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Contributors

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Royal College of Surgeons of England

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INTELLIGENCE IN THE VAN:

THE BEGINNING OF THE BEGINNING AND THE END OF THE END.

THE records both of Scripture and of Science recognise a beginning before the beginning of all mundane things; and, as for the end, Science shows us that there can be no sense in supposing that we have seen the end of evolution; while Scripture points to a new world.

Thus we read in Genesis, chap. i.:—

"In the beginning God created the heaven and the earth, and the earth was without form and void,* and darkness was upon the face of the deep, and the Spirit of God moved upon the face of the waters."

And in Revelations we read (xxi., xxii.):—

"And I saw a new heaven and a new earth, for the first heaven and the first earth were passed away . . . I am Alpha and Omega,† the beginning and the end, . . . and there shall be no night there ‡ . . . for the Lord God giveth them light,§ and they shall reign for ever and ever."

And thus we read in the records of scientific research and speculation:—

"Had we not better recast our definitions of matter and force? For if life and thought be the very flower of both, any definition which omits life and thought must be inadequate, if not untrue."—(Professor TYNDALL, *Scientific Materialism.*)

"I cannot stop abruptly when our microscopes cease to be of use. Here the vision of the mind authoritatively supplements the vision of the eye. By a necessity, engendered and justified by science, I cross the boundary of experimental evidence, and discern

* "Waste and void." (*Revised Version.*)
† "The Alpha and the Omega." (*Rev. Version.*)
‡ ". . . shall be night no more." (*Rev. Version.*)
§ "Shall give them light." (*Rev. Version.*)

in that matter— . . . the promise and potency of all terrestrial life." —(Professor TYNDALL, *Belfast Address*.)

"But it is necessary to remember that there is a wider teleology, which is not touched by the doctrine of evolution, but is actually based upon the fundamental propositions of evolution . . . From this it follows that the existing world lay potentially in the cosmic vapour."—(Professor HUXLEY, *Academy*, Oct., 1869.)

"Let us picture the very beginnings of time, before geological ages, before the earth was thrown off from the central nucleus of molten fluid, before even the sun himself had consolidated from the original protyle. Let us still imagine that at this primal stage all was in an *ultra-gaseous state*, at a temperature inconceivably hotter than anything now existing in the visible universe; so high, indeed, that the chemical atoms could not yet have formed, being still far above their dissociation point . . . But in the course of time, some process akin to cooling, probably internal, reduces the temperature of the cosmic *protyle* to a point at which the first step in granulation takes place; matter, as we know it, comes into existence, *and atoms are formed*. As soon as an atom is formed out of *protyle* it is a store of energy, potential (from its tendency to coalesce with other atoms by gravitation or chemically) and kinetic (from its internal motions). To obtain this energy, the neighbouring *protyle* must be refrigerated by it, and thereby the subsequent formation of other atoms will be accelerated . . .

"We have glanced at the difficulty of defining an element; we have noticed, too, the revolt of many leading physicists and chemists against the ordinary acceptation of the term element. We have weighed the improbability of their eternal self-existence or their origination by chance. As a remaining alternative, we have suggested their origin by a process of evolution like that of the heavenly bodies according to Laplace, and the plants and animals of our globe according to Lamarck, Darwin, and Wallace. . . . . .

"We cannot, indeed, venture to assert positively that our so-called elements have been evolved from one primordial matter; but we may contend that the balance of evidence, I think, fairly weighs in favour of this speculation."—(Professor CROOKES, *Address to the Chemical Section of the British Association*, 1886.)

Dr. A. W. WALLACE (*Prov. Medical Journal*, April, 1887), summarising Professor Crookes, says: "Giving only his conclusions, they are these:—What we know as elementary substances would be dissociated into more elementary substances still if sufficient heat could be applied

to them. Ultimately, a condition of dissociation would be reached in which the molecules would be so separated that they would no longer exist as matter, and as a consequence, heat, which is a mode of motion of matter, would also cease to be. It would be transformed into a form of energy of which we can have no conception."

In these deeper and deeper dredgings in the great seas of scientific research, and in these more and more comprehensive views of the meaning of the wondrous harvests thus secured, we are giving up, step by step, the untenable grounds on which matter was supposed to have come before force.

To assert that force was the product of the matter which it governs is tantamount to asserting that the material universe created the God who was to govern it—a *reductio ad absurdum*. For, if matter was competent to evolve the power essential to its governance, such power would be *post factum* and needless!

The only proposition which to my mind is logically tenable, is that force in its whole potentiality must have the first place in all our calculations—a place before "the beginning" of all mundane things. This primordial force I shall call, for the sake of brevity and comprehensiveness, "Potentia"; and I shall assume that this Potentia comprises within itself the possibilities of every mode of lifeless force (including all the physical forces) and every mode of vital force, including a mind-mode and a soul-mode, and I shall assume that the scheme of the universe was—*through the medium of matter* to differentiate all the possible modes of Potentia, and step by step *to individualise the highest modes*, so that—that which in "the beginning of the beginning" was diffused through space, shall in "the end of the end" people the realms of Eternity with *individual* souls.

I proceed to show that these are no audacious speculations, but the legitimate deductions from a careful and reverent study of both Religion and Science: a combination without which no conclusions can completely satisfy the human mind.

When I published my "Lectures on the Germs and Vestiges of Disease," in 1861, the following works, the importance of which it is impossible to over-estimate, had but lately been given to the world:—

1. Groves' "Correlation of the Physical Forces." (1846.)
2. Carpenter's "Mutual Relations of the Vital and Physical Forces." (*Phil. Trans.*, 1850.)
3. Paget's "Lectures on Surgical Pathology." (1853.)
4. Van der Hoeven's "Handbook of Zoology." (Translated from the Second Dutch Edition, 1856.)

5. Milne-Edwards' "Leçons sur la Physiologie et l'Anatomie comparée de l'Homme et des Animaux." (1857.)

6. Darwin's "Origin of Species." (1858.)

7. Bernard's "Lectures on Experimental Physiology." (1860.)

These works had excited my deepest interest and admiration, and in studying them I had attempted to utilise both the facts and ideas which they contained for the advancement of practical medicine, and in this connection I ventured to add some new hypotheses. Thus in the Lectures to which I have referred I said: "From this review of a number of facts I endeavoured to lead you to the conclusions that, from the first production of the embryo until the end of the complete animal's career, all the processes of life, including protection from the invasion of disease, support under disease, repair after disease or injury, and the reproduction of the species, are manifestations of this same force to which I have referred. I also endeavoured to show you that throughout the animal kingdom all these manifestations of force are found to follow a *regular* course, the end of which is the attainment of a certain object—that they occur according to certain rules, and that a comprehensive view of these rules appears to justify us in the conclusion that, in the wise and perfect plan of creation, all these phenomena of animal life are governed by a *general law*, which I called '*the law for the attainment of the ultimatum;*' and which I attempted to express thus: 'At every period of an animal's life, the force (or vital mode of force, V.M.F.), will be sufficient in every respect and determined in that direction, essential, at the time, to the attainment of the ultimatum.'" (p. 144.) "The idea we form of this ultimatum must not be limited to the individual, but must be extended to the species." (p. 5.)

"In the next place I pointed out that an animal, when sent into the world, is possessed of a certain amount of matter; and a certain amount of force, manifested in the processes of life; and that the continuance of its existence depends upon its possessing accumulators of fresh force and of fresh matter. I attempted to show that the plan of organisation of all living things, however simple or complicated, provides them with such *accumulators of force and material;* and that by these means an accumulation of matter and of force takes place, by a succession of transferences from the inorganic world; and I pointed out, as a necessary conclusion from the premises given, that the constitution of the animal, both in material and force, is dependent on the condition of the world in which it exists, and subject to alterations correlative with those of that external world itself.

"Following up this subject I presented to your consideration an

hypothesis which appears to me to explain a larger number of the facts concerned than any other with which I am acquainted; while it brings into unison some that have appeared antagonistic, and explains some for which no explanation has heretofore been offered.

"I suggested that a certain amount of the force which has been accumulated and manifested in the processes of life, passes on into the germs of a new generation, and thus secures the multiplication of the species,—carrying on from generation to generation the impress of successive changes in the sources from which it is derived." (p. 146.)

"According to this hypothesis . . . . there will be no 'antagonism between the operations of generation and development,' and the familiar example brought forward by Dr. Carpenter, as indicative of such 'antagonism,' is deprived of all antagonistic meaning. 'Between these two operations,' says Dr. Carpenter, 'there would seem to be a kind of *antagonism*. Whilst every act of *development* tends to *diminish* the germinal capacity, the act of *generation* renews it; and thus the tree, which has continued to extend itself by budding until its vital energy is well nigh *spent*, may develop flowers and mature seeds, from which a vigorous progeny shall spring up.'

"According to my version of these phenomena, the tree, which has been extending itself by budding, has not been spending or exhausting its vital energy at all; on the contrary, this extension has been coequal with the accumulation of vital energy (or as we call it vital mode of force). This vital mode of force, instead of being 'spent' (as Dr. Carpenter calls it) when it ceases to manifest itself in the continued extension and budding of the tree, has simply been *determined in another direction* consistent with the conditions of existence, in obedience to the law for attaining the ultimatum. The vital mode of force, as it ceases to be required and ceases to be manifested in the development of buds and leaves, is gradually passing on into the germs of a new generation; and hence that development of flowers and maturation of seeds to which Dr. Carpenter refers with so much surprise. That each of these seeds should be competent to originate a tree similar to the parent, would indeed be extraordinary, if it were produced by a parent of which the vital mode of force was already '*spent*'; but there is nothing extraordinary in the fact on the hypothesis that—with the extension of the processes of life in the parent tree, force and material were accumulated from the inorganic world, and that this accumulated force and material was divided among the seeds in quantity similar to that with which the seed was endowed from which the parent tree originated" (p. 46).

"Whether or not Mr. Darwin is right in attributing the *origin of species* to natural selection, few can dispute the fact that such natural selection occurs universally throughout nature; that the being which is best suited, whether in body or mind, to the conditions of life in which it is placed, will be the one to survive in the struggle for existence, and thus prove the propagator of its species.

"According to my hypothesis, then, the *descent* is determined by the conditions of existence, not only, as Darwin says, by selecting the forms of life most suited to them, but also by *assimilating every generation to the conditions into which it is born, and thus favouring the characteristics on which its selection will depend.*" (Double selection.) (p. 47.)

"It does not appear that Mr. Darwin has recognised the influence that may thus be exercised by the 'conditions of life.' If my hypothesis is correct, it will lend a new importance to his theory of 'Natural Selection,' and it will supply, in part at least, an element which some of his critics have thought wanting." (p. 46.)

In the lectures from which I have quoted the above passages, I said: "In the case of man . . . he cannot be said to have reached his ultimatum when he has secured the multiplication of his species, but only when he has fulfilled his other functions in this world." (p. 4.)

I did not attempt to carry out the consideration of the ultimatum of the human species beyond its mundane existence. But, in the further development of the ideas then indicated, it became an inevitable conclusion that *the ultimatum of man is not limited to this world*—that whereas in all the animal creation lower than man we may discern in this world the ultimatum for which force is provided, in man we discover modes of force for the attainment of ends not realisable in this world.

This brought me face to face with the great question of the relations between Intelligence, Instinct, Mind, and Soul, and in my "Notes for Future Work" I made this memorandum: "Is not the difference between what we call instinctive action and intelligent action simply that, in the one case, the development of the necessary faculties and machinery is perfected before birth and, in the other, after birth; and does not careful observation detect that even instinct is, in a small degree, further perfected after birth, just as intelligence is so perfected, in a larger degree?"

In the quarter of a century which had elapsed since I dropped the subject at this point in 1861 and took it up again in 1886, the pressing

claims of a professional life forbade me to feel justified in spending my time on less practical studies than those connected with the prevention, detection and cure of disease. But in the greater quiet of my Bournemouth home I have not hesitated to resume the thread of my former work.

Since the ball was set rolling by Grove and Darwin, a whole library of observation, research and speculation has been added to our store, much of which I have thought it necessary to go through before venturing on the further development of my subject; and I am especially indebted to Sir John Lubbock and Professor Romanes for those careful observations and collections of facts with regard to the habits of living creatures which have made it possible for me to test, step by step, the justness of my conclusions.

As soon as I have finished this outline of my scheme I shall fill in some of the most important details and show the grounds on which my conclusions have been formed.

Let us, now, continue the consideration of that primordial force which I have called "Potentia," and which I assume comprises within itself the possibilities of every mode of force, both lifeless and vital.

We have no cognizance of Potentia in its higher modes, except through its manifestations in association with matter. But as we do not doubt its existence in the lower modes of the physical forces because we have no cognizance of them except in association with matter, so we need not doubt its existence in the higher modes because we have no cognizance of them except through matter.

Professor Crookes has suggested a primal state in which (to quote Dr. Wallace's *résumé*) "molecules would be so separated that they would *no longer exist as matter*, and, as a consequence, *heat*, which is a mode of motion of matter, would cease to be; it would be transformed into a form of energy of which we can have no conception."

Without attempting to go further than to assume the existence of some such primordial state in which Potentia—"the beginning of the beginning"—reigned, we have abundant evidences that, from this point, Potentia gradually became manifested in association with matter, and that, under the regulating power of Potentia, matter gradually assumed various transformations or modes, and in these transformations Potentia also assumed various transformations or modes.

One of these modes of Potentia was Vitality, or the Vital Mode of Force (see p. 6); and in the association of this vital mode of force with

matter we have the introduction of living things, vegetable and animal, constituting the organic world.

But vitality does not necessarily involve mind. The vital mode of force is not necessarily the mind-mode. Thus we have the vegetable kingdom, vital but not mental. But with the introduction of locomotion the vital mode assumed a mind-mode. Directly voluntary locomotion is required, the guidance of mind becomes essential to the individual in its struggle for existence.

But *mind* does not necessarily involve *soul*, any more than vitality necessarily involves mind. It was only when the mind-mode of vital force became associated with matter in the form of man, that it could assume the soul-mode. The explanation of this fact is very simple, and it is quite certain that, by whatever process this stage in the association of force and matter was reached, whether by evolution or otherwise,—at this stage an *impassable bar was placed, once and for ever, between man and every other living thing*, by which he was put out of reach of the possibility of competition from any other animal.

In no animal but man can mind assume the mode of soul.

The essence of this bar is a combination of subjective reasoning and an attitude of mind which I shall call *Aspiration*, *i.e.*, a panting after or ardent desire to attain some object more elevated than the individual itself.*—(WEBSTER.)

This attitude of mind is not peculiar to man, but is observable throughout the animal kingdom. The lower animals, at last, aspire to man ; man aspires to other men superior to himself ; and within these limits man and the lower animals occupy the same ground. But the lower animals have either no power, or at most a very restricted power, of *subjective* reasoning. Hence their aspirations end with the highest object presented to their senses. But man having a greater power of subjective reasoning, his aspirations do not stop when he no longer *finds an object* higher than himself, but carry him beyond the material world around.

In this aspiration towards a *subjective superior*, mind casts off its chains and assumes the mode of soul. Thus does man attain his ultimatum.

Potentia, which was "the beginning of the beginning," having, through its association with matter, become individualised in its highest mode, peoples with immortal souls the eternal realms of space, which is "the end of the end."

* "As the hart panteth after the water brooks, so panteth my soul after Thee, O God."—Psalm xlii. 1.

We must now retrace our steps and consider some of the most important details of the plan which I have sketched.

Professor Romanes has taken great pains to draw up definitions of REFLEX ACTION, INSTINCT, AND INTELLIGENCE OR REASON, which shall appear to be consistent with the recorded facts of natural history. These definitions I gratefully accept as, at least, sufficiently near the truth to form the basis of the succeeding arguments, because by doing so it will avoid much preliminary discussion of terms, and will enable us both to utilize the same stock of observed facts.

Professor Romanes says :—

"Reflex action is non-mental neuro-muscular adjustment, due to the inherited mechanism of the nervous system, which is formed to respond to particular and often recurring stimuli, by giving rise to particular movements of an adaptive though *not of an intentional* kind.

"Instinct is reflex action into which there is imported an element of consciousness. The term is therefore a generic one, comprising all those faculties of mind which are concerned in *conscious and adaptive action, antecedent to individual experience,* without necessary knowledge of the relation between means employed and ends attained, but similarly performed under similar and frequently recurring circumstances by all the individuals of the same species.

"Reason or intelligence is the faculty which is concerned in the *intentional adaptation of means to ends.* It therefore implies the conscious knowledge of the relation between means employed and ends attained, and may be exercised *in adaptation to circumstances novel alike to the experience of the individual and to that of the species.*"*

I think it is self-evident that on the first entrance of a living creature into the universe all its acts must have required "adaptation to circumstances novel alike to the experience of the individual and to that of the species."

Intelligence, therefore, must have come first. Our key-note, then, must be "Intelligence in the Van."

Therefore,—while accepting, as I have said, Professor Romanes' definitions,—according to my views *the order of events must be reversed.* Intelligence must come first, instinct next, reflex action last.

I proceed to show how I explain this reversal. We must begin at a stage in which the mind-mode of vital force in association with matter,—*i.e.,* an intelligent living entity—makes its *début* into "circumstances novel alike to the experience of the individual and to that of

* *Animal Intelligence.* By George J. Romanes, M.A., LL.D., F.R.S. 3rd Edition. Kegan Paul, Trench & Co.

the species"; and, therefore, is entirely dependent upon its "intentional adaptation of means to ends,"—*i.e.*, the "intelligence" of Professor Romanes. Being the first of its kind it could have no hereditary guides to voluntary action; although, of course, subject to all modes of force lower than the mind-mode.

Such an intelligent vital atom could not at first have any *habits*, and the area of its possible necessities of action for the attainment of its ultimatum would be infinitesimal. For simplicity of exemplification we may suppose that only one "intentional adaptation of means to ends" is essential to its survival—to the attainment of its ultimatum. This effort of intelligence it must repeat and repeat as long as it exists, and by this repetition of "intentional adaptation" the "means" will become more and more suited to the intention, and will require less and less intentional control to co-ordinate their operations. They will thus become more and more unconscious, and as the necessary machinery becomes more and more perfect in its capacity of automatic action, so will cerebration become more and more unconscious. In the end a machine will have been developed capable of performing a definite co-ordinate act with no more "intentional adaptation" than is requisite to work the otherwise automatic machine. This machine thus formed by the *habitual* "intentional adaptation of means to ends" will be hereditary, and the creature which inherits it will be possessed of *one instinct*,—a faculty capable of "*adaptive action antecedent to individual experience*,"—which will represent the habitual experience of its progenitor as regards the act which it is capable of performing. It will possess a machine capable of doing, with a minimum amount of intelligent guidance, that which in the progenitor could only be done by "intentional adaptation of means to ends" for each occasion. (See p. 16.)

To this extent it is evident that this second generation is better off than the first, for it has more capability of action with the same amount of mind. The area of its possibilities is thus increased, and supposing a number of such creatures to have been produced, the circumstances in which they live will be more complicated than those of their progenitor, and a second or third "intentional adaptation of means to ends" may be essential to their survival; and if these become habitual co-ordinate acts, as in the case of the first, the next generation will inherit three instincts instead of one, that is, three capabilities of action with a minimum of mind required for their guidance. If no more was essential to the attainment of its ultimatum we might thus find a creature rich in the power of instinctive action, but poor in

the power of "intentional adaptation of means" to any *new* "*ends*." It might have only enough free mind to work its instincts.

When we find such a creature — many examples of which are familiar to naturalists—we may conclude that its genealogy is very antique.

Now let us consider what will further happen to these co-ordinate machines, or hereditary instincts of which I have spoken. As, in the first case, the *repetition* of "intentional adaptation of means to ends" led to the development of a co-ordinate machinery, capable of performing the necessary act with a minimum of conscious intention, and thus led to the transmission of an instinct, so in the further repetitions of these instinctive acts will less and less conscious guidance be needed, until at last the machine will become completely automatic, containing within itself its own nerve-centre and all else that is requisite for its perfect independent action. It will then constitute a "non-mental, neuro-muscular adjustment,"—the essential of Professor Romanes' definition of a *reflex action*.

In this conversion of an instinctive action into a reflex action, mind is again liberated—as it was in the conversion of intelligent action into instinctive. Thus the creature which inherits one reflex machine and two instinctive machines, will have more intelligence to spare for further adaptive action than its progenitor had, who had three instincts and no reflex action. It is easy to see how this process may be carried on, so that generation after generation, even without any accumulation of force and accession of mind, will have more and more capacity for action under more and more complicated conditions of existence.

And if we add to this the accessions due to force-accumulation, which I have left out of the account, the area of possibilities is still further expanded. (See p. 6, "Accumulators.")

It is hardly necessary to say, but I may do so by the way to prevent misapprehension, that when I speak of a 1st, 2nd and 3rd generation, it is only for simplicity of diction. Any number of millions of generations may have existed before what I have called No. 1 passed into No. 2, or No. 2 into No. 3.

We have now seen how, with *Intelligence in the Van*, an animal capable of mental, instinctive, and reflex action might have been evolved from *Potentia;* and how, in process of time, with its increasing adaptation to the increasing area of its possibilities, it might reach a stage in which nearly all the acts necessary to its existence had been relegated, 1st to the class of Instincts, and 2nd to the class of Reflex acts: thus releasing mind for the control of the instincts and

of such new acts as may be required by circumstances which do not recur in sufficiently often repeated identical groups to become habitual; or, in the words of Professor Romanes' definition of Reason, "In adaptation to circumstances, novel alike to the experience of the individual and to that of the species."

Up to this point we can see no distinction between the highest creature among the lower animals and the still higher stage of development in the form of man.

But as I said (p. 10), "It was only when the mind-mode of vital force became associated with matter in the form of man that it could assume the soul-mode. . . . And at this stage an *impassable bar* was placed, once and for ever, between man and every other living thing."

I proceed now to consider the details of this bar.

We have traced the evolution* of an animal in which the mind-mode of force, which in the beginning was occupied in the conduct of the lower necessities of existence, has been, step by step, released from these humbler duties as they have been, step by step, provided for by subsidiary arrangements, until it is left free for the attainment of higher ends.

It is at this point that subjective reasoning enters the arena—mind acting upon mind within its own citadel—evolving "those internal states of thought or feeling of which the mind is the subject, opposed to *objective* which is applied to things considered as separate from the mind, and as *objects* of its attention. . . . That which is *subjective* in one relation may be *objective* in another. Thus *subjective* states of mind when recalled and dwelt on for the purpose of inspection or analysis become objective."—(WEBSTER, *Encycl. Amer.*)

Chief among the ordinary operations of mind are Discovery, Con-

* "It is impossible, then, for those who have the slightest respect for truth, to ignore the theory of evolution. Its expounders differ, as we shall presently see, in the scope which they ascribe to it; but though there are differences of opinion as to the range of the law, the fact of its being a law, a fundamental law, of nature, is no longer a matter that can be denied, or even doubted. The knowableness of God, if it is to be proved at all, must be proved upon the understanding that evolution is the method, or, at any rate, *one of the methods*, by which nature works. Any theologian who denies this, places himself by so doing beyond the pale of controversy. *Falsum in uno falsum in omnibus* . . . "—(Sermons preached in St. Peter's, Cranley Gardens, 1883-4, by the Rev. A. W. MOMERIE, M.A., D.Sc., late Fellow of St. John's College, Cambridge, Professor of Logic and Metaphysics at King's College, London.)

trivance and Invention. Discovery—which brings to light that which existed before but which was not known—is exercised by every living creature from the lowest to the highest forms, as, for example, in the discovery of food and habitation, and may be placed lowest on the list. Contrivance appears to require a higher mental effort than discovery, and is also seen through the whole of animated nature, as, for example, in their architecture.

Neither discovery nor contrivance necessarily involves subjective reasoning, although in their highest development subjective reasoning may be introduced. Contrivance is often mistaken for invention, and even in dictionaries "contrivance" and "invention" are stated to be synonyms. No doubt many so-called inventions are no more than skilful contrivances. The essence of contrivance is the planning how to put things together so as to attain some given end. It is when it goes beyond this and *introduces something altogether new* for the purpose of attaining the end in view that it becomes invention. And—although the border-land between the two may be very difficult to define in a given instance of the lowest form of invention and the highest form of contrivance,—there can be no doubt of the distinction when invention is exercised in its highest forms; and it is in them that subjective reasoning becomes an essential ingredient.

The *contrivances* of the lower animals have this great distinction from the *inventions* of man, viz., they are contrived for the use of the one individual contriver, or at most for that of some other individual, taking his place, possessed of the same contriving power; whereas the inventions of man are designed for the use of any number of other persons not possessed of the same inventive powers.

It has occurred to me that such an invention—that is a machine so invented and constructed—is the analogue of an instinct.* By

* "The Patent Automatic Knitting Machine, with ribbing attachment," is "so simple that it can be worked by the blind." "It knits all kinds of articles in wool, cotton, silk and merino—so simple that a child can work it with comparative ease; ten to twelve pairs of socks, or four to six pairs of stockings can be made per day by one person."

"The manufactories of Birmingham, which hold the first rank in the pin industry, are said to produce about 37,000,000 of pins per day! The machines are so perfect, that they cut wire into pieces of the right length, head these pieces, point them, polish them, sort them out, and stick them into papers all in rows: to such a pitch has our mechanical ingenuity reached! A machine of this kind, so far as pin-making is concerned, appears to have life, so rapid and precise are its movements."—(*The World of Wonders.*)

the mind of *one* individual a number of possible acts are mentally assembled and co-ordinated in such a manner as to attain a given end. The machine so conceived at first exists only in the mind, but when its necessary parts have been brought before the mental vision a sufficient number of times to make it complete and to enable the subjective machine to be contemplated as an object for imitation in a material form, it can be constructed either by the inventor or from the inventor's description; and having been so constructed under the influence of the mind of the inventor, it can be used by another individual possessed of no more intelligence than is sufficient to work the machine, perhaps by the turning of a handle, the winding up of a spring, the stoking of a furnace, or the like; and this machine can be multiplied a thousand times, by simple imitation, without any further exercise of the inventive mind.

Thus the mind of one individual is utilizable by thousands of other individuals with scarcely any mental effort. This invented machine is in all respects analogous to an instinct, which is, as we have seen (p. 12), a machine embodying the intelligence of one individual, capable of being worked by another individual with a far less amount of intelligence.

But the vast difference between an instinct and the machine invented by man, is this, that whereas the instinct is only an hereditary machine, and, therefore, can only be multiplied by lineal descent from individual to individual, the machine invented by man can be multiplied and multiplied in his own generation till it is diffused over the civilised world.

An instinct is a contrivance for liberating the mind of successive generations from those habitual acts which engaged the minds of previous generations, and thus leaving it free for the attainment of new ends. An invented machine is a contrivance for liberating mind by enabling an indefinite number of individuals to benefit by the mind of one individual without using their own, which is thus left free for the attainment of new ends; and, unlike instinct, it is independent of habit and hereditary descent; and even the mind that first invented the machine is liberated, after its completion, for fresh work.

It is impossible to over-estimate the power which, in this way, is attained by one animal to rise above every other.

But it is by the application of subjective reasoning to the invention of traditional speech, and of writing, that the animal is raised to

the proud position which has won for him the exclamation of the Poet :—

"What a piece of work is man! How noble in reason! How infinite in faculties! In form and moving how express and admirable! In action how like an angel! In apprehension how like a god! The beauty of the world! The paragon of animals!"—(*Hamlet*, Sc. ii.)

In the present day it can no longer be doubted that the lower animals have some means of intercommunication, which serves in them the purpose of speech. But there is no evidence to prove—and there is much evidence to the contrary—that any animal but man has the power of communicating information of what has not been presented to its own senses. There is abundant evidence to prove that the lower animals can and do, by some means, tell one another what they have felt, or smelt, or seen, or heard, or perhaps even what they have done. But there is no evidence to prove that any animal, lower than man, has the power to tell to a third individual what a first individual has told to a second, but of which the second has had no objective knowledge.

Man alone can claim the prerogative of gossip—that is of telling what he has been told on no other evidence than that of the teller! Gossip requires the power of subjective reasoning, and is the essence of what I have called *traditional speech*, or speech used to diffuse from individual to individual, and from generation to generation, the objective experiences of one individual.

The invention of traditional speech possessed by those accustomed to invent machinery—by which the intelligence of one individual could be utilized by others—naturally led to the invention of a machinery by which that traditional speech might be preserved, and by which the experiences of one man might be conveyed to others independent of personal communication:—by which mind might be liberated from the operations of memory and of directing articulate utterances of thought, and might thus be left free for the attainment of new ends.

Reading followed, as a matter of course, and the invention of printing came at last to carry the work to a further stage of perfection.

By traditional speech, by writing and by reading, the experiences and thoughts of one individual are capable of being diffused over the generation in which he lives to an unlimited extent; and each of the individuals to whom these experiences and thoughts are communicated may become a new centre from which fresh accessions of thought may spring, based upon these newly acquired possessions; and thus, in one generation, the conversion of vital force into its mind-mode may take

place to such an enormous extent that, at one leap, man is placed beyond the reach of any other living creature, and this leap is repeated by each succeeding generation and increased at a compound rate.

> " * * * A small drop of ink
> Falling like dew upon a thought, produces
> That which makes thousands, perhaps millions, think.
> 'Tis strange! the shortest letter which man uses
> Instead of speech, may form a lasting link
> Of ages. * * * * " BYRON.

Once arrived at the stage of man, but little more is done in the addition of new instincts. For, as I have shown, only so much of intelligent action is relegated to the class of instinct as is engaged in innumerable repetitions of exactly identical operations to meet identical groups of circumstances. And the more and more complicated and varied the circumstances surrounding the individual, the more and more will every act require a new exercise of reason or intelligence—"the faculty which is concerned in the intentional adaptation of means to ends. It therefore implies the conscious knowledge of the relation between means employed and ends attained, and may be exercised in adaptation to circumstances novel alike to the experience of the individual and to that of the species." (Romanes.)

From stage to stage of the evolution of living things from the lowest to the highest forms, the mind-mode of vital force is liberated and accumulated to provide for the higher necessities of intellectual life.

But as I stated at p. 10, "mind does not necessarily involve soul any more than vitality necessarily involves mind"; and notwithstanding all this liberation and accumulation of mind, man would still be but the highest of the lower animals, were it not for *Aspiration*, that attitude of mind which, as I have pointed out, is common to man and the other animals.

But when this attitude of mind—this ardent desire to attain some object more elevated than the individual—is associated, as in man, with a power of subjective reasoning, Aspiration, finding no objective superior presented to the senses, is directed to a subjective unseen superior and mind assumes the mode of soul. (See p. 10.)

At various epochs in the history of man this subjective aspiration has been assisted by objective aids in the form of prophets, angels, and the like, which have been shown to man for a brief space and then taken away.

By traditional speech, by writing and by reading, the records of these objective aids have been illimitably diffused and transmitted to assist

the subjective aspirations of succeeding generations.* And in the highest of these records we find the difficulty of aspiration towards an absolutely subjective superior helped by a suggested realisation of the idea in the objective form of a Father.

At page 12 I have attempted to show that the operations of mind only become capable of lineal descent in proportion as they are more and more frequently repeated in exactly similar acts, by which more and more perfect brain-machines are developed and co-ordinated —these machines being all that is capable of transmission from parent to offspring. And although, as I have pointed out, page 18, the extreme complexity of the conditions in which man exists calls for so many *new* acts of intelligence to meet *new* circumstances that the chance of any of them becoming so habitually identical as to be transmitted as instinct is very small; yet, to a certain extent, even the highest mental acts may become so customary to individuals and to communities as gradually to develop co-ordinate brain machines, for their more or less automatic performance; and in this manner they may become *instinctive* in successive generations. Hence we find the customs of peoples more and more difficult to alter as they are more and more ancient, and as these peoples have less association with others having different customs. That is to say, the more instinctive the people have become the more they resemble the lower animals in the difficulty of altering their habits and customs.

The great moral and social lesson to be drawn from this consideration is the vast importance of good habits; and, also, the importance of relegating to the class of habits all that we can of what we know to be good, and of thus liberating mind for the attainment of new ends at the same time that we transmit good instincts to our successors. It also suggests that it is folly to attempt to eradicate the manners and customs of nations at a single blow.

Even the attitude of aspiration towards a subjective superior, by which mind becomes soul, may, by habit, be made more and more instinctive by the transmission of such brain machinery as the habit of aspiration has developed. By traditional speech, writing and reading, that which would otherwise have depended upon the lineal transmission from one progenitor is diffused in each contemporary generation among thousands of progenitors, and by them to thousands on thousands of descendants. In this we may see a marked illustration of that

* "And ye shall be witnesses unto me . . . unto the uttermost part of the earth. And when he had spoken these things, while they beheld, he was taken up; and a cloud received him out of their sight."—(Acts i. 8, 9, *Rev. Version.*)

double natural selection which I pointed out in 1861: "according to my hypothesis the descent is determined by the conditions of existence, not only, as Mr. Darwin says, by selecting those forms of life most suited to them, but also by assimilating every generation to the conditions into which it is born, and thus favouring the characteristics on which its selection depends." (See p. 8.)

By traditional speech, reading, and writing, each generation is born into, what may be called, a mental atmosphere, favouring the characteristics transmitted by its progenitors. The effect of this double selection, as applied to the attainment of man's highest ultimatum—the soul-mode of Potentia—must be inconceivably immense.

According to the views which I have now attempted to project, the position of THE MATERIAL UNIVERSE IS INTERMEDIATE BETWEEN POTENTIA IN ITS PRIMORDIAL STATE OF DIFFUSION AND ITS FINAL STATE OF INDIVIDUALISATION. From the birth of the first atom of matter, through all the wondrous forms in which it is presented to the senses of conscious beings, including those beings themselves, it is but the medium for the attainment of the eternal ultimatum of man, "when the spirit shall return unto the God who gave it."—(Ecclesiastes (or Koheleth) xii. 7.)