

connect the present distribution of animal life in each part with that which has characterised it in past periods of the world's history. This Mr. Wallace has, perhaps as perfectly as it is possible at present to do, accomplished in the work before us, which exhibits in every page the results of immense reading and research, as well as critical ability, in drawing conclusions from the mass of facts he has accumulated.

Mr. Wallace adopts Mr. Sclater's divisions of the world, which our readers may perhaps be interested to know. They are—(1) The Palearctic region, which includes all temperate Europe and Asia, from Iceland to Behring's Straits and from the Azores to Japan. This extensive region is subdivided into the European, the Mediterranean, the Siberian, and the Manchurian sub-region. (2) The Ethiopian region, subdivided into the East, West, and South African sub-regions, and a sub-region comprising Madagascar and the adjacent islands. (3) The Oriental region, including all India and China from the limits of the Palearctic region, the Malay peninsula, Java and Baly, Borneo and the Philippine Islands and Formosa. It is divided into the Indian, Ceylonese, Indo-Chinese, and Indo-Malayan sub-regions. (4) The Australian region, divided into the Austro-Malayan (including the islands from Celebes and Lombok on the west to the Solomon Islands on the east), the Australian, the Polynesian, and the New Zealand sub-regions. (5) The Neotropical region, comprising all South America, and divided into the Brazilian, the Chilian, Mexican, and Antillian sub-regions. And, lastly, (6) The Nearctic region, comprising all temperate North America and Greenland, divided into the Californian, Rocky Mountain, Alleghanian, and Canadian sub-regions. There are thus six regions and twenty-four sub-regions.

The Palearctic region has 136 families of vertebrata and 3 peculiar families, the Ethiopian 174 and 22, the Oriental 164 and 12, the Australian 141 and 30, the Neotropical 168 and 44, and the Nearctic 122 and 12.

In order that the geographical distribution of animals may be followed, it is requisite that some principles of zoological classification should be recognised, and not the least valuable part of Mr. Wallace's work is the presentation of the results of recent inquiry in this direction to the eye of the reader in a tabulated and readily intelligible form.

Mr. Wallace commences the theoretical part of his treatise with a short account of the extinct mammals of the old and new world, a fitting introduction to the study of the distribution of the present fauna of the globe.

The Tertiary period is that which is of most interest to the modern zoologist; for the deposits of that period are characterised by containing the remains of numerous mammals the relations of which to the species now existing are of the most intimate kind, whilst the fossils of the secondary period are so archaic in form as to present little in common with those of our own time. The great size of many of the animals of the Tertiary period inhabiting the now temperate zone, as the mammoth, mastodon, megatherium, gigantic Irish elk, the sabre-toothed tiger, &c., is a remarkable circumstance. Their disappearance he attributes to the occurrence of the glacial period, when a cap of ice certainly several thousand feet, and perhaps some miles, in thickness covered the earth from the poles to the 40th degree of latitude. But the formation of such an immense mass of solidified water, it is calculated, would have depressed the sea level 2000 feet, a depression that would have greatly extended the limits of America, Australia, and other parts of the globe, where the animals, driven by the intense cold from the temperate regions, probably took refuge if capable of undergoing adaptation.

*The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas, as elucidating the Past Changes of the Earth's Surface.* By ALFRED RUSSEL WALLACE. With Maps and Illustrations. In 2 vols. Macmillan and Co. 1876.

It is well known that to Mr. Wallace a share of the credit is due of establishing that important theory which has been named after Mr. Darwin, and which has played so great a part in the literary history of the last seventeen years. In the work before us Mr. Wallace has added another laurel to his crown, for though he has himself in previous works, and though some recent writers, and notably Mr. Darwin himself, in his "Origin of Species," have advanced some general views on the geographical distribution of species, yet there has been no attempt to give a collective account of the fauna of the various regions of the globe, nor to

We have no space to take the several regions *seriatim*, but may call a few facts from one—the neotropical region. This region, represented by South America, is characterised by the large number of peculiar family and generic types. It has eight families of Mammalia absolutely confined to it, and at least a hundred genera, amongst which the sloths, armadillos, anteaters, and guinea-pigs, the large group of platyrrhine monkeys, the coatis and blood-sucking bats, are conspicuous. On the other hand, with two exceptions, the Insectivora are wholly wanting. It has no oxen or sheep, and, indeed, no form of Ruminant except deer and llamas; neither do its vast forests and grassy plains support a single form of non-ruminant ungulate except the tapir and peccary. Amongst its birds, the most remarkable are the toucans, curassows, tinamous, and humming-birds; in regard to which Mr. Wallace observes—"How vast must have been the time required to develop these beautiful and highly-specialised forms out of some ancestral swift-like type; how complete and long-continued the isolation of their birth-place, to have allowed of their modification and adaptation to such divergent climatic conditions, yet never to have permitted them to establish themselves in the other continents. No naturalist can study this single family of birds without being profoundly impressed with the vast antiquity of the South American continent, its long isolation from the rest of the land surface of the globe, and the persistence through countless ages of all the conditions requisite for the development and increase of varied forms of animal life." The reptiles, amphibia, fishes, and invertebrata generally of this region are not less remarkable.

The phenomenon of migration, which, though most familiarly known as occurring in birds, has also been observed in fish and several mammals, is very interestingly explained by Mr. Wallace. After pointing out that our temperate climate leads to the descent during winter of birds from the north, and the ascent from the south of others during the summer—the northern visitors being the fieldfare, the redwing, the snow-bunting, the turnstone, and numerous ducks and waders; and the southern ones being the cuckoo, swift, swallow, and numerous warblers,—Mr. Wallace observes that of the latter, or southern migrating birds, all cross the Mediterranean in three places only, either from the south of Spain in the neighbourhood of Gibraltar, from Sicily over Malta, or to the east by Greece and Cyprus. Now it is a curious fact that the Mediterranean, some parts of which are of profound depth, 12,000 feet or more, is remarkably shallow (1000 to 1500 feet) at these points, and he considers that the instinct of migration has arisen from the habit of wandering in search of food common to all animals, but greatly exaggerated in the case of birds by their powers of flight, and by the necessity for procuring a large amount of soft insect food for their unfledged young. Hence the conclusion easily follows that the migration of such birds as the swallow dates back from at least the period when there was continuous land along the route passed over; and it is a suggestive fact that this land connexion is known to have existed in recent geological times. Britain was connected with the continent, during and probably before the glacial epoch, and Gibraltar as well as Sicily and Malta, were also recently united with Africa, as is proved by the fossil remains of elephants in their caverns. The submersion of the two above-named tracts of land would be a slow process, and from year to year the change might be hardly perceptible. It is easy to see how the migration that had once taken place over continuous land would be kept up, first over lagoons and marshes, then over a narrow channel, and subsequently over a considerable sea, no one generation of birds ever perceiving any difference in the route.

Mr. Wallace in many places adduces facts and arguments that afford strong support to the Darwinian theory. To give one instance only, but a very interesting one: It is one of the doctrines of Darwin that the beautiful hues of the more conspicuous flowers of the globe have resulted from the attraction their remote ancestors have proved to insects by which they were fertilised, the more gaily coloured being just those that produced progeny. Now the New Zealand region is remarkably deficient in insect life, and in strong confirmation of Mr. Darwin's theory is the fact that the flora is almost as strikingly deficient in gaily coloured blossoms. With some exceptions the flowers are inconspicuous and often green, offering a singular contrast to the general brilliancy of Australian flowers, combined with the abundance and variety of its insect life. It further occurred to Mr. Wallace that if this reasoning were correct, New Zealand plants ought to be also deficient in scented flowers, because it is a part of the same theory that the odours of flowers have, like their colours, been developed to attract the insects required to aid in their fertilisation. He therefore at once applied to Dr. Hooker, as the highest authority on New Zealand botany, simply asking whether there was any such observed deficiency. His reply was: "New Zealand plants are remarkably scentless, both in regard to scented flowers of leaves with immersed glands containing essential oils, and of glandular hairs."

The second volume of Mr. Wallace's work is the converse of the first. Whilst the first is occupied with an account of the several regions of the world, and enumerates the animals that are found in them, the second takes the several classes and families of the animal kingdom, and states the regions in which they are found. The former is the zoological geography of the world, the latter the geographical zoology. If it be desired to know what animals are found in a given region, the first volume must be referred to, but if it be wished to ascertain what region a particular animal inhabits the second must be examined.

The book is illustrated by admirable coloured maps of the different zoological regions, as well as by a series of plates representing the peculiar features of the fauna of each district. We may add that the index is singularly complete.