge*" with "*intellectual grip*," which is "*inborn, and cannot be taught.*" The average man to-day, when confronted with phenomena he cannot comprehend, will as readily refer the cause to "*spirits*" as did his ancestors thousands of years ago. It is true that we do not now refer thunder and lightning to the activities of spirits or demons ; but that is because of slowly acquired extension of knowledge—not because of greater intellectual capacity ; the extreme

slowness of this acquisition of knowledge is well illustrated by the fact that it has taken man more than two thousand years to acquire the knowledge of facts he possesses to-day regarding the immediate nature of electricity.

We have seen that mind is continuous and conserved, just as matter and energy are ; that mind is coeval with and inseparable from matter and energy ; that mind cannot be created or destroyed in the same sense that energy cannot be created or destroyed ; that mind is a mode of energy, and is correlated with other modes of energy—convertible, as other energies are, into any form that energy is capable of assuming.

We have seen that mind in the individual being—mind, or spirit, or soul, call it what you will—is evolved from those immense co-operative communities of millions of millions of living units—cells—which we term man or animal ; and that it cannot possibly continue to exist when those communities are dispersed and cease to co-operate as a result of the conditions which follow those changes which we term death (70).

Death of the living being results in the dispersion of the molecular mind units whose co-operative activities conditioned the individual conscious and organic mind of that living being. The total of the mind units that existed in that being still exist in the scattered remnants of its structure ; but they have ceased those elaborate and complex co-operative functions which alone condition the existence of every living thing and every expression of mind in that living thing. Each remnant unit still retains the same mind powers undiminished that previously operated in the mind of the individual during its presence in the organism, and it is now available to join again into co-operative activity with other units in any other living thing that is being evolved.

231.—*Immortal mind in the atom.*

The only mind that has continued existence, and which survives the living organic being, is the mind of the smallest irreducible entity of substance that man has a sufficient knowledge of to warrant its use as a basis in organic evolu-

tion—the atom. The atom cannot be destroyed or changed in any manner whatever, by any force or means at the command of man ; therefore, whatever be the value of mind energy attached to the unit, it lives continuously through the ages, remaining the same through all possible changes in environment. We cannot differentiate between an atom—or molecule—of hydrogen taken from a living being, from that taken from a meteorite, or from the depths of a coal mine. The breaking down in radio-activity of the three heaviest known atoms : uranium, thorium and radium, neither of which enter into the necessary structure of living things, is evidently a faint survival of the general nature of activities in a long past order of nature, widely differing from the present ; and the ultimate cause of this constantly changing order of nature is involved in the unfathomable first cause.

But the *compound* mind of a compound body, as found in living things—man, animal or plant—is quite a different matter to a basic elemental unit of mind. It is quite evident that the flow of mind energy resulting from the co-operative activities of a highly complex organisation cannot continue to flow (70), and must cease to exist as a complex individual mind effect when the co-operative structures which condition it cease to act in co-operative association and are scattered abroad. And if it ceases to exist, it is evident that it cannot be even a spirit or a ghost.

If we scrap a battleship, take it all to pieces, and disperse it as so much steel plate, copper tubing, brass fittings, engines, boilers, and other things, we cannot, after the ship has been so reduced to its structural units, say that the ghost or spirit of the material battleship still exists ; we cannot say that those dispersed structural units still function as does a battleship. But they still function as units, exactly as they did before the battleship came into existence, and they are available to enter into the structure of another ship, or any other structure that is in course of being evolved.

And it is precisely the same with a complex living organism. Its individual mind functions are only made possible by its complex structure. When the organism dies and is

"scrapped" into its structural units, its complex individual mind has passed out of existence, although, as in the case of the "scrapped" battleship, the structural units that conditioned the organism still exist. We have no more reason to conclude that a dead person has a spirit than to conclude that a broken up battleship has a spirit.

The conditions which accompany the evolution and devolution of the individual, as outlined in our eighth chapter, exclude the possibility that there can be any "spirit" of an individual organism existing after that individual organism ceases to exist; and we may without further argument conclude that, whatever may happen under any circumstances at spiritualistic séances or anywhere else, nothing can be put down to the agency of spirits of the dead; and as there cannot be anything supernatural, it must therefore be possible to co-ordinate all authentic phenomena to the agency or influence of the living and to actual forces in nature.

232.—*Subjective evidence valueless.*

In entering upon a study of psychic phenomena—or so-called spiritualism—we must draw attention to the fact that the vast amount of matter published regarding subjective evidence obtained at séances and from other sources, and which is believed by so many to be proof of supernatural influence, is so closely related to phenomena that occur naturally, under conditions that cannot be differentiated from the normal, and to well-known phenomena that occur in certain pathological conditions, that such subjective evidence becomes valueless as a proof of actuality.

For even in the normal condition of sleep there are psychic phenomena as truly marvellous and incomprehensible as any subjective experiences of a medium during a séance. We are so habitually familiar with these phenomena, that the deep mystery in them has ceased to impress the mind. And, from the normal conditions during sleep to talking in one's sleep, which is slightly abnormal, to walking and doing things during sleep, somnambulism, which is to a greater degree abnormal, and so on to the hypnotic and the trance conditions, there is a perfect continuity in essential

nature. All such phenomena must be classed as manifestations of but differing phases of the same genetic factor, i.e. variation in mind function, organic and conscious.

It would consequently serve no purpose to enter into much detail regarding the mass of subjective evidences obtained at "séances" or "sittings." The conviction of so many, that such evidence indicates a supernatural power, or that the phenomena must be due to spirits, is mainly due to a lack of knowledge or of a true relative value regarding what is already known of the psychic possibilities in normal conditions and in abnormal pathologic conditions, where there is no question of interference by the supernatural.

And we need but briefly refer to some of the phenomena that occur naturally, under both normal and abnormal conditions, to convince anyone who approaches the subject with appropriate mental detachment, that the subjective evidences (?) of activities of the supernatural at séances are practically valueless as evidences of anything beyond natural phenomena.

233.—Dreams forgotten may appear as actual experiences.

Apparently normal persons are sometimes unable to distinguish a dream from an actual occurrence. Sleeping and dreaming are normal conditions; when we sleep, we always dream; but often we do not remember when we awake that we have dreamt (194). We may dream and not know it, yet afterwards believe that the incidents in the dream were actual events of our waking hours. We can vouch for the following two instances, and, as the matter is important, we give full details.

A person we are well acquainted with—sensible, practical, and a good business man—bought from the Forestry Department of New South Wales all the cedar standing and fallen upon a reserve of about six square miles in area. Timber had been fallen and drawn to saw mills for many years off this area; our friend and others knew its features well, and it was intersected in all directions with timber truck tracks. He walked through and about it for weeks, locating standing cedar trees and fallen cedar logs. One day (?) he came upon a splendid log about three feet in diameter, which had been

cut into four lengths of twelve feet each, ready to be drawn out by a bullock team. They lay on the level flat of a depression, which opened out from a well-worn track, near a spot well known to all timber getters. He told several persons about his find, and wondered greatly how it came about that it should have been left there in a place so easy to draw away from, as the value of the logs on the spot was about thirty pounds.

When his teams came on to the reserve to draw the timber away, he told one of the drivers to go to this spot and haul away the four logs. The man went, but returned saying no such logs were there—or ever had been—for there was no stump anywhere near from which such a tree could have been cut. Our friend thought the man must have gone to the wrong place, so he simply said : "Come along, I'll show you where they are." But when he got to the place where he believed he had seen the logs, no logs were there, and it was very evident no such logs had ever been there.

Our friend frankly confessed to us afterwards that he must have dreamt he had seen them—that was the only way he could explain the matter. He had remembered as an actual waking experience that which had occurred in a dream that was forgotten.

When speaking of it afterwards, he said he would have taken an oath upon the Bible that he really had seen those logs, and that the logs were there. And it is quite evident that if in that dream he had seen a person who had been dead for years—which is very usual in dreams—he would have been equally convinced he had seen a spirit, and nothing could have altered that belief—*because it could not possibly have been proved that he had not seen a spirit.* In this case the delusion was easily and most certainly proven ; but there must be many such cases where the character of the dreams afford no means of determining that they are not realities.

The above incident was much discussed locally, and in the course of conversation led to a confession from a well-to-do farmer, who owns about twelve hundred acres, that he had seen (?) a cow of his stuck fast in a boggy place and sent a hired man to help it out, but the man came back and said he

had seen the cow grazing as usual and quite clean about the legs ; that it had never been in the bog, for there were no marks or tracks showing that any of the cattle had been stuck. The farmer could not understand how this could be, so he went and examined the place where he had seen the cow bogged, and went also to where the cow was grazing, and examined it. And he was forced to conclude that he must have only dreamt he saw the cow bogged.

It is but rarely that such forgotten dreams as are afterwards thought to be actual waking experiences can be *proven* to have been but dreams. In every case where a forgotten dream of a dead person is afterwards remembered as though it was an actual waking experience, there is no possibility of proving it was not actual. And it is very probable that such illusions occur much more frequently than we are aware. There is in common use the scornful and derisive expression : " You must have dreamt it," which deters one from making such experiences known. And we have no doubt that there are persons so constituted that they frequently consider as an actual event in their waking hours that which they have dreamt in sleep, or in some degree of hypnosis ; and thus innocently acquire a notorious character for untruthfulness, or, as is more probable, fame as a medium.

Within our own experience we can call to mind two young girls who became notorious amongst their acquaintances because of their frequent untruthful statements regarding persons and incidents. One of these girls was a full cousin to the writer ; the other in no manner related. There was usually no apparent reason for these statements, no evident intention or purpose to be served ; and, considering these two cases after the lapse of many years and under the light of our wider knowledge of psychic conditions, we now feel convinced that both these girls were abnormal in mind activities, and not infrequently were unable to distinguish a dream from a waking experience—a condition indicated by Irish people by the term " Aisling "—waking vision.

234.—Infinitely varying conditions between sleeping and waking.

Another point we must consider is, that between sleeping and waking there are an infinite number of degrees of consciousness, so that persons may be actually dreaming, when to an observer they are apparently awake. Even in sleep there is always a modicum of consciousness ; and in mere drowsiness there is a modicum of sleep and dreaminess.

The conditions of normal sleepers when dreaming, of somnambulists and of mediums in hypnotic or in trance conditions, are all of the same essential nature, i.e. variations in the relative degrees of conscious mind and organic mind affecting differing centres of activity. The reader here must not forget that organic mind has a consciousness of its own, of which we remain unconscious (94). In any mental centre where consciousness is below normal, organic mind is dominant and abnormal ; where conscious mind is full, organic mind ceases to be dominant.

The average medium may be regarded as one who is dreaming. Such persons have a sufficient consciousness for the character of their performances, and their dreams are influenced in character by mind radiations from persons present (83). If it were possible to speak of volume in regard to mind, we should say that the organic mind in the organism has greater volume than conscious mind. Since every particle of living tissue has appropriate organic mind, whether it be of man, animal or plant, it is quite evident that an elephant, for instance, has a much larger volume of organic mind than a man ; and as its brain is smaller than that of a man, it has a less volume or range of conscious mind. Einstein has demonstrated mathematically that the mass—or weight—of a body is the measure of its energy content. And as we have many reasons for believing that it is organic mind which influences the conscious mind in obscure and startling psychic phenomena, we have thus a means of explaining why animals sometimes figure as being cognisant of supernatural (?) phenomena, and referred to as proof of its occurrence.

The organic mind, radiated by the circle of sitters at a séance, influences the organic mind of the medium ; and

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since conscious mind is evolved from the activities of organic mind, thoughts and conceptions arise in the mind of the medium that really originate in some person or persons about her.

As there must be a complexity of radiating influences from a number of sitters, the utterances of the medium are often broken and disjointed, so that it is impossible to make any sense of them. But when one person present happens to be sufficiently dominant in influence above the others, we get clear and coherent results, and it becomes possible for mediums, at times, to make a clear statement of facts or incidents they know nothing whatever about in their normal state, and of which the dominant person is truly sure that no one in the world but himself had any knowledge. Spirits of the dead are then called upon to explain these perfectly natural but abnormal and mysterious happenings.

235.—*Dual personality.*

A medium should be regarded as a person who, under given conditions, can pass into a state which is practically one of a dual personality. In pathologic cases abnormal conditions may endure in time to the extent of presenting well-defined dual personalities. Dual personalities are facts, not theories. Many authentic instances are on record, and other cases continue appearing, of persons who, in some mysterious manner, completely lose their personality and become a stranger to their real selves. They wander aimlessly about, not knowing their own names, or where they lived, and sometimes the whole of their previous existence, prior to the change that came upon them, is blotted out from their consciousness.

A case of multiple personality is recorded in the *Proceedings of the Society for Psychical Research*, Vol. xviii, 1903-4, by Dr. Albert Wilson.

The subject in this case was a girl of twelve and a half years, and her unique abnormal conditions commenced as a sequel to an attack of influenza. During the nine years following she exhibited not less than ten distinct personalities, the first of which was mania, accompanied by convulsive seizures and catalepsy. For three years after the child first

became abnormal the ten different characters frequently changed from one to another. Then followed six years of more stable conditions, usually in the personality that occurred sixth in the series, and in which she had to be re-taught how to read, write and spell. This sixth character ultimately became apparently the permanent character. During all these years a most extraordinary series occurred of changing psychic and changing pathological conditions. The case is probably the most remarkable of its kind on record. Dr. Wilson refers all these psychic and pathological changes to variations in local arterial circulation, due to pathologic conditions—there is no question whatever of anything supernatural.

We have temporary dual personality even in trivial departures from the normal. A person may talk in his sleep at times and intelligently answer a question put to him ; yet, on waking, he will say he did not dream, and does not remember that he talked and answered a question. The fact that he *did* answer proves that he had at least a degree of consciousness sufficient to answer just as a normal waking individual. Yet when he fully awakes he has no knowledge of what his other self had done when he himself seemed asleep.

The somnambulist may rise from his bed and do things intelligently—even to solving problems that have eluded him when awake ; yet, when he wakes up he has no knowledge of what his other self had done while his ordinary self had been asleep ! Further, he can see quite well, although he cannot possibly use his eyes for the purpose ! This is an evidence of the mysterious powers of organic mind, which we should always remember when considering any of the wonders of this mysterious and conscious intelligence which is beyond the range of perception by the conscious mind of man.

All these dual or multiple personalities, equally with the mysterious personalities of mediums at séances, have the same essential or ultimate physical basis ; they all arise from differences between the range and modes of activity and intelligence of the conscious and organic mind of the subject ; and these are conditioned by variations in the

mutual actions of the elements in metabolism in the structures of the nervous system.

This rationale coincides with Dr. Wilson's conclusions given above, if we introduce one word, " changing," to make it more exact. Thus : "*Dr Wilson refers all these psychic and pathological changes to variations in local arterial circulation due to ' changing ' pathologic conditions.*"

Changing pathologic conditions are impossible without changing metabolic conditions, and changing metabolic conditions are simply changes in the mutual actions between the elements within the physiological units—the cells.

236.—When conscious mind rests, organic mind has fuller play.

When conscious mind is at rest, organic mind has fuller play ; our dreams are evidence of this. When consciousness is concentrated upon any problem or subject which deeply interests us, immediate mind (85) is largely drawn upon for its evolution ; less is available for direct organic activities. A condition approaching sleep may affect one or more of the sensory organs, and we gradually become less and less conscious of our environment. The clock may strike the hour, but we do not hear it ; we become oblivious to all ordinary sounds about us. Under such conditions of intense mental activity we are drawing so largely by conscious mind upon the immediate mind available, that there is not sufficient left for normal expenditure by the purely organic functions of organic life ; and if the mental strain is of some duration, we become momentarily "run down." Thus there is no possibility under such conditions for organic mind to express itself in any dominant or unusual manner, either in a "medium" or in auto-suggestion. To do this the expenditure of immediate mind by conscious mind must be less than normal, so that organic mind may have a full and free supply.

The semi-conscious condition is the one that practitioners in auto-suggestion choose as the most effective for the purpose of influencing organic mind activities ; mediums usually pass into a condition of unconsciousness, more or less complete. And as the total of immediate mind energy is at every

moment a fixed quantity, if we shut off a portion of the expenditure by consciousness, the more there remains for organic mind activities.

There is practically no limit to the number of mysterious and differing psychic conditions that are possible—from mere dreaming to the most extraordinary in pathologic and hypnotic conditions—and they are as continuous with each other in basic nature as degrees of heat or variations in velocity of a moving body.

237.—The question of immortality; Mæterlinck and his lamp.

The question of spirits of the dead, of course, involves the question of immortality, and it is really astonishing what an amount of valueless matter has been written on the subject. Mæterlinck in his essay on "Immortality" in the volume *Life and Flowers* says, in discussing this problem :

"Here stands my lamp on my table. It contains no mystery ; it is the oldest, the best known and familiar object in the house. I see in it oil, a wick, a glass chimney, and all of this forms light. The riddle begins only when I ask myself what this light is, whence it comes when I call it ; where it goes when I extinguish it."

Here we have a mass of wrong and confused ideas, due to a lack of differentiation between immediate nature and ultimate nature. He says there is "no mystery" in his lamp. But the mere existence of that lamp is an unfathomable mystery. There is no mystery about the immediate nature of the light. The mystery appears when we try to comprehend how the elements hydrogen and carbon in the oil, when in mutual action with the oxygen in the air, can evolve light in the evolution of carbon dioxide. This is the ultimate nature of the mystery—exactly as the mutual actions of elements with other elements within living things cover the mystery of the ultimate nature of the mind they evolve. Every particle of substance in the lamp, the oil, wick and glass, is a profound ultimate mystery. But neither the glass nor the wick are essential in the production of light ; only the hydrogen and carbon of the oil and oxygen in the air are needed, acting mutually upon each other. The

light does not come when he calls it ; it only comes when the oil in the moistened wick is heated to flame temperature by another light. It does not go anywhere when he extinguishes it ; it only goes when it exists—when it is alight, it goes radiating away into space, and is transformed into other modes of energy. When the light is extinguished, or the oil supply is exhausted, it ceases to exist, it ceases going anywhere. Exactly as individual mind energy radiates from the individual living thing in mental and physical movements, so long as that individual is burning up the "fuel" supplied as food, and ceases radiating when "fuel" ceases to be available ; so with the oil lamp, the radiations do not go anywhere when the individual "goes out"—they simply cease to exist, and for exactly the same reason. There is neither ghost nor spirit left to either the extinguished light or the extinguished individual.

238.—*Memories of the different senses. Inandi; Martin Luther.*

Besides the delusive nature of dreams, which sometimes makes it impossible to distinguish between what is real and what is imaginary, we have the cases of hallucination, where spectral figures in human shape, not existing to normal sense, are presented to the mind with a vividness sufficient to create a belief in their reality. That such apparitions are but freaks of memory there can be no doubt, however difficult it may be to co-ordinate psychic and physical facts in such a manner as to prove the truth of our statement.

In dreams we have visual memories presented by organic mind—usually in a jumble of presentations, because there is not conscious mind sufficient to control them. Some persons have an astounding memory for certain things only ; there is a distinct memory faculty for every phase of perceptive sense. There is memory for faces, for dates and names, for character of sound, for anything that is read, for anything that is seen, for any words that are heard, for anything felt or tasted, and a good memory for some things may be associated with a bad memory for other things.

Inandi, the latest arithmetical prodigy, has an abnormal aural memory for figures. Blind Tom, the musical genius,

had an abnormal memory for sounds. The Admirable Crichton must have had an astounding memory for what he read. Those leaders of men who never forgot a face must, of course, have had wonderful memories for faces. In fact, any kind of human genius must be gifted with an unusual memory for the essential facts that condition the genius.

Now, when visual memory under any kind of abnormal conditions reaches a certain degree of intensity, images may be presented so vividly that they appear to be real. And sometimes this abnormal visual memory is associated with an abnormal aural memory.

It is well known that Martin Luther believed that he many times talked with the devil! In this case the origin of the hallucination no doubt originated in dreams, not remembered, that afterwards merged into consciousness as memories of actual experiences. The plainest of common sense decides that Luther never did talk with the devil; yet if his hallucination had taken the form of the spectre of some dead person it would have been held unquestionably by spiritualists that Luther had had communion with a spirit.

239.—*Apparitions; Nicolai, the Berlin bookseller; Sir David Brewster.*

We have also the classic case of Nicolai, the Berlin bookseller, which was investigated by the Academy of Berlin. His apparitions were many, and took the form of his friends and acquaintances still living! His case is a singular one in this respect—he knew that the apparitions were only illusions, and they irritated him by their frequent appearance. He saw his friends and acquaintances in their usual habits of dress so vividly as to create illusions of reality—recurrences of visual experiences by an abnormal visual memory.

Sir David Brewster, after a practical examination of visual impressions, said :

“ When the eye is not exposed to the impressions of external objects, or when it is insensible to these objects in consequence of being engrossed with its own operations, any object of mental contemplation, which has either been called up by the memory, or created by the imagination,

will be seen as distinctly as if it had been formed from the vision of a real object."

We need not continue with further instances of hallucination; the matter is not controverted even by spiritualists. But consideration must be given to the phenomena, because they add weight to the cumulative mass of evidence we adduce against the existence of spirits.

Another fact that we oppose to the existence of spirits is that some cases supposed to be absolutely conclusive evidences of their existence are not at all conclusive. We here allude to those cases where a supposed spirit has appeared to some person when another person has been dying some long distance away. Some such cases are so well authenticated that we must assume that some at least must be true; and it must be possible to construct a coherent rationale for their appearance.

First of all we must note that such apparitions occur very rarely. In not one case in a million of people that die does any person, at any distance away, perceive any apparition of the dying person. If every person that died had a "spirit" that could travel in any direction it chose and communicate with whom it chose, it is not in the least probable that not one in a million of spirits should take advantage of that possibility.

This fact alone is sufficient to determine that "spirits" do not exist, and that such "visions" of dying persons, although purely subjective, must be due to radiations of mind energy under very exceptional conditions from the *yet living*. The present writer has lived for seventy-five years, and quite a host of his friends and acquaintances have died, but never a one has "reported" to him in spirit form the moment or the manner of death. Hundreds of millions of adult persons now living can vouch for a similar lack of any such experience.

But we have such an amount of reliable evidence from many persons and from all directions that mind energy vibrations may be transferred from one person to another, and reproduce the same mental concept that originated them, that we may fairly assume the phenomena to be a fact. The origin of the concept so transferred is unknown to the

recipient ; it enters into his consciousness in the manner of memory concepts—we do not know how, by means of organic mind movements—just as in the reverse movements by auto-suggestion in pathology, where our own conscious movements enter into and influence the organic mind—we do not know how.

240.—Communication with persons in extremity thousands of miles away.

In those rare and strange cases where, when persons are dying—which is of course prior to the coming into existence of an imaginary “spirit”—a conscious perception of something affecting the dying one is perceived by another person any distance away ; we have room for dealing with the case, as being a matter not concerned with spirits, but with a still living person. Yet it must of necessity be a combination of conditions extremely rare that render such a phenomenon possible. And as any rationale of the immediate cause must be a physical one, we shall first point out the facts that make such an explanation possible.

1. In all cases considered authentic the subjective experience extends to one person only.
2. Mind is a mode of energy conditioned by changes in movement, and is as physical in its nature as any other mode of energy (73-4).
3. All modes of energy are transformable into other modes of energy.
4. Mind energy is so nearly akin to electric energy, that the latter may replace the former in physiological research and in pathological diagnosis (78).
5. Radiations of light are movements which traverse space with a speed of 186,000 miles per second ; in any ponderable matter which stops them they are transformed into heat energy.
6. When heat energy radiates away, it is re-transformed into light energy—electro-magnetic movements.
7. In the scale of energy vibrations there are large gaps of unknown vibrations, one of which may be occupied by mind energy vibrations.

In some cases of persons dying under unusual conditions,

there must be intense mental activity, abnormal temperature, and consequent abnormal energy radiation. This radiation, as it cannot be less subtle than heat—for we cannot differentiate between them—must traverse space with a velocity equal to light. And being perceived by the organic mind of a person in "tune" with its wave length, who is at any distance on the earth away, it is, at practically the same instant in time, retransformed back again by the conscious mind of the recipient into the movements that conditioned the conscious thoughts of the dying person—just as light vibrations, when stopped, are re-transformed into the heat energy which originated them—and he receives a "message" from, or a "vision" of, the one in extremity.

One person can now actually speak to another person thousands of miles away by "wireless" by just such transformations of energy movements; in both cases there are absolutely continuous movements between sender and recipient; we can do intentionally, by artificial means, what nature sometimes does spontaneously. And it would be absurd, knowing so little as we do of the mysterious powers of organic mind, to contend that man can do artificially that which nature cannot do, when conditions offer her favourable opportunity. Wireless communication, in the light of our knowledge regarding the correlations between mind, energy and matter, actually demonstrates that it is possible, by movements that are continuous, for the mind of one person to influence the mind of another at the greatest possible distance away on earth within an interval of less than a second in time. But it is not a "spirit" of a dead person that does this; it is the mind of one in extremity, who may be dead a few minutes or hours afterwards.

In attempting tentatively to co-ordinate the psychic activities of persons dying with the psychic presentations affecting another person thousands of miles away, we have to deal almost exclusively with those electro-magnetic vibrations which not only condition light, heat, magnetic and electric phenomena, but which also condition mind movements (29). All etheric vibrations are movements of energy. A gap exists between electric and light waves; and a gap between light rays and X-rays. Nothing is known of

any vibrations beyond X-rays. It is very suggestive that the gap near the centre of the known scale of energy vibrations should be between electric and heat vibrations. For mind energy comes closer in nature and in association with these modes of energy than to any other. And as mind energy cannot be less subtle than any other mode of energy, we are entitled to conclude that mind energy vibrations have at least equal velocity with those of heat, light or electricity ; and thus must travel in space with such speed that any mind radiations occurring under exceptional conditions in a person that is dying may produce conscious effects upon another person at the farthest distance apart that is possible on the earth's surface in the same second of time in which they leave the source of origin. Etheric vibrations *per se* are imperceptible by man. He can only feel or see the effects of them. If one directs the eyes to an object, he sees that object by means of the vibrations of light that are reflected from it. But he is quite unconscious of the existence of the vibrations which make his knowledge of the existence of the object possible. And when one sees a "vision" of something a great distance away he is quite unconscious of the actual physical means which make the vision possible.

We can to-day communicate with persons thousands of miles away "without contact," in the sense in which those words were used some years ago, in objection to the possibility of certain stated phenomena. The only "contact" between two operators using "wireless" is the ether of space, which conveys vibrations at the velocity of 186,000 miles per second, and by means of which they can speak to each other. And if we go deeply enough into this matter, we find there is a perfect continuity of movement from psychic to physical, and back from physical to psychic, between the minds of two persons speaking by wireless telephone ; and the actual effect is essentially the same as if the two were sitting in the same room talking to each other. And in wireless, as in "vision," the recipient is perfectly unconscious of the vibrations *per se* which make communication possible, although he may be fully informed as to the theory of the matter.

Every mental concept, every thought or emotion, is

motor in its origin and motor in its consequences. Say the concept "*danger*" arises in the mind of the sender of a wireless message; the vibrations in the neurones of the cortex which conditions the concept are conveyed to and transformed by his hand into the symbols whose vibrations represent the wireless for "danger." These symbols are transformed by electric energy into equally definite representative etheric vibrations; and in the same second the same process is reversed thousands of miles away, and in the brain neurones of the recipient arises the concept "danger."

It would be unreasonable, *a priori*, to say definitely that mind energy could not, under some rare abnormal conditions, do the same thing without the artificial aid of electric energy. Man's conscious intelligence cannot transform mind energy into electric energy, but organic mind is constantly doing so. At every beat of the heart there is a change in electric potential.

Still further evidence of the possibility of the transmission of mind radiations—particularly from those dying under unusual conditions—is afforded by the fact that mind energy functions are conditioned, just as are all other modes of energy, by *changing movement* (18).

Between persons closely related structurally, either by birth or coincidence, there must exist a more than usual effect of radiant mind energy, by which one influences the other; but there is no *conscious* evidence of its existence—just as we cannot determine whether our own conscious thoughts arise from our own organic mind or to what extent we derive them from organic mind radiations from others.

If we connect ourselves within an electric circuit of a few milliamperes, we feel a distinct impression or shock at the moment of contact; then we feel nothing, or at the most a slight sensation of warmth. If the current is shut off, we again feel a shock, and we feel these shocks every time contact is made or broken. Electric energy is closely allied to mind energy (78); it can produce effects upon consciousness at distances as far apart as the earth will permit. And we may reasonably assume that an *unconscious* connection by radiations between two minds, no matter what distance

apart, may be "shocked" into consciousness by that sudden change in the character of vibrations which must follow the very unusual conditions that precede death of a violent or unusual nature. And this consciousness may resolve itself into a vision of the exact conditions preceding death. Just as the "shock" of a "wireless" vibration reproduces the *exact conditions which caused it*.

Now, in the best authenticated cases of dying persons producing impressions upon the consciousness of others a long distance away there is an unusual or violent manner of death; and there must also be unprecedented and rapid *changing movements* within, and radiations from, the physiological units of the nervous system. We may assume that these unusual changes of movement are sufficient to produce a conscious "shock" in some particular person at any distance away whom the dying person was thinking of. Just as changing movements universally give rise to impressions that are proportionate in intensity to the differences in the changes.

If one kind of vibrations can traverse some 186,000 miles per second, and progress in space year after year for hundreds of years, as do vibrations of light, and still produce a conscious effect upon living things countless millions of miles away; and if by wireless, one person can speak to another thousands of miles away by means of vibrations, we have not a shadow of *a priori* reason for denying that it is possible for mind energy vibrations—the most subtle known to man—to influence, under rare conditions, a conscious mind thousands of miles away.

241. *Clairvoyance ; radiations ; prophecy.*

The same agency gives also a rationale for the phenomena of clairvoyance. And, as in the case of all effects from radiations, it is by means of organic mind, of which we are unconscious, that these radiations are received. All our senses of perception, upon which our intelligence wholly depends, are functions of organic mind, and do not become conscious perceptions till their movements have reached the cortex of the brain by means of the nerves connecting it with the physical mechanism of our sensory organs (103).

Thus the radiations in clairvoyance *enter unperceived* into the mind of the subject and become consciousness in such a manner that he has not the slightest idea as to *how* he saw the things that appeared or the incidents that were taking place at the same moment far beyond the powers of normal vision.

All such visions have a sound basis of possibility in the known facts in physics, physiology and pathology ; and there is no need to call in the agency of " spirits," as did many of our ignorant ancestors, to account for all phenomena which they could not understand.

Man has but recently discovered that matter evolves an energy that radiates through space, and can even pass in a direct line through cast iron. It has taken him all the thousands of years he has existed to do this. And if sub-animate or "dead" matter can do this, surely it is unreasonable even to think that animate matter cannot radiate energy. The fact recently made public by Professor A. V. Hill, that effects upon the emotions in a person included within an electric circuit can be registered by an instrument that measures electric resistance, and other instances in pathology and in physiological investigations, where electric movements are influenced by living energies and living energies are influenced by electric movements, all point to the hypothesis that living organisms radiate an unknown mode of energy, although we have not yet been able to differentiate this radiation from that of electricity or of heat, with both of which it is so intimately correlated.

" Spirits," as the agents in clairvoyance, unfortunately lead to the belief in the foretelling of future events, a serious departure in the wrong direction. For it is impossible, in the very nature of things, that any one ever did or ever will truly foretell future events. By which we mean the predicting of an event which has no rational connection with present conditions. One may *think* it will be wet to-morrow, and *say* that it will be wet. If it happens to be wet, it is not the fulfilment of a prophecy ; it is the confirmation of a judgment founded upon appearances. Or one may scan the political horizon ; and *think* from what he sees that war will break out within a year. And he may have the courage to

back up his thoughts by *saying* so. And if war does happen to break out within a year, it is not fulfilment of a prophecy ; it is a confirmation of his judgment. Any statement, to be prophetic, must go beyond a mere opinion founded upon the probable trend of events ; and it is belief in just such impossible statements that a belief in the agency of spirits fosters and lessens our respect for human intelligence.

242.—*Authorities (?) ; A. J. Davis ; Sir Oliver Lodge ; "Thy Son Liveth."*

Of the mass of literature upon the subject of Spiritualism very little indeed is worthy of serious attention. Through all there runs an abundant stream of internal evidence of its utter unreliability. We shall refer to only two writers—Andrew Jackson Davis, who turned out about thirty volumes of astonishing nonsense, yet was accounted in his time as the most gifted seer, and whose influence amongst spiritualists was probably greater than any other writer—and the anonymous writer of an up-to-date work entitled *Thy Son Liveth*. We shall quote but briefly—a very little is sufficient for our purpose.

Davis in his work, *The Great Harmonia*, gives an account of the death by hanging and the resurrection of a murderer, Dr. Webster, in which the following statements appear :

" It took him seven and a half hours to be born into the other sphere. This was done without his consciousness of having any existence. The soul centre of the head—which became as a star—ascended about four miles above the streets ; at an angle of about thirty degrees. . . His consciousness was somewhat between sensation and thought ; that is, he had neither thought nor sensation ; his state was just between joy and sorrow, heat and cold, harmony and discord. . . . There were five spirit persons attending him. By their kindly offices, he was carried to the Spirit Home. . . . He was eight days and a half in that semi-conscious condition. Every day, at eleven o'clock, I walked to the retirement of Mount Auburn, in order to witness that beautiful spectacle beyond the Milky Way. . . . As he roused and opened his new organs, I saw upon him certain expressions of agita-

tion, alarm, wonder, somewhat of gratification. He made an effort at memory—What! is this Boston? Is this a dream? Have I been asleep? I was hung. No! this is not Boston! Thus he was awakened by music to a knowledge of his future work."

In his volume, *The Temple*, Davis gives quite a different account of the spirit leaving the body of a dying person, and uses such terms as:

"'A golden magnetic halo' 'a throbbing almost selfconscious atmosphere' 'the psychic emanation contains some proportion of every principle composing the soul-motion, life, sensation, ethers, essences, vital magnetism, vital electricity, instincts' 'the brain cells, the corpus callosum, the medulla, and the spinal cord and ganglia are ablaze with contractive and expansive energies, which gently pulsate, and seem to direct and govern themselves by a kind of automatic self-consciousness.' 'A thought laden love thread tranquilly draws the new born higher up' 'Rapidly the celestial gravitation attracts the new body obliquely through the higher atmosphere. Arrived at its own place in Summerland, the sleeping one is surrounded by an assemblage of beautiful welcoming citizens of that locality.'"

It is a depressing thought that millions of persons, supposed to be capable of reasoning, actually believe such rubbish to be reliable evidence.

Another volume of this man Davis, called *A Stellar Key to the Summerland*, is a sort of guidebook to travellers in heaven! He gives the names of many islands and springs, tells about "teacher physicians," "spirit physicians," "an island where resided spirits from the planets Mercury and Venus, and another island inhabited by young persons from earth who died as orphans!" The influence of this man Davis operates to-day. "Summerland" has become quite a fashionable resort since he invented the place. Sir Oliver Lodge, in *Raymond*, tells us that his son—through the medium Mrs. Leonard and her "controls"—states that he was "living in the third sphere, and that it is called 'Summerland.'"

We selected the above particular incidents from Davis'

works, not because he speaks more unreasonably than usual, but because he deals with the death and resurrection of a man who died a violent death ; and he purposely, in a hypnotic condition witnessed (?) them, in order to obtain a knowledge of how long it took after the man died before he appeared again in the next sphere. It took Webster seven and a half hours to be born again ; and eight and a half days to become conscious !

But "Bob," in *Thy Son Liveth*, also died a violent death, and he did not know he had been killed ; he did not even lose consciousness ! He was instantly alive in the next sphere, and did not know that anything had happened to him ! He tells us that after they went out to charge the enemy :

"I was one minute in the thick of things, with my company, and the next minute Lieutenant Wells touched me on the arm and said, 'Our command has crossed. Let's go.' I thought he meant the river, and I followed him under the cross fire barrage the Tommies made, up to a hillside I had not noticed before—a clear spot, not blackened by guns. Lots of fellows I knew were there, and strange troops. I glanced down at myself. I was olive drab alright. But my uniform was not khaki. It seemed to be a fabric of some tenuous kind. I had no gun. I overtook Wells. What the deuce is the matter with me—with us all ? He said, 'Bob, we're dead.' I didn't believe it at first. I felt alright, etc., etc."

"Bob" did not know he was dead. After he was killed he followed Wells under the cross fire barrage the Tommies made. But he does not explain how it was that Wells knew he was dead. Dr. Webster, according to Davis, was eight and a half hours unconscious after he was dead. Then he was awakened by music, and remembered, "I was hung." He was kindly attended to by five spirit persons ; and it seems, according to Davis, that murderers by poison are more considerately treated than they have a right to expect in the "other sphere."

Further on the dead "Bob" tells his mother that he is "using an abandoned apparatus in the trench to-day,

we are assigned to duty here for the present. . . . Just now we are engaged in relief work. . . . I have just come in from duty, and Jack Wells is with us in immediate command of our company. Also there are a number of dogs with us. I am plugging away at wireless. Love and marriage are certainly in bud and flower here. I can see this fact with my own eyes."

So it seems that "Bob" is as lively, as substantial, and durable and in as good fighting trim as when he was alive! And there are dogs in heaven!! Who are the brutish unbelievers who say that dogs have no soul, and that in heaven there is neither marriage nor giving in marriage?

"Bob" must be reliable, for he tells these things direct to his mother. He does not believe in go-betweens; he cautions his mother not to go to mediums! Sir Oliver Lodge acquired his information regarding Raymond most suspiciously indirectly. A supposed coloured "guide" tells a supposed "Feda"; the supposed "Feda" tells Mrs. Leonard; Mrs. Leonard tells Sir Oliver! Yet the only real authority (?) we have are the subjective phantasms of a neurotic woman in an unreliable mental condition!

So it is with the medium "Peters." Raymond tells "Moonstone"; Moonstone tells Peters; and Peters tells Sir Oliver!

The earlier "seers" had no "controls." But they created such an interest and following that "business" in Spiritualism developed and created further opportunity for the exploitation of weakly reasoning and superstitious persons by the introduction of "guides" and "controls" to complicate matters and deepen the mystery. These "guides" and "controls" offer easy means of escape from the results of misstatements by mediums—"blaming the other fellow." Quite a good business move; American inventions of course.

The statement of Sir Arthur Conan Doyle that "Spiritualism unites real science and real religion, each supporting the other," is a most mischievous and misleading statement. It strongly tends to keep down the low average value of human intelligence.

And according to the great American authority upon matters spiritual—Professor Hyslop—a man is "*either*

ignorant or a moral coward," if he does not "accept the existence of discarnate spirit and the proofs (?) of it!"

The whole of the matter in spiritualistic literature is full of such gross internal evidences of unreliability, and any person who cannot appreciate the negative value of the little we have quoted must be like unto those who believe the world is flat—no evidence will convince them of their error. And we may here be allowed incidentally to draw attention to the fact that keen observers of the results of Spiritualism warn those who may possibly inherit a tendency to nervous disorders to have nothing to do with practical inquiries; for these sometimes lead to insanity in the predisposed. Among others, this is the opinion of Dr. G. M. Robertson, Superintendent of the Royal Asylum of Morningside, Edinburgh.

243.—*Moving of objects; ectoplasm; materialization; Sir William Crookes.*

Regarding the moving of material objects, the reality of ectoplasm, and of materializations, it is impossible to say how much may be true or only imaginary in the great mass of literature available. But we can say with confidence that no objective phenomena can occur at any séance whose immediate nature cannot be accounted for by physical natural causes. We believe that the conclusion arrived at by the first committee officially appointed by the first Psychological Society in Great Britain to inquire into the truths of the reported happenings at Spiritualistic séances and of which Mr. William, afterwards Sir William, Crookes, was a member, put the matter in a true light when they reported :

"that they had witnessed the manifestations of a force with which mankind was not yet acquainted, but that 'spirits' had nothing to do with them."

It is interesting here to note that Mr. Crookes, in trying to track down this unknown force, came upon his discovery of that wonderful little mechanism—the radiometer—which constantly revolves under the influence of daylight or the electric light; also that he was the first man who acquired a knowledge of "radiant matter"—a fourth state of matter.

He demonstrated its existence in a series of brilliant experiments before the British Association in 1878. And it is mainly by the demonstrable existence of "radiant matter," which of necessity involves radiant energy, that any authentic happenings at séances can be explained, as to their immediate cause, in terms physical.

Crookes' discovery of radiant matter and its associated fluorescent phenomena ultimately led to the discovery of X-rays, and on to the investigation of fluorescent minerals, which resulted in the discovery of radio-activity by Becquerel, in 1896, and later to the discovery of radium by M. and Mme. Curie.

Thus, the recognition by Mr. Crookes of the existence of an unknown mode of energy through knowledge obtained of the activities of this energy at so-called Spiritualistic séances,—a mode of energy now aptly termed "psychic"—led to the discovery of the radiometer, and had its influence in leading up to the discovery of radio-activity and to the now general belief that not only all forms of energy, but also all forms of matter, radiate.

The reason man remains so ignorant about the immediate nature of psychic energy is that he has never yet been able to measure its intensity in the exact manner that is possible with other modes of energy. It may have been determined in some exceptional cases what amount of physical energy could be recorded upon a spring balance by psychic energy; but any such cases are open to objection so long as it remains impossible for any scientist to measure it under ordinary conditions, as he would measure degrees of heat. The world is waiting for a means to do this. When mind energy becomes generally known as a physical fact we may hope for greater knowledge of its immediate nature.

We are as well acquainted with the fact that when energy is not supplied to the brain the evolution of conscious mind energy ceases as we are with the fact that when energy ceases to be supplied to the revolving dynamo the evolution of electric energy ceases. The immediate nature of both electric energy and mind energy are to this extent the same—both are evolved from other forms of energy, and both are transformable back again into other modes of

energy. And as we are now fully aware that matter may be resolved into energy, and energy into matter, we cannot *a priori* determine that, under the abnormal conditions usually present at séances, it is not possible for visible presentations to be evolved from the energy radiated from the persons present—a radiant energy more subtle than any yet known to science.

244.—Abnormal condition of mediums ; mechanical equivalent of heat.

Mediums usually fall into an abnormal condition ; their extremities become cold, and a clinical thermometer will show a reduction in temperature ; and by the sitters present it is often observed that a coldness is felt which chills the hands. This is a very definite sensation ; Sir William Crookes has compared it with that which is felt "when the hand has been within a few inches of frozen mercury."

The human body is mostly water. A person of average weight will have about one hundred pounds of water in his body. Water has a greater amount of specific heat than any other known substance. The amount of heat necessary to raise the temperature of one pound of water one degree is sufficient to raise the temperature of more than thirty pounds of lead to the same extent.

If an average person loses one degree Fah. in temperature, he has radiated away as much energy as would be sufficient to raise one hundred pounds in weight to a height of 772 feet. This is sufficient energy to lift a large circle of sitters and all the furniture in the room to the ceiling ! Or, if transformed into matter, to evolve a tenuous materialised form.

This does not necessitate the introduction of any new or fantastic theory. It is one of the common facts in physical science that the mechanical equivalent of heat—the amount of energy represented in the raising of one pound of water one degree Fah.—is equal to 772 foot pounds. It is a common fact in chemistry that energy is transformed into material structures, and that material structures can in part be resolved into energy.

Through all this there is no attempt to reach beyond the immediate nature of mind. Its ultimate nature, as with

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every fundamental natural fact, is beyond the scope of man's abilities. Just as we know the immediate nature of electric activities, without knowing what electricity *per se* is, so we may yet know more of the immediate nature of mind activities without ever knowing what mind *per se* is.

CHAPTER XV

A PHYSICAL LIMIT TO INTELLIGENCE

245.—*Instability of brain structure a necessity.*

Just what is meant by the heading to this chapter will not be readily perceived unless the reasons for so expressing it have been explained.

There is, in one sense, a physical limit to intelligence, in that every basic physical fact presents a limit to our intelligence, beyond which we cannot pass. Mind, matter, energy, the mere existence of anything whatever, the unknown phenomena between cause and effect, which we find everywhere in chemistry, physics and biology, all present, in one sense, a physical limit to our intelligence.

But it is not to such facts we refer. We refer to the possible physical limits in the structure of the brain and nervous system in man which function organic and conscious mind. For, as all mind functions throughout nature increase in range with every rise in the complexity of structure of these physical or physiological systems, it follows that the limit of intellectual power depends upon possible limits to complexity in structure.

We might have expressed the problem as "A physiological limit to intelligence," but that would have excluded the fact that even in the physical, sub-organic intelligence is also governed by structure.

So, although we in this chapter deal only with intelligence in man, our postulate is universally applicable; and we have chosen the expression "A physical limit to intelligence" as broadly embracing a universal meaning.

We demonstrated in our ninth chapter that all function in nature is inviolably conditioned by structure. And as intelligence in animals runs parallel with increasing complexity in the structure of the brain and nervous system,

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and reaches its maximum expression in man, the question naturally presents itself—is it physically possible that the structure of the human brain can become more complex?

We have to consider the fact that the functions of the brain are conditioned by the physical *instability* of its structure; its very instability is an essential necessity to its functions, and a further advance in complexity would involve a greater degree of instability. So the problem resolves itself into—Can the brain acquire a still greater complexity in structure and yet retain a sufficient stability for an extension of intelligent function—or, would such a reduction in stability result in a derangement of function?

In the structure of all living things the dominant necessity is instability, for such structures are changing every instant of time—breaking down and building up; it is the constant changing which conditions that which is termed **vitality**—life.

246.—A limit to instability; there must be orderly function.

Yet living things must function in some manner of order; the instability of structure must be controlled and kept within certain limits, and these limits mark the boundary of possible evolutionary development.

It has so often been observed that genius is akin to madness, that it seems to us as if any further extension of complexity in brain structure, beyond such as may have conditioned the intellects of our pioneers in knowledge during the last few thousand years, would result in an instability that would make intelligent function weaker. For the molecular movements that constitute intelligent thought must have an orderliness sufficient for intelligence; a too unstable structure would give uncontrollable or disorderly movements—just as the increased instability of molecular movements in the brain of a fever patient causes delirium—genius would degenerate into lunacy.

The records of the past show that species of animals have evolved, attained their maximum development, endured for a time, and then become extinct. Within the memory of persons now living the aboriginal Tasmanian has become extinct. It is highly improbable that any race of men ever

existed having keener powers of observation than the aboriginal Australians. That race also will soon become extinct, and with them will go what we may term the maximum possible physical limit of complexity in structure of the mechanism which constitutes human powers of observation.

Has man attained his possible maximum physical limit in the evolution of the physical basis of mind? Has he not yet reached it, or has he passed it?

In his complex structure there are sixteen or more different elements of matter. We may assume that during the many thousands of years he has existed these elements have attained in the human brain the limit of complexity that is possible to them. And we may assume that no other element of matter is likely to enter permanently into its structure, and so make for greater complexity. For, from the nature of the properties of matter, its attractions, affinities and repulsions, matter will naturally successively assume all the forms of which it is capable. Although alcohol and various drug molecules which cause alteration in mind function are so often presented to the brain structure, it refuses to adopt any such molecules as permanent factors in its structure. It does not seem capable of any permanent addition to its complexity. All other elements and molecules than those now in operation must have been rejected as possible co-operators in man's proteid molecules countless millions of times, in untold myriads of individuals during past ages. And from this point of view he has reached the physical limit of intelligence.

By this limit we indicate the *maximum* possible complexity in the physical basis of the greatest of human minds. The average mental development is, in every age, very much below this. If such a limit has been reached, then it remains possible only to raise the average of human intelligence in the manner tentatively indicated in our chapters on "Hereditiy." We cannot extend the intellectual power of genius any further than has already been accomplished by natural processes in evolution.

247.—*Intellectual power; Clerk Maxwell; Ancient Philosophers.*

Intellectual power may be defined as the capacity to comprehend the relations existing between differing facts or presentations in nature. Knowledge of facts is acquired by simple observation and experience. It requires no conscious exercise of intellect to have a knowledge of the fact that a ripe apple parting from its twig will fall to the ground. But it did require an exercise of intellect amounting to genius to connect the fall of the apple with the fall of the moon towards the earth. To acquire a wide knowledge of facts only requires a few textbooks and a good memory. And memory is not a phase of mind requiring intellectual power. The deductions of the alchemists were as reasonable as the deductions of modern chemists in relation to the facts known in their day. Any modern chemist of to-day, with but the knowledge of facts known to the alchemists, would have thought as they thought. The difference between them is not at all a matter of intellectual power, it is purely a difference in knowledge of facts.

If we compare the intellectual power of philosophers who lived thousands of years ago with those of modern times, and give due consideration to modern advantage in the vast accumulation of physical facts not known to the ancients, we find there is no evidence whatever of any increase in intellectual power, although we have, in the meantime, acquired a much wider range of knowledge. We can see clearly that if those ancient philosophers and scientists had lived in our own times, with the knowledge of facts which we have to work upon, no man of science or philosophy in modern times could surpass them in mental and physical achievements.

Even the brilliant genius of Clerk Maxwell was bound to recognise that

"The most ancient philosophers whose speculations are known to us seem to have discussed the ideas of number and of continued magnitudes, of time and space, of matter and motion, with a power of thought which has probably never been surpassed "(3).

If, in the space of time covered by the records of philoso-

phic and scientific speculation, the power of thought in man has shown no advancement, it is extremely probable that it never will, and we may reasonably assume that the physical basis of mind in man has attained its limit of complexity and instability in structure.

248.—Zoroaster ; Hammurabi's laws ; the Akkadians.

For this period goes back, at the least, about eight thousand years. Aristotle places the date of Zoroaster at approximately that early period. Zoroaster established a new religion and a philosophy that has its adherents at the present day. He taught that all things have two extremes or poles—polarity : light and darkness, good and evil, heat and cold, and so on. The fact that he established a new religion indicates that prior to his time other religions had existed, and probably also other philosophies.

The oldest known code of laws, that of the Babylonian king, Hammurabi, dates back about four thousand years ; yet although the whole of them translated into English do not occupy a tenth part of the space in this volume, he contrives to get into that small compass definite and precise laws which practically cover the whole range of modern legislation—an example in brevity and simplicity that might well serve to-day as a guide to modern law makers.

His laws cover : false evidence in law, faulty decisions by judges, theft, trading with minors without consent of elders, lost property, traffic in slaves, burglary, brigandage, outbreaks of fire, duties of soldiers, administration of dead soldiers' property, protection of the property of a soldier taken prisoner, leases of land, responsibility of tenants, breaches of contract, usury, irrigation, agistment, trespass, gardens and orchards, landlord and tenant, act of God, negligence, wine selling, meetings of rebels, distress for rent, storage of corn, deposits of value, libel, rape, adultery, concubines, divorce, wasteful and careless wives, inheritance of property, marriage settlements, adoption of infants, damages for assault, doctors' fees and fines for harmful treatment, builders' fees and penalties for faulty work, payments for boat building and penalties for faulty work, hire of boats and responsibility of boatmen, hire of oxen and

penalties for ill use of them, goring by ox or bull, hire of workmen, hire of cattle wagons and drivers, payments per day to hired tradesmen—potters, tailors, masons, carpenters, rope makers, builders.

Throughout the whole of the two hundred and fifty sections of these laws of Hammurabi we find no internal evidence of an average intelligence inferior to that of to-day. We cannot conceive that our modern law makers, had they existed under the conditions that obtained in Hammurabi's day, would have enacted more comprehensive, concise or better laws.

But this evidence of an intelligent capacity four thousand years ago, equal to that of the present day, *followed* a preceding civilisation which may be traced back two or three thousand years further. Its language, in Hammurabi's day, had become a "dead" language—the "Akkadian," which was studied and taught, even as we study and teach "dead" languages to-day.

Of the intellectual range in the Akkadian culture that preceded the Semitic Babylonian of Hammurabi's time we have but meagre details, but we know, from the clay tablets exhumed from the ancient libraries in temples and palaces of Chaldæa, that the Akkadians in the time of Sargon I, whose date is fixed at about 3,800 B.C., or about five thousand seven hundred years ago, were a civilised people, well versed in astronomy. Some of the tablets recovered were from the royal library of Sargon I.

We cannot think of a people who established libraries and were well versed in astronomy as being other than intellectual. Clay tablets in those days served the purpose that books do now; and it was a practice to place tablets under the foundation stones of notable buildings for the information of the people of the future, just as we to-day sometimes place coins and printed matter under foundation stones for the same purpose.

The labour necessary for making and writing upon tablets, conjoined with the limited space afforded, would act as a brake upon the acquisition and extension of knowledge, compared with our facilities in writing and printing. Trivial phenomena would find no place upon clay tablets, yet things

that appear trivial have often been the germs of important discoveries. To the facility in recording facts and conserving them in printed books that are easily read and transmitted to future generations is due the immense advance in knowledge that has been achieved in modern times. But that advance in knowledge does not of necessity involve any advance in power of mind. Had paper and printing books become common in the time of the Akkadians, the standard of knowledge of the Ancient Greeks might have equalled the standard of knowledge of to-day.

249. Man's erudition not a measure of his intellect; ancient Greeks.

When we attempt to measure the intellectual capacity of men who lived at different periods in the world's history, our first consideration should be that of the state of knowledge obtaining at the time the men lived. Unless this is done, no conclusion of any value can be arrived at. Man's erudition is not a measure of his intellect.

We get a more definite idea of the intellectual power of the ancients when we advance from the Akkadians and the Semitic Babylonians down to the ancient Greeks of from two thousand to two thousand five hundred years ago.

Thales, six hundred years B.C., calculated and predicted the date on which an eclipse of the sun occurred—May 28th, 585 B.C.,—and we cannot properly appreciate this feat unless we give fair consideration to the fact that he had no telescope or any of the instruments of precision which assist the astronomer of to-day.

In the time of Thales there were observatories in the large cities in the valley of the Euphrates.

Ptolemy carried the exposition of plane and spherical trigonometry to so perfect a form that it was not surpassed until the sixteenth century.

Nearly two thousand years elapsed before human genius advanced beyond the point attained by Archimedes in mathematics.

We have evidence also that contemporary with the ancient Greeks there existed in other parts of the earth an advanced state of knowledge and intelligence. We have

reliable astronomical data from the Chinese, dating back four thousand years.

Archelaus taught the mind was mingled with matter. To-day we find that matter and mind are inseparable.

Aristotle seems to have been at least equal in power of mind to any man who ever lived. He laid the foundations of the sciences of natural philosophy, mechanics, physiology, and natural history, and for many centuries was the leading intellectual light of the world.

In reasoning upon memory, he associates mental operations with *movement*. He is still quoted at times by modern men of science. He first recorded the singular phenomenon in the reproduction of cuttle fish, "Cephalopeda," two thousand years before it was discovered (?) again by modern science in 1850!

We can only do justice to the intellectual greatness of Aristotle by imagining what he could have accomplished, had he had the foundation of knowledge to build upon that is available to us to-day—the astronomical knowledge,—the laws of gravitation, the conservation of matter and energy, and the general knowledge available to physicist and chemist; and that with this knowledge he also possessed the invaluable instruments of delicacy, precision and observation that to-day so largely extend the range of our senses of perception.

Epicurus taught that all that exists is corporeal; the intangible is non-existent. Things exist which our senses are not subtle enough to detect; and atoms differ only in size, figure and weight, and are perpetually moving at a rate far surpassing our conceptions.

One cannot but marvel at the intellectual grip of this man, who lived more than two thousand two hundred years ago, and yet could reason down so correctly to the nature of atoms upon the very limited knowledge of definite physical data then available.

It is only quite recently that the actual velocity of atoms has been mathematically computed. The rate of movement of the hydrogen molecule, according to Clerk Maxwell, exceeds six thousand feet per second.

The opinion of Epicurus that all that exists is corporeal

is well backed up by the inclusion by modern scientists of light, heat and electricity into the domain of physics ; by the recognition of the electron as a physical unit in electricity, and the discovery that energy has mass.

We have previously referred to Empedocles, Anaxagoras, and Democritus (3), who anticipated modern knowledge. Homer, Socrates, Hipparchus, Euclid, Aristophanes and others could be included in evidence of the intellectual greatness of the ancients ; but we think sufficient has been offered to show that we have no evidence whatever that the intellectual power of man has any greater value to-day than it had at least two thousand five hundred years ago.

250. *Ancient buildings : Baalbec : Selinus : fossils.*

There were intellectual giants thousands of years ago, just as there are intellectual giants to-day ; there were childishly superstitious and unreasonably ignorant people thousands of years ago, just as there are such people to-day. Euclid is still taught in our schools ; yet he lived and reasoned out his problems more than two thousand years ago ; problems that require more mind power for the solution of some of them than is possessed by probably more than three fourths of the human race of to-day. If further evidence is required, we have the material evidence of the wonderful structures erected by the ancients, of which we do not even know when or by whom some of them were built ; and we have the evidence of fossil remains.

In the walls and the columns of the temple at Baalbec are stones of dimensions and weight that would tax the capacity of modern man to place in position. This structure had fifty-four columns about sixty-two feet high, many of them formed of only three blocks fitted together without mortar, but with strong *iron* dowels. The weight of these blocks would average about thirteen tons, and the top ones would have to be lifted to about forty feet above the floor of the temple to be placed in position upon the two bottom ones. These gigantic columns were topped with richly wrought Corinthian capitals, which, in turn, supported a proportionately gigantic entablature. In the foundations of this temple may be seen to-day many huge

stones accurately fitted, weighing more than a hundred tons ; but there are at least three of them, each one of which weighs more than two hundred tons !

In the moving and in the placing into exact position of these immense blocks a degree of skill and an intelligence would be required equal at least to that required for any modern structure, however much more complicated its mere details might be. And the engineer who directed the work must have been a man who, even to-day, would be regarded as a man of powerful intellect—a man of genius. For in mechanical manipulation we have to exercise the highest mental faculty in man—that of causation.

The ruins of Selinus in Sicily show that two thousand five hundred years ago the art of sculpture was highly developed. The sculptured metopes of the temples in these ruins are of extraordinary beauty. Many evidences of this nature might be quoted.

Fossil remnants of man have been found in Great Britain, some dating back at least twenty thousand years, that were of modern type in all essential features. According to Prof. Elliot Smith : “ They were, if anything, both mentally and physically superior to the average present day inhabitants of Europe.”

251. Increasing knowledge of facts increases possibilities.

There is no man living to-day who could construct a modern locomotive, given only the knowledge of facts that were available a hundred years ago. Every mechanical and physical marvel of to-day has been a gradual development, made possible by a knowledge of facts acquired by the experiences of many generations. Hero of Alexandria, one hundred and thirty years B.C., constructed a steam engine on the continuous rotary principle, and the man who to-day designs a modern locomotive is indebted to all intermediate mechanical genius from their day to his.

No man living to-day could construct a wireless telegraphic service, given only the facts available fifty years ago. Marconi could not have done what he did without the aid of the accretions to knowledge furnished by thousands of scientists who preceded him—from Thales onwards.

They provided the data that made "wireless" possible. We see from such facts that it is the gradual additions to knowledge, and not of necessity any accretion of mind power, that are responsible for the great extension of technical possibilities that are in evidence to-day. The invention of the steam engine made possible the invention of the locomotive; the invention of the internal combustion engine made possible the invention of flying machines. And thus it has always been—one thing leads to another. The more man needs, the more he invents. The ancients invented less, because their needs were less, and their knowledge of facts less wide; not because they were intellectually inferior.

When Columbus discovered America there was no need for the mammoth palatial steamers which are now running every day across the Atlantic; nor had man acquired the knowledge of facts which enables him now to construct such vessels. There is a need and a demand for them to-day, and acquired knowledge of facts has enabled us to meet that demand. It is not because we are intellectually superior to those who lived when Columbus made his famous voyage.

It is impossible to define exactly the difference between knowledge and intellect, for they are but differing values of mind, and continuous with each other. But there is a real and important distinction, and we will try in the following instances to make this difference clearly evident.

No human genius could ever have acquired by the exercise of intellect alone, a knowledge of the fact that a body at the surface of the earth will fall a distance of sixteen and one tenth feet in one second of time. The fact became known from practical experiments, through the simple evidence of our senses of perception, and it could never have been made known to us in any other manner.

When the fact of the distance fallen in one second was established, then it became possible for intellect alone to extend *a priori* our range of knowledge. For it had always been known as a fact that the higher the point is from which a weight drops on your toes, the more it hurts. So reason had already taught us that a falling body has a uniformly accelerating motion. And, given a uniformly accelerating

motion, a body starting from zero and falling sixteen feet in one second must have a velocity at the end of the second equal to thirty-two feet per second. Thus from a fact not made known by intellect or reason, but by the evidences of our senses of perception, we may by operation of intellect determine how far a body will fall in two, three, four or any number of seconds.

Sir Isaac Newton, knowing that there is no "up" or "down" in the universe, recognised that the fall of a body to the ground must be due to an energy which attracted it. He was also aware that the intensity of an energy varied inversely as the square of its distance—as with light energy. Thus he was led to form the theory that the departure of the moon from a straight line—amounting to a small fraction of an inch per mile—was due to the same attractive energy which causes a stone to fall to the earth again if we throw it up in the air. He firmly established the truth of his theory by proving that a stone at the distance of the moon away would fall to the earth in one second exactly as far as the moon is deflected from a straight line in one second.

Thus we got the law of universal gravitation by the exercise of intellect, as the result of the acquisition of the knowledge of a fact not made known by any unusual effort of intellect, but by simple experience. And the law of gravitation and all the further knowledge we have gained from it would be unknown even to-day, had not the distance a body falls in a given time been demonstrated by experiment and the evidences of our senses of perception. It is thus that extended knowledge of facts makes possible man's achievements to-day beyond those possible to previous ages, although he may not have advanced in intellectual powers.

So it happened with the discovery of the velocity of light. No man, by reason or intellect alone, could have demonstrated that Jupiter has a number of moons revolving about him. The fact was discovered by Galileo when he pointed the first telescope to look at Jupiter. He saw that it had a number of moons; he could not help seeing them; it required no intellectual effort to do so. When the periods and sequences of the revolutions of the moons about Jupiter

were determined and a "time table" was made indicating the dates and times of future revolutions, it was found that the moons did not revolve according to the times calculated. This was something unexpected ; the observers were not looking for it, but they could not help seeing that it was so ; it required no intellectual effort. But it did require some *intellectual effort* to arrive at the conclusion that the apparent irregularity in the moons' revolutions about Jupiter was due to time occupied by the movement of light from those moons to the earth, as a consequence of the lengthening or shortening of the distance between them. For prior to this it was universally believed that light travelled instantly to any distance. They came by *intellectual effort* to the conclusion that light travelled 186,000 miles per second. This conclusion has been demonstrated by practical experiments to be a truth. And it has had an important influence upon our conceptions regarding the physical structure of the universe, culminating in the new science of "relativity."

But it is quite evident that this advance in knowledge could not have happened if the fact of the existence of Jupiter's moons had not been made known by someone simply seeing them ; or if the fact of their apparent irregularity in revolution had not been discovered by someone who simply noticed it. So that our knowledge of "relativity" to-day has arisen from two facts discovered without any effort of intellect ; the existence of which facts reason or intellect alone could never have discovered.

252. *Evidence from superstitions ; daily press.*

In one direction the ancients evidence a decided superiority in intelligence. In the ancient Greek classics there is far less evidence of prevailing superstition than is present in the Teutonic classics. And as the superstitions of a people have a very close relation to mind power, they form a very fair basis for a judgment of the average intelligence of that people. We find to-day, even in the most civilised nations, evidences of widespread superstition, which are not compatible with the notion that man *en masse* possesses the degree of intelligence that he is popularly credited with.

If we include within the term "modern" a period of about two hundred and fifty years—a reasonable estimate, when we go back about thirty times that length of time to "ancient"—we must include in our evidence that : Sir Matthew Hale condemned two witches to death in 1664 ; that several others were convicted at a later date—Jane Wenham in 1712 ; that the last execution for witchcraft in Scotland was in 1772 ; that penalties for witchcraft in Ireland were not repealed till 1820 ; that John Napier, the inventor of logarithms, believed in magic ; that Kepler, the famous astronomer, believed in astrology ; that Henry More, Glanvil, Bodin the great French publicist, Sir Thomas Brown and John Wesley believed that disease and death could be caused by malevolent apparitions.

The belief in the power of an "evil eye" still exists. The writer once heard a woman angrily declare to her husband, who was incapacitated by a disease of the spine : " Someone has had an evil eye on ye, or ye would'na be sae bad as ye are."

We distinctly remember a trial in Ireland some years ago when a man and some of his friends were convicted of causing the death of a woman by burning. The man's wife was ill, and it was believed that her illness was caused by an evil spirit, which had taken possession of her. So he got some friends to assist him to place the woman seated upon the fire, in order to roast the evil spirit out of her !

There are a vast number of people in the world, civilised and otherwise, who have no higher range of intelligence ; yet they are *all included* in the human race, which is credited with having the " divine gift " of reason.

The daily press furnishes us with a continuous stream of evidences of low intelligence and superstition ; some of the most recent are :

The passing of a law by the State Legislature of Tennessee, making it unlawful for any pupil of any school or university of Tennessee to receive teaching about Evolution.

The sailing from Sydney of Bishop (?) Leadbeater with a retinue of fifty followers on board the *Oronsay*, bound for Adyar, India, in order to be present at the Messiah's Second Coming.

The demand of the synod of a church in Amsterdam that Dr. Geelkerken shall sign a belief that the conversation with Eve and the serpent really happened.

The trial in Paris of twelve women, members of the order of "Notre Dame des Pleurs" (Our Lady of Tears), for flogging the Abbé Desnoyers of Bombon, near Melun. The accused declared that the Abbé was the embodiment of Satan, and the most formidable wizard of modern times ; that he had cast an evil spell on a large number of people at Bordeaux ; that as the Abbé had sold his soul to Satan, the Devil had to be driven out by flogging.

The London and North Eastern Railway is abolishing the number 13 on its sleeping cars. Many persons refuse to occupy that berth when it has been reserved for them. And they are not uneducated people who usually make use of sleeping berths.

Six leading members of the Mexican Catholic Episcopate have been ordered to leave the country. President Calles says that the Episcopate is the main cause of religious war, which is dividing the nation, and has been directing the revolution and inspiring such outrages as the recent terrible butchery of railway passengers at Limon.

253. *Sir A. Conan Doyle : business advertisements.*

Sir Arthur Conan Doyle's statement in September, 1925, that he had

"made no plans for future work. My guide has warned me to hold myself in readiness for a great event ; a catastrophe in nature that is overtaking the world. Lady Conan Doyle has had messages from the other side, foretelling a world catastrophe. I get all my spiritualistic messages from my wife, who receives them from my guide, and passes them on to me. I have been getting similar messages for a long time. Each one indicates the nearer approach of a catastrophe, and confirmations have been received by sixty mediums in all parts of the world."

In a pamphlet circulated gratis as an advertisement for a business venture we find the following :

"Ancients had a firm belief that the date of their

birth determined to an extent one's character and fortune. The scientists of to-day, especially the astronomers, have proved that the ancients were right in that belief. According to the teachings of these men, the position of the stars and planets at the hour of our birth permit us to foresee important events in our lives. This booklet gives you a horoscope for each month of the year," etc.

When trash of this kind is acceptable amongst the mass of a people—and business advertisers have a very keen scent for what will interest possible customers—what a low average of intelligence must exist among them !

In the advertisement spaces of cheap novels that are sold by the million, published by a firm whose head was knighted for services rendered to the English nation, you will find information regarding persons who can foretell your future, interpret your dreams, draw your horoscope, and so on—if you post them a shilling in stamps ! But what can you expect when the most revered book—nominally at least—in civilised countries has its books of prophets, its condemnation of witches to death, and its casting out of evil spirits ?

254. Connection between structural development and function.

When we consider that this widespread intellectual weakness continues after the efforts of nobler minds in all ages down to the present day to elevate the intelligence of the masses above the degradation of superstition, we cannot rationally conclude that the average intelligence of the human race has improved in any perceptible manner during thousands of years. And as mind function and power depend upon and are conditioned by structure, there is apparently some physical limit beyond which man cannot pass.

We see throughout the whole range of living things a most definite connection between structural development and the range of living functions. In animals with a defined central nervous system we see a definite connection between the development of that nervous system and the range of mind activities ; we know that the advance in structural development is concurrent with increased complexity,

delicacy of balance, and instability ; and it is evident that to this instability there must be a physical limit. This is indicated by the close approach of genius to insanity, which has been so often noted ; the limits of instability in genius having reached its possible limits for rational function, it hovers on the brink of that abnormal instability which functions insanity.

255.—*Evidence of biometrics in Heredity.*

That there is some physical limit in evolution is also clearly indicated by the results of the biometrical study of heredity by eugenists such as Sir Francis Galton, Professor Karl Pearson and Professor Walden. The biometric facts show that not only the physical system, but the nervous system also, has some limit beyond which it cannot pass under the existing conditions in nature. The average height of sons whose father is above the average is *lower* than that of the father. Sons of a father below the average height have an average height *above* that of the father. And the same holds good in regard to intellectual development. The sons of a father who has an intellect *above* the average have an average intellect *below* that of the father. And the sons of a father who has an intelligence *below* the average will have a *higher average* intelligence than the father. If we consider mothers as well as fathers, the same tendency must appear in offspring towards that average development, which restrains every species of living being within a limited range.

Thus, if both father and mother are above the normal average range mentally or physically, or if they are above the normal average range both mentally and physically, the average development of their offspring must be lower than that of the parents. Every one who looks about him may see instances of the truth of this.

It must be clearly understood that we are speaking of *average* results. Even so, these results are indeed very suggestive. It is quite true that a father with an intelligence above the average may have a son with a still higher intelligence. And one of the first reasons for the appearance of this volume is to determine that the average of intelligence may be raised—even if we cannot go beyond the maximum—

if we can acquire a definite understanding of the immediate conditions that operate in evolving a child that develops into a more intelligent being than either of its parents. No education of parents—in the ordinary sense of the term—will accomplish this ; the only means is by some pre-natal influences operating upon ovum, sperm, embryo and foetus—as indicated in our chapters on heredity.

Everything that lives is bound by existing physical conditions in nature to develop to such an extent, and no further—except by artificial alterations in those physical conditions.

Man has lived under such conditions for thousands of years. Indeed, artificiality at the present day has run to an excess that breeds degeneration, and we hear an insistent call, "Come back to nature." Giants do not produce giants ; dwarfs do not produce dwarfs ; nor does genius produce genius. When development has, by reason of some unusual or accidental conditions, gone beyond the average mentally or physically, it promptly comes down again, and tends towards the average that average environment allows to be comparatively permanent.

The undefined conditions in nature which confine each species of living thing to a certain range in evolutionary development—the size and intelligence of a micro-organism, a mouse, a dog, a sheep, an elephant or a whale—most certainly indicate that there is some physical limit to the development of every specific form of life ; and man himself cannot be an exception, even though he happens to be the most intelligent.

Increased instability in structure is the necessary fundamental condition which differentiates the animate from the sub-animate ; and the brain and nervous system of men of the highest intellect appear to have reached the limit of instability consistent with functional stability.

256.—Our hope for the future.

We cannot deny the evidences of continuous change in the character of animate life on earth during the period of its evolution, caused by the continuously changing character of environment—using this term in its widest sense (222-3).

We cannot deny that children born of the same two

parents may differ widely in hereditary traits ; and we cannot deny that these differences must to some extent be due to varying conditions of potency in both father and mother before conception occurs ; and, probably to a larger extent, by varying conditions in the mother during gestation.

These differences cannot be other than due to changing moods, and to the influences of environment upon the parents. Therefore the cause of differences in children of the same parents must be pre-natal ; it cannot be otherwise ; and pre-natal influence must have a most important potential value.

We cannot deny the abundant evidences of the perfect continuity and correlation between conscious and organic mind which are so clearly indicated in many various ways in both normal and abnormal conditions (98 *et seq.*), and we can see that it is quite possible to raise the average intelligence and character of man, even although it may be impossible to raise the maximum limit to which man has already attained. The present average is due to average influences. If those influences are appreciably raised in character as a consequence of increasing knowledge of the possibilities in pre-natal influences then average intelligence will be raised in character as a necessary consequence.

As the individual evolution of man in embryo and foetus proceeds in time according to his evolution as a species, the mechanism of his highest functions is evolved last of all. And it is during the evolution of the cortex of the brain that the mother's influence is all important. If a prospective mother exercises her intellect, trying to do things or make things, or trying to reason out problems—doing anything which unusually exercises her cerebral centres of causation, it will certainly add to the intelligence of her child. In exactly the same way as do the cells upon the palm of the hand develop additional strength of structure by doing hard work (99), so will the cells of the physical mechanism of reason in the foetus develop more strongly through exercise, by virtue of the intimate sympathy existing between the conscious mind of the mother and the organic mind of the child within her.

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But such purposive exercises of the mother must be entered upon in a proper mood. They must not appear as an arduous task or as something disagreeable that ought to be done. A careful selection should be made regarding what is likely to be interesting or even amusing, and there is in most cases a sufficient latitude in this direction.

We have no need yet to be pessimistic about the future of the human race ; the way is open to developments which will largely increase the pleasures of human existence. And the way to these developments is by learning more regarding the influences conscious mind may exert prenatally upon organic mind, and the conditions which are necessary to make those influences the most effective in the direction we wish to go.

THE END.

