Education by Wireless

W.E.A. Lectures on Evolution

SINCE times as remote as the fifth century B.C. philosophers have propounded theories to account for the marvellous diversity of forms which constitute the fauna and flora of our globe. Such hypotheses may always be grouped either as theories of creation or theories of evolution. According to the former, chief amongst which are the theory of Special Creation founded upon the literal interpretation of the first chapter of the Book of Genesis, and the theory of Catastrophism proposed by Cuvier, all living species and plants and animals were created separately, almost simultaneously, and independently of each other. On the other hand, all the numerous theories of evolution attempt to explain the distribution and existence of the organisms comprising the fossil and modern faunas and floras by the assumption that life has gradually unfolded and branched from an original simple primitive form which came into existence—we know not how—soon after the earth became habitable for life.

The first hazy theories of evolution were put forward in very early times by the Greeks, but it was not until the later part of the eighteenth and the beginning of the nineteenth century that the subject was dealt with scientifically, while Charles Darwin in his "Origin of Species" (1859) was the first to gather together a really formidable mass of evidence in its support. Since that time the researches of hundreds of investigators, zoologists, palaeontologists, and botanists, have revealed such an enormous number of facts which cannot be explained in any other way that it is probably safe to say that every scientist of note agrees that evolution must have taken place in the past and is slowly proceeding on its course to-day.

In these four short articles it is intended to disregard the controversy between scientist and layman as to the existence or otherwise of such a process, but, assuming that the case for evolution is established, to consider the much more interesting question of the mechanism by which this process of growth and branching of the tree of life proceeds, and the laws which govern it. What are these evolutional changes and what is the driving force behind them? These are vexed questions over which there has been much controversy, and it is to such differences of opinion that anti-evolutionists really refer when they state that scientific authorities themselves disagree widely on the subject of evolution.

Before considering the mechanism of organic change, three fundamental factors, all having an important bearing on evolution, should be emphasised. These fundamental factors are Variation, Heredity and Isolation, and their operation is admitted by every biologist and geologist.

The basic requirement for evolution is undoubtedly variation, for all must admit that if there was no such factor—i.e., if the different individuals of the same species were all identical with one another—then any such species must remain unchanged until extinction, and from it no new species could arise. It is a matter of common knowledge, however, that no two human beings, for example, are exactly alike; and the same thing applies to a greater or less extent to all other species of living things. It is in such variants from the normal conditions of the species that the raw material for evolution is to be found.

In contrast with variation, which may be regarded as the progressive factor in evolutionary change, is the conservative factor of heredity which is just as much an established fact as variation, and by which the offspring tends to have exactly the same character as the parent. Now it must be remembered that evolution implies a change gradually taking place in a race of organisms, and therefore changes in an individual produced by variation can have no evolutional significance unless they can be transmitted by heredity. Heredity is an extremely complex subject which is as yet only partially understood, though the work of Mendel, Weismann, and others, has done much to elucidate its problems. Theories of heredity—such as the famous theory of Mendel—should not be confused with theories of evolution, though they are frequently quoted as such. But some of the problems of heredity nevertheless have a very important bearing on the mechanism of evolution, and among questions of this sort possibly the most discussed is that relating to the possibility or otherwise of the inheritance in succeeding generations of new characters acquired by the ancestral form in response to external environmental stimuli. The student of genetics declares that such inheritance of acquired characters is extremely unlikely; and yet the geologist sees much in the study of fossils to support the opposite view. On the other hand the inheritance of congenital variations—for example shortness of stature, peculiarities of facial features, or colour-blindness in man—is a definitely established fact.

Even when the inheritance of a variation or series of variations in successive generations has resulted in the production of a new form, there is still a third condition which must obtain before the species can become established. It must be isolated or segregated from the parent species or from other new species of similar ancestry, or else interbreeding with the production of hybrids and intermediate forms.

The changes which take place in organic evolution are extremely slow, so that the time required for the differentiation of the complex and varied organisms which people the world to-day from their common protozoan ancestor must have been of great duration.

Geologists have succeeded in measuring with moderate accuracy the time that has elapsed since the oldest strata containing the fossil remains of what were once living creatures, were laid down as sediments on the sea floor. This estimate is about 800 million years—a lapse of time so vast in comparison with the few thousand years of historical time that the human mind can scarcely comprehend it.