A HISTORY OF THE IDEA OF EVOLUTION[1]

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THE task I set for myself in the next hour is to expound for you the history of the idea of the evolution of life. Ideas are born; they develope; they are transformed; but they never die. The history of ideas is the history of the race. They are the real events. Let them be never so new or strange, they have their roots in the far past with a continuity of growth. That is the only justification of history.

Man has always had a curiosity about himself, and about the world in which he finds himself. His earliest observation must have been one of likeness and dissimilarity between objects. Out of that would arise categories; and as he subdivided his categories, he must have observed that insensibly one form merged into another. At that moment the idea of evolution was born. Eventually it developed into a theory which attempted to account for the whole universe and all its contents.

For many primitive ages the subject would excite only a simple curiosity. Denizens of the earth had other things to think about; but there never was a tribe with an intelligence so lethargic that it was without a theory of some kind to account for its own existence. Those theories are the material of mythology, superstition, folk-lore, and tradition. Even down to our own time naturalists were content with their categories, and willing to accept the account of creation as they read it in their sacred books. But the moment arrived when the material accumulated by the fossilists, the botanists, the zoologists, the anatomists, the chemists, the physicists, was so vast that the categories became only a little less numerous than the objects themselves. The philosophers then came upon the scene in search for a principle that would classify and connect all categories into one coherent and intelligible simplicity.

In an obscure way the philosophers had always been at work, but they were inevitably driven back to an evolution of some kind. Empedocles, who attributed all forms of life to the operation of the four elements, earth, air, fire, water, under the influence of two innate forces, attraction and repulsion, was not the earliest of the evolutionists; nor was Aristotle, who classified all animals having

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backbones as blood relations. Francis of Assisi, in a much deeper sense and by a profounder intuition, declared that we are all brothers to the beasts of the field, the birds of the air, and the fishes of the sea. Goethe, more a poet and less a saint, leaped to the specific conclusion that all created forms are cousins sprung from a common stock, and that their diversity is caused by their environment, the eagle by the air, the seal by the sea, the mole in the earth. Linnaeus was neither saint nor poet, but a scientist even in the modern sense. Towards the end of his life he began to suspect that all species arise by a process of gradual variation.

It was not until our own day that these speculations aroused anything more than the mildest interest. Then there was a sudden blazing up, and—as is usual in the public mind which is ignorant of history—the conflagration centred about the person of one man. This man was Charles Darwin, who in 1859 published his celebrated book which bears a title explanatory of the contents,—"On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life." It is a dull book. Few persons now living have read it, and none but the most hardy will venture upon the labour. It contains a vast array of facts, which completely proved what any gardener or breeder already knew.

His own grandfather, Erasmus Darwin, who was born in 1731, showed by numerous examples the sequence of variation and environment. "The world has been evolved," he wrote, "not created: it has arisen from a small beginning, and has increased through the activity of the elemental forces embodied in itself." Lamarck in 1809 had already declared "that species were an illusion produced by the shortness of our individual lives, and that they were constantly changing and melting into one another and into new forms."

Before the year 1780, Buffon had published twenty-five volumes on natural history, all pervaded by rudiments of the evolutionary idea; and in 1830 Cuvier created some interest in the French Academy by suggesting a multiplicity of original species, in opposition to St. Hilaire who contended for one. A penetrating critique of this continuity of doctrine is contained in the preface by Mr. G. B. Shaw to his second last play. If I were quite sure you had studied and understood that preface and play, I should have spared you much of this exposition.

This controversy about evolution was the principal event of the nineteenth century. In magnitude it is comparable only with the controversy over Christianity in the first. The causes were

somewhat similar. It was a contest between the spirit and the word. The evolutionists were not spiritual above all men; but their opponents were under the strictest bondage of the letter, like the Pharisees of their own book, taking their stand upon the written, as opposed to the living, word. They did not understand the writings which they held sacred. They did not understand that their book is written in terms of art; and art has a language of its own, which must be learned. That book, their opponents reminded them, contains several accounts of the creation of the world; these accounts differ among themselves; if read with strict literalness, they could not all be true; they might all be literally false. It was suggested to them that if they would learn of the creation of the world they must seek where that account is written,—in the world itself, and not alone in any book. The traditionalists had assumed too much, and the things that could be shaken passed away.

These writings, I may add, were confused by glosses made upon them. The dogma of the eminent Lightfoot, Vice-Chancellor of the University of Cambridge, that man was created on October 25th, 4004 B. C., at nine o'clock in the morning, became in the minds of many of equal authority with the more general affirmations in the text. We are less credulous now. If a similar statement were made by our own Vice-Chancellor, Sir Arthur Currie, we should require, at least, that it be confirmed by Mr. E. W. Beatty, the Chancellor, before we believed it. It is all an affair of evidence, and the evolutionists in time became bold enough to deny the dogma.

Those alone who passed through that period can understand the havoc wrought in the minds of men. The fabric of their dearest beliefs appeared to be dissolving, and the evolutionists offered nothing in exchange. They had nothing of the kind to offer. Their business was quite otherwise. This disorder extended into every individual life. Families, churches, societies were divided. Students in universities strove to reconcile old beliefs with new facts which could not be evaded even whilst they were being denied. The world was in panic.

The public mind can entertain only one idea at the same time, and that idea is the more disturbing because in its extreme form it is usually grotesque, a false simulacrum of the reality. Evolution then became a kind of witchcraft, its familiar a monstrous monkey. Many of those who went by the name of evolutionists were equally ignorant; the worst of them had a malicious joy in discovering, as they supposed, a scientific warrant for their inherent atheism. This university never yielded to the evolutionists' authority in a

living matter arose upon the earth from non-living matter at a time when electrons had joined to form atoms, and atoms molecules, when by radiation the mass had become cool enough to yield water in which colloid carbons are soluble. By this theory mind is traced back to the earliest physiological reaction.

Forty years ago the student of evolution was referred to Thomas Henry Huxley. The student of the modern idea can do no better than follow, as I have done, his collateral descendant, Mr. Julian Huxley. This most modern biologist is firm in the belief, as I am, that all matter, whether living or not, is associated with something of the same general description as mind in the higher animals; that, in his own words, there is one fundamental substance which has not only material but "mental" properties. To this the term "world-stuff" is applied. The term "matter," he protests, will not do, "since physicists and chemists have moulded the word to their own uses, and they have not learned to measure the mental element it contains."

Mr. Bertrand Russell, who also has an admirable gift of exposition, is more specific in his description of this "world-stuff." He affirms, "though not with complete certainty, that all matter consists of hydrogen nuclei and electrons, which are therefore the only 'elements' in the strict sense of the word." "Whether these two will ultimately prove to be modifications of some one more fundamental substance," he finds it "quite impossible to say." "It may be found," he concludes, "that the aether is, after all, what is really fundamental, and that electrons and hydrogen nuclei are merely states of strain." Finally he declares "that no physicist really means to assert that an electron is a little hard lump of matter." It may, he suggests, be something more analogous to a noise, merely a disturbance in the aether.

Mr. Russell likens the atom of helium to a revolving wheel of four spokes and a short axis, every spoke having at the end a hydrogen nucleus, and the axis at each end an electron. That would be a contrivance like a "jack-stone." I present to you a handful of these familiar objects as a concession to the scientific demand for the concrete, and also to suggest that nothing is so false as an illustration; for an atom cannot have any essential resemblance to a jack-stone. I could have produced a more elaborate contrivance, but it would not make the matter any clearer, and the expenses of the university for scientific apparatus are already heavy enough. I present to you also an object sent to me by a famous physicist in another university. He uses it to illustrate an electron or a planet. He furnished me with a formula showing, if I read aright, how

many cubic millimeters of pressure to the square milligramme it will endure. It seems very hard, and measures exactly one centimetre in diameter. My colleague, the professor of botany, thinks it was once a ball-bearing in some machine. I have now by the word alone created a jack-stone and a planet, or rather caused them to emerge into your minds without the intervention of your eyes. The man with the mongoose may have been right after all.

You see now, I hope, the position to which I have led you. All life is one. It is continuous and uniform,—with unity and continuity, as the philosophers say. And yet, we must be careful even in this assumption of continuity, although it is the essence of the Newtonian doctrine, reinforced up to a certain point at least by the modern idea of relativity; for the still more recent observation of the world of electrons is disturbing. In that world the electrons appear to move and display energy, not continuously, but by a series of unpredicted jumps; and this process by which an electron passes from one orbit to another is, as Mr. Russell reminds us, apparently quite contrary to every law in the Newtonian conception of physical occurences. Indeed the new dynamics of the atom seems to confirm Einstein's surmise that neither time nor space itself is continuous. Certainly he has destroyed the established conception of mass as the quantity of matter, for mass according to his doctrine is absorbed into energy and is inconstant to that extent. I am not a scientist, but merely an historian using scientific ideas for the development of my theme; and yet I feel a certain temerity in even mentioning phenomena which were first described in an adjoining lecture-room by my one time colleague, Professor Rutherford.

Applied to life, if life be one, the terms "lower" and "higher" are then no longer terms of mutual exclusion, of contra-distinction. They are merely terms of degree and quality. Life is the final expression of the universal Will. That is the inner meaning of evolution. To live according to this Will is the unconscious desire of the giraffe which achieves a long neck in order that he may not perish. That "this will be done" in himself is the final end to which every rational human being aspires daily in order that he may not perish too. This is the "kingdom" whose coming is desired, a kingdom in which that Will shall have been completely achieved. Giraffes and men who tried to live without conformity to, or in transgression of, that Will have come to a bad end. Their reward is death. Evolution in so far as they are concerned is at an end.

By this universal formula of the emergence of the universal

Will, every problem in biology is solved,—the problem of good and evil, of ease and pain, of right and wrong, of sin and penalty, of necessity and freedom, of riches and poverty, of life and death. These problems, after all, are fundamental in biology, for I do not conceive that the science of biology ends with the life of the oyster. Indeed it is probable that if you really understood the oyster, you would understand much else besides; still more probable that, unless you understand this "much else," you cannot understand the oyster at all. You might be oyster-men: you will not be biologists. One of those special biologists, known as a poet, discovered long since what the real problem of the biologist is:

> Flower in the crannied wall,
> I pluck you out of the crannies,
> I hold you here, root and all, in my hand.
> Little flower—but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.

You will observe that the poet has introduced into our discussion an important word that up to the present I have deliberately avoided, and I must stop long enough to remark that biologists are beginning to suspect that without this word their terminology is impoverished. It is of ancient lineage. The Greek biologists knew it as Logos, and to those same Stoics a very famous half-Hebrew half-Roman biologist expounded the essence of that power in terms which for clarity and completeness are yet unexcelled. In it, he said, we live and move and have our being. Those of you who are unfamiliar with the reference will find it in the library. I may remark further that in these days a scientific man may be as religious as he likes, and no aspersion cast upon his science; and a religious man may be as scientific as he likes, and no aspersion cast upon his religion. It was not so in Sir William Dawson's time; but he would find himself quite at home if he lived to-day.

You will observe, finally, that I have introduced still another new word—religion. It need create no alarm. The idea is quite scientific. Let my friend Cowper Powys expound it. Every living being, from the parasite that lives upon the bacillus to the student that lives upon the university, looks out upon the universe through eyes that enlarge and increase in the process of evolution. These media of consciousness are sensibility, sensation, desire, emotion, passion, will, conscience. When these eyes look out in different directions, there is discord and consequent death. When all these eyes look forward, and give guidance in conformity with

the general Will that governs, there is peace and life. This life then moves in the spirit of religion. The change is so remarkable, it is commonly described as a new creation. The human mind is the largest field for the progress of evolution.

At times it does happen that there are persons of extreme perception to whom this Will is especially revealed. The One through whom this Will was most especially revealed found his final authority in this: "I am come that men might have life, and that they might have it more abundantly."