

Natural History.

WALLACE'S ISLAND LIFE.*

FEW works on science have attracted more general attention and admiration than those of Mr. Wallace, and few have met with more general appreciation and acceptance among naturalists. Well known in the scientific world as having independently worked out the law of Natural Selection, which he announced at the same time with Darwin, and the author of numerous works of importance, he stands in the very front ranks of England's scientific men.

His Geographical Distribution of Animals, published in 1876 by the Harpers, is justly regarded as one of his greatest works, and to that the present volume is, in some sort, a supplement and completion.

The study of the fauna and flora of islands, as distinguished from continental life, is marked by many and serious difficulties, and in many cases the knowledge that we require can never be obtained, owing to the settlement of the country and the consequent destruction of the forests and introduction of exotic species of plants and animals, which must soon cause the extinction of indigenous forms of life. A true and natural classification of plants and animals is required for the intelligent pursuit of this study, and though this is now being reached, it is too late in many instances for us to benefit by it. The doctrine of evolution, or to use a term as expressive and more generally understood, "descent with modification," is the key to the problems which we have worked out, and it is only since 1859 that this doctrine has been set before us in its full clearness, and has received general acceptance. So long as the various forms of life could be accounted for on the theory of a special creation for each one, there was manifestly no further explanation required of the phenomena of the distribution of plants and animals. If each form of life was created and placed in its special habitat, everything was said, we could not go back of that.

The conditions which serve to influence the distribution of life are many and various, and the facts requiring elucidation so intricate, that until the present time, the problem presented to us have never been satisfactorily explained. The traveler in Northern Japan will find there birds which he has been accustomed to see in Great Britain, some species being the same, others closely similar, though he is separated from that island by the whole breadth of a great continent. But let one who is familiar with the fauna of Australia proceed to New Zealand, only thirteen hundred miles distant, and he will find almost every form of life, whether animal or vegetable, wholly unlike what he has been accustomed to in the neighboring continent. In the Malay Archipelago is a still more striking instance. The islands of Bali and Lombok, each about as large as Corsica, are separated by a strait only fifteen miles across, yet these two islands differ more widely in their birds and quadrupeds than do England and Japan. On this continent we have a similar case. The flora and fauna of the Eastern States, as one passes southward from Northern New England, changes somewhat, becoming more luxuriant as we approach the Gulf, but not altering its essential character, even at the Southern extremity of Florida. But just across the narrow strait which divides that peninsula from the Bahamas, is a vegetation truly tropical, and with it a bird and insect fauna almost identical with that of Cuba. Paleontology gives us much assistance in working out the genetic connection of the various forms of life now existing upon the earth. In some cases, the ancestors of living forms have been traced back through their various changes and modifications to the beginning of Tertiary time, while, too, many evidences of the migrations of certain groups are furnished by their fossil remains, and the proofs of such migrations shed a flood of light on the present distribution of many existing animals. The knowledge derived from stratigraphical geology is also very important, for from it we learn what portions of the earth have been long submerged beneath the surface of the ocean, and thus what portions have long been isolated and allowed the time for the development of a special flora and fauna of their own.

Other and even more important classes of evidence are the great changes of climate which have taken place both in the polar and temperate zones—which are shown by the evidences of a luxuriant vegetation in the former, and of glacial action in the latter—and the theory of the permanence of existing oceans and continents. It is now generally believed that mild climates near the poles and periods of intense cold in temperate regions have several times in the course of the world's history alternated with climatic conditions not markedly different from those now existing, and the influences of such changes upon life as regards the migration, the modification and the extinction of species can scarcely be over estimated. The theory of the substantial permanence of continental and oceanic areas is a new one, and is as yet very imperfectly understood. It is, however, thoroughly believed in by Mr. Wallace, and there seems to be good evidence in support of it.

After presenting us with a vast amount of information on the distribution of different forms of life on islands and continents, Mr. Wallace summarizes the facts which he has brought together, and in the concluding chapter of his work gives the results of his study of the most difficult subject. He says, in brief,

That the distribution of the various species and groups of living things over the earth's surface, and their aggregation in definite assemblages in certain areas are the direct result and outcome of a complex set of causes, which may be regarded as "biological" and "physical." The biological causes are mainly of two kinds—firstly, the constant tendency of all organisms to increase in numbers and to occupy a wider area, and their various powers of dispersion and migrations through which, when unchecked, they are enabled to spread widely over the globe; and, secondly, those laws of evolution and extinction which determine the manner in which groups of organisms arise and grow, reach their maximum, and then dwindle away often breaking up into separate portions which long survive in very remote regions. The physical causes are also mainly of two kinds. We have, first, the geographical changes which at one time isolate a whole fauna and flora, at another time lead to their dispersal and intermixture with other faunas and floras—and it was here important to ascertain and define the exact nature and extent of these changes, and to determine the question of the general stability or instability of continents and oceans; in the second place it was necessary to determine the exact nature, extent and frequency of the changes of climate which have occurred in various parts of the earth, because such changes are among the most powerful agents in caus-

ing the dispersal and extinction of plants and animals. Hence the importance attached to the question of geological climates and their causes which have been here investigated at some length with the aid of the most recent researches of geologists, physicists and explorers. These various inquiries lead us on to an investigation of stratified deposits with a view to fix within some limits their probable age; and also to an estimate of the probable rate of development of the organic world; and both these processes are shown to involve, in all probability, periods of time much less vast than have generally been thought necessary.

Having done so much in the First Part of his work, Mr. Wallace then proceeds to apply the facts and theories already established to the explanation of the phenomena exhibited by the faunas and floras of the principal islands of the globe, which he classifies in three groups in accordance with their physical origin, each of which exhibits certain well-marked biological features.

Of all the conclusions which the author draws, perhaps the most important is that with regard to the age of the earth which we inhabit, or more properly, that which treats of geological time as bearing on the development of life, and with an abstract of his remarks on this subject we must close our review of this most interesting work. The periods of time usually demanded by the geologist for the development of the organic world have been very great, but we find in the earliest fossiliferous rocks evidences of the existence of many forms which require vast periods of time for their development. The physicist, however, denies that any such enormous periods of time are available. The sun is losing heat more rapidly than it could acquire it from any conceivable source, and the earth is cooling and must once have been too hot to admit of the existence of life upon its surface; the friction of the tides is constantly checking its rotation, and this cannot have gone on indefinitely without making our day much longer than it is. By means of various estimates, which need not here be gone into, it is shown that the rate of modification in the organic world, in remote geological time, was probably much greater than it now is, and that at the present epoch the earth is in a "phase of exceptional stability, both physical and organic, and it is from this period of exceptional stability that our notions of the very slow rate of change have been derived."

Mr. Wallace's work is replete with new facts, and gives us the views of the most advanced thinkers of Europe. It is of the utmost value to science. Besides this it comprises a fund of interesting information on natural history that will recommend it to a very large class of readers who have no special scientific knowledge.

*—Island Life, or the Phenomena and Causes of Insular Faunas and Floras, including a Revision and attempted Solution of the Problem of Geological Climates," by Alfred Russel Wallace. New York: Harper & Brothers, 1881.