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## The Status of Evolutionary Theory

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The question we are discussing today, if my understanding is correct, is whether the doctrine of evolution has been conclusively proved or whether it must still be regarded as simply a scientific hypothesis, that is to say, one of the possible explanations of the diversity of the organic world in the past and in the present.

Some preliminary clarification is necessary. The question as I have framed it is, I think, in several respects ambiguous. To begin with, the methods of proof and the degree of certainty attainable in the various departments of science, taking this word in the broad philosophical sense, differ very considerably. We cannot expect to prove a proposition in natural science in the same way and to the same degree as we can prove a proposition in metaphysics or mathematics. The natural sciences have for their object the material world. Our knowledge of the material world entails continuous contact by means of our senses. Consequently, direct observation is an essential feature of the development of the natural sciences and an essential element in building up the proofs of its propositions. The farther we have to depart from direct observation, the less certain our propositions become and the more speculative they become, taking the word "speculative" not in the true philosophical sense, but as indicating guesses and hypotheses corresponding more or less to the facts of nature and put forward as possible explanations of these facts.

Therefore, while we cannot ask in a proposition concerning evolution the degree of certainty we expect in mathematics or metaphysics, there is a certain minimum we must require before we can agree that the proposition has been proved.

The word "evolution" is also an ambiguous term. It would indeed be quite a task to list all the senses in which it has been used.

However for the purpose of this argument we may distinguish roughly two meanings of the word "evolution." The first is the meaning given to it by the old founders and propagandists of evolutionary theory : which is, the progressive development of living forms from the lowest level near or identical with, the inorganic level, to a complex or higher level which they all agreed was reached in the human species. I think practically all of these fathers of evolution had in their minds the philosophical concepts of degrees of being exemplified in their discussions by the use of the words "lower" and "higher." They had these ideas in their minds in spite of the fact in general they repudiated philosophical doctrines. The mere idea of complexity does not convey what they were driving at. A heap of stones is more complex than a single stone, but it is not higher in the

sense which the evolutionists used this word. Thus the classical idea of evolution is that of progressive development. The other way of interpreting the word "evolution" is to regard it simply as equivalent to the word "change" or "motion," eliminating the idea of direction and particularly of progress. This is the viewpoint taken by such modern evolutionists as Étienne Rabaud who denies emphatically that it is proper to speak of higher or lower or of increase in adaptations or of biological progress. Organisms change under the influence of the environment and that is all we can mean or should mean by the word "evolution."

This distinction is of course only a very rough distinction. A great deal could be said about this point. However, the two points of view thus crudely distinguished must be kept in mind when we are considering whether evolution has been satisfactorily proved or not.

Now if we are asked whether evolution in both these senses is an objective reality in the organic world, we must answer that it is ; but we are not thereby agreeing with the fathers of evolutionary theory and their modern descendants. Evolution in the sense of progressive development is objectively evident in the ontogenetic development of organisms. A human being begins as an organism which must be regarded, from the philosophical standpoint, as low in the scale and must be considered, from the anatomical standpoint, as extremely simple and it progresses by an orderly and ordered development to a very complex condition in which powers which the philosopher can justifiably call of a higher level are manifested. This is true evolution which we see going on before our eyes. Evolution in the second sense of change is equally obvious and we see it continually everywhere. This change seems to be random or non-directional. The evolutionary geneticists deny, in general, that the mutations they regard as the basis of evolution are *progressive*. They assert, in fact, that they are non-adaptive, except by accident. If there is, in fact, a development in the sense of better adaptation to the conditions of life, this is therefore due to a succession of accidents. The geneticists of this school speak of "pre-adaptation" ; but this does not indicate any positive connection between the situation that must be met and the mutation that meets it ; the "pre-adaptation" is so, simply because a circumstance arose, by chance, in which the mutation was useful. It is clear that there is no real pre-adaptation in such cases. Nevertheless, the geneticists (e.g. Patterson and Stone, in *Evolution in the genus Drosophila* (1952), p. 234) maintain that the "visible morphological differences between species" are adaptive, which means that the most minute characters mentioned in a specific definition are positive conditions of its existence.

Evolutionists like Julian Huxley and G. G. Simpson assert that in man the evolutionary process has produced a being that is unique in that he is capable of purposeful actions, for which he is responsible

and yet affirm that the evolutionary process itself is entirely purposeless and that man was engendered by material forces alone. This is called by Julian Huxley "a glorious paradox." It appears rather to be simply a contradictory proposition. To be truly responsible, a being must be the source of its own action and thus, in so far as it is responsible, independent of the material world and material forces. If it is not, then its action is determined, in the last analysis, by these forces ; and its liberty, on which its responsibility depends, is an illusion, as the old materialists — more logical than Huxley and Simpson — had always maintained. Whereas the Aristotelian recognizes in all things a principle of finality and a principle of randomness or non-finality, so to speak, Huxley and Simpson admit in man a principle of finality, but exclude it from the rest of the universe. The impression one gains from the writings of the evolutionists of this school, is that they have lost the power to resist certain evidences, have found no way of reconciling them with certain other beliefs to which they are attached but have decided to make the best of a bad job.

Now I think it is right to say that the intensive and extensive study that the modern geneticists have made indicate on the whole that there is an order in the changes in the sense that their characteristics can be expressed in general laws. This fact certainly does not suggest that the organic world is simply in a state of flux ; it rather suggests, like the facts of ontogenesis or individual development, that the changes are regulated by certain specific principles. Looking at it in another way, we might say that they suggest the essential soundness of the Aristotelian view that every material thing is composed of a principle of specificity and stability and a principle of non-specificity or change which the Aristotelian calls "form" and "matter." As the mediaevals put it, the material thing is *ens mobile* : something essentially changeable. Anyone who says that organic species are absolutely fixed is therefore departing from the Aristotelian viewpoint and interpreting nature in terms of platonism. He is interpreting it as a collection of pure unchangeable forms, whereas the Aristotelian sees it as a collection of forms immersed in matter in which there is a possibility of definition provided we do not attempt to make the definition too rigid and unalterable. On the other hand, if the entity of material things is determined and governed by a specific principle then it is clear that they will not of themselves tend to be other than they are, changes will in general occur within the confines of the type and forces that tend to push the organism outside the type will simply be lethal to it. It is therefore difficult to accept the view, expressed by P. Leonardi, that there is in an organism an *inherent evolutionary tendency*.

As Aristotle said long ago, art imitates nature and we can perhaps best understand the problems involved in the idea of evolutionary change according to the classical theory of the founders of the doctrine

if we consider machines which resemble organisms in that there are heterogeneous assemblages of parts whose activities converge toward a certain specific end. We can readily see without any elaborate argument that random changes in the disposition of the parts of any machine and particularly of complex machines, like typewriters or microscopes, are not at all likely to have the result of transforming the assemblage into an entirely different machine directed toward some entirely different end. For example, random changes in the disposition of the parts of a typewriter are not likely to transform this into an adding machine. They will simply transform it into a broken down or non-functional typewriter ; in other words, into a heterogeneous assemblage of which the parts do not converge toward any particular end. This corresponds with our experience with living organisms. If we attempt to deflect the course of development of an animal, we do not produce a different species ; we merely produce a monster or kill the organism. As the geneticists have shown, mutations are in the majority of cases not adaptive but pathological or lethal. The data of genetics, says the great zoologist Caullery, do not constitute a basis for the classical evolutionary doctrine. Attempts have been made to find proofs of evolution in the data of comparative anatomy and in embryological development but, to my mind, these proofs are entirely worthless and do not really merit examination. There is of course plenty of evidence for variation or in other words for the idea that we cannot define species in the purely Platonic sense, but there is no satisfactory evidence for the doctrine of evolution as it was put forward by the founders of the doctrine and their modern disciples.

Since nothing that can be reasonably regarded as a real proof of evolution can be obtained from the study of living forms, it is necessary to turn to the geological history of living organisms. However, we must note first that we really cannot use the word " history " in this connection. History is a human product. It depends on the existence of documents or of oral tradition and or, in other words, on a record of events made by other human beings. Where such a record does not exist we cannot really speak of history. Now though the phrases " geological history " and " palaeontological history " are commonly used, these are not histories in any true sense. There can be no history concerning the object of these sciences because there have been no witnesses of the events with which they deal. From the data they have collected, the geologists and palaeontologists have attempted to construct a history or at least a chronology of the events that have occurred in the history of the earth. To what extent they have been successful is a matter of opinion. Geologists have come to a pretty general agreement about the order of the main groups of rocks and this is perhaps a sign that the arrangement has a reasonably good scientific basis. However, they seem to admit

that the order of the fossils is based on the rocks, while the order of the rocks is based on the fossils so that there is a certain circularity about the type of argument used in geology. There are a few geologists, admittedly unorthodox, who regard the standard geological arrangement with great scepticism. They say that the strata which are currently regarded as chronologically the earliest just happen to be the ones the early geologists found at the bottom when they first started to work in a certain particular area and that if they had started work in another area, they would have chosen another series as the lowest. They allege furthermore that the order of the fossils is not something which has been imposed by geological data but that it is derived from an *a priori* idea as to how the organic forms should appear in nature, this idea in turn being based on deductions from embryological development. They say also that there are many cases in which the order of the strata does not correspond to the classical order and that the explanations put forward to get rid of these difficulties are not at all plausible. I do not pretend to assert that these objections to orthodox geological doctrine are decisive, but I do think they are sufficiently serious to make us hesitate about the idea that geology can present us with what is really equivalent to a historical account of the appearance of organic forms on earth. This feeling, I think, is reinforced by the procedures of the geologists and palaeontologists in regard to the descent of organisms and particularly perhaps with regard to the descent of man. There are hardly two palaeontologists who are in agreement on this matter and hardly a year passes without some palaeontologist coming out with an entirely new theory in regard to human origins. The reason for these discordancies must lie in the incoherent and fragmentary character of the data which is of such a nature that a variety of plausible but inconclusive interpretations can be placed on it.

Another very serious difficulty which was for long kept in the background by the exponents of evolutionary theory in the belief that it would disappear in the course of time and also perhaps because a full statement of it would have made it difficult to produce conviction in readers or hearers, is the discontinuity of morphological types in the geological strata. Now that the early enthusiasm for the classical geological doctrine has somewhat worn off, more and more attention is being paid to this difficulty. If we take a group like the insects, we find that the sub-groups — the orders, the families and even in general the genera — appear suddenly in the geological strata and are not connected by series of intermediate forms showing the gradual transition that the classical evolutionary theory requires. The palaeontologists have tried in a rather simple minded way to get around this difficulty by calling these groups of apparently independent origin, cryptogenous, meaning that we do not know where they started though they probably started somewhere. However, if we

take the facts as they stand, the facts are that the groups appear suddenly in the strata and we have no reason therefore to say on scientific grounds that they appeared gradually. If organisms were amorphous and did not present co-ordinated morphological adaptations the case would not be so serious, but, as I have already said, an organism does resemble a machine in that it is a heterogeneous assemblage in which differing parts contribute by their different actions to the same end which is subservient to the needs of the organism and it is extremely difficult to conceive how transitions between such co-ordinated types could take place. Still more difficult is it to imagine that such transitions could occur as a result of purely random variations in the organism or under the impact of random variations in the environment. Authors like Caullery and others freely admit this difficulty and evolutionists like Rabaud, as I have already said, attempt to get around it by arguing that the idea of co-ordinated adaptations is an illusion.

Some of the more recent evolutionists, like Simpson, appear to accept the evidence that types appeared suddenly and yet admit that they present co-ordinated adaptations, which, nevertheless, arose by a purely random process. The difficulty of maintaining simultaneously these discordant propositions is perhaps not much greater than in the system of gradual long-term evolution. Still, it is more apparent and the fact that the modern school fails to perceive it shows how far their philosophical ability has declined in comparison with their Victorian ancestors.

To the philosopher, the subject has a somewhat different aspect and indeed a profoundly different aspect. Contemplating the assemblage of living creatures, he finds that they display not merely material differences but formal differences and what may be called differences in that they represent different points in the scale of being and furthermore that between these points a transition under the influence of random material factors or through the efforts of the organism itself are strictly impossible. Therefore, if we start with the assumption that evolution has occurred and that there has been no matter in how discordant or irregular a manner a rise from a low ontological level to a high ontological level, this must be due to the action of factors which do not form part of the physical world. Therefore, we must invoke the action of external intelligences of the type that the classical philosophy has always considered to be part of the universal hierarchy. Only through the action of such intelligences can we conceive the transitions which are necessary for a process of progressive evolution and only in this way can we explain the abrupt transitions that palaeontology shows us. This I understand to be the view of Charles De Koninck.

I will freely admit that this interesting and valuable idea eliminates many of the difficulties I find in the doctrine of evolution considered

at least from the philosophical standpoint. However, I do not think it is an idea that would readily be accepted by the associations for the advancement of science or by orthodox biologists at the present time. "There is neither need nor excuse," says G. G. Simpson,<sup>1</sup> "for postulation of non-material intervention in the origin of life, the rise of man, or any other part of the long history of the material cosmos." Indeed, according to this author, evolutionary change "is not progress in a general or objective sense and does not warrant choice of the line of man's ancestry as the central line of evolution as a whole." In any event "man is the result of a purposeless and materialistic process that did not have him in mind." The views of this author are probably representative at the present time and, if this is true, we cannot expect biologists in general to accept the idea that evolution is a directed process, much less a process directed by immaterial intelligences.

Furthermore, I do not see any particular necessity to invoke this idea unless I have been convinced by the scientific data that some kind of progressive evolution has really occurred and to my mind the data do not impose this idea. Personally, I think the value of Professor De Koninck's view is that it frees us from the accusation that we refuse to accept evolution as a fact because of preconceived religious or philosophical ideas. If we can escape from this, we also escape from the compulsion to accept evolution in the classical sense as a fact. If we can reach this point, then we can begin to look around for other explanations of the diversity of organic form and of the various facts that have been regarded as inexplicable except on the ground of evolutionary theory. It seems to me that this would be extremely beneficial. Surely all explanations of organic diversity have not yet been found and surely there is room for original thought and research on this matter. In my own view, the developments in studies of morphogenesis from a physical and chemical standpoint, that is to say from the standpoint of the positive sciences, may eventually clear up many of the problems which are now solved only in purely verbal terms by the application of evolutionary doctrine.

However this may be, I hope that what I have said is sufficient to show that while the doctrine of evolution has certainly been fruitful in many ways and while it is an interesting and plausible doctrine, the facts at our disposal do not oblige us to accept it as a truth and that the most reasonable scientific attitude and the attitude most likely to lead to scientific advancement is to keep our minds free and continue to adhere to evolutionary theory, if we wish to do so, merely as a theory. My view, therefore, is that the doctrine of evolution does not refer to a fact but is merely a hypothesis.

W. R. THOMPSON.

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1. *The Meaning of Evolution*, revised and abridged edition, 1952.