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DARWIN'S ARGUMENT

Long before Darwin's time men had speculated upon the possible evolution of one species or one type of animals from others. Even if we leave out of account the suggestions of other eras of thought, such as those of the ancient Greek epoch or of St. Augustine in the early period of Christianity, and confine ourselves to the unitary development of Western thought which started with the Renaissance, we find numerous thinkers who advanced evolutionary theories. Prominent among these were Erasmus Darwin, Lamarck, and Robert Chambers. The merit of Charles Darwin, however, was twofold. First, the facts themselves assumed a new form in his hands. As presented by his predecessors, they had provided a legitimate basis for speculation. His industry and patient reasoning piled and shaped them until they formed a chain of circumstantial evidence so cogent that but one conclusion was possible. And, secondly, he provided a theory to account for the facts and the conclusions drawn from them, and a theory which in its broad lines was seen at once to satisfy all the requirements made on it. That is to say, whereas the theories advanced by earlier evolutionists had been either vague to uselessness or at variance with biological knowledge. Darwin, at the same time as he made inevitable the conclusion that evolution had occurred, provided a plausible and reasonable explanation of the mechanism by which evolution could have been brought about.

"Only a Theory?"

What the evidence was which he collected in such overwhelming battalions I have attempted to outline in my first article. He marshalled it and showed that all of it was consistent with the idea that the various forms within a group had developed or evolved from some common ancestral form, while a great deal of it was inconsistent with tho only other theory which had been put forward to account for the facts-namely, the theory that all the hundreds of thousands of different existing species had been created as they are, once and for all by a divine fiat. Indeed, for much of the evidence no other theory seemed possible than that of evolution. Especially was this true of the succession of related fossil types in the rocks of one area, and of the existence in embryos of higher animals of organs like gill-slits or notochord now found in the adults of lower types from which the higher forms could he presumed to be descended.

People sometimes talk of the theory of evolution as "only a theory." It is "only" a theory in this sense- that no one has yet watched all the stages by which one species is produced from another species or one group from another group: and this, of course, is chiefly- a matter of time, since evolutionary processes appear to demand centuries or millennia instead of years or decades. But a scientific theory, in the accepted and proper sense of the term, is (as

opposed to a mere hypothesis) an attempted explanation which not only satisfies the known facts but enables us to prophesy other facts, and does so better than any other explanation that has been advanced.

Later Confirmation.

This is very much the case with the theory of evolution. Generations of biologists have been digging up facts all over the world since 1859, yet no single one of these has been hostile to the theory of evolution. Many of them (specially the detailed studies of fossils and the proof of the chemical similarity of the blood of animals which the evolutionist claims as closely related) support it more cogently and in greater detail than those which Darwin had at his command. And many of the facts have been unearthed because the evolution theory made us suspect that they should be there if search were made- for instance, the discovery of extinct men and ape-men in varying degrees intermediate between modern man and the higher apes.

Let me repeat that not only does it account for the facts better than any other theory, but that no other theory has ever been advanced which is not immediately and conclusively negatived by large bodies of known fact. In this way evolution is as much a fact as that mountains have been raised by foldings of the earth's crust, deep valleys carved out by erosion, and islands like our own separated from the mainland by gradual subsidence. The evidence in both cases is circumstantial, not direct; but it is none the less conclusive.

Darwin’s Argument.

The new method which Darwin advanced to account for evolution was what he called natural selection. The following was his line of argument. If we look at the domestic breeds of one animal we shall often- as with dogs- or pigeons for instance- find them so different from each other that a systematist unacquainted with the facts would classify them in different species, genera, or even families. This diversity has been brought about by the artificial selection of man in a few centuries or at most millennia. If we can find any selective process at work in nature it would have whole aeons in which to work, and could account for the diversity of animal and plant forms, for the beautiful way in which they are adapted to their mode of life. and for the fact that improvement accompanied by extinction of less satisfactory types has taken place during geological time. Now, as Darwin proceeded to point out, this selective process must exist since it follows automatically from the following known facts. First, that variation are constantly occurring in all directions in organisms; secondly, that certain kinds at least of these variations are inherited; thirdly, that in all species even the slowest-breeding; more young are produced than can survive.

This last fact must lead to a struggle for existence; this will lead to a survival of the fittest; and this- with the aid of the first two sets of facts, to a progressive hereditary alteration of species- in other words, to evolution.

Acquired Characters.

Other explanations of evolution have been offered. The only ones that demand serious consideration are various modifications of the original Lamarckian hypothesis, which assume that the effects of use and disuse, the effects of training, or the direct effects of external environment accumulate in the race- in other words, that acquired characters are inherited. For this, however, no conclusive proof has ever been offered. Weismann showed on what unsatisfactory evidence the accepted belief in the process rested. Later work, such as that of Kammerer, has not yet been accepted because so far no other scientist has been able to confirm his results. It is highly probable that in certain cases we shall find outer agencies affecting the germ plasm; but it is to all intents and purposes certain that neither the important large steps in evolution nor the fine details of adaptation of organs can have been accomplished by this means.

The key to the problem remains in the study of variation. Variation of evolutionary value starts in the hereditary constitution, not in the modifications brought about by the effects of the outer world or of use and disuse. But what causes this “spontaneous” inner variation? That is one of the greatest of the unsolved problems of biology.