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‘The Geographical Distribution of Animals.’¹

To the superficial reader these two handsome volumes will prove intolerably tiresome; but by all to whom reading is something more than a mere pastime, if they have patience to follow Mr. Wallace’s sober statement of facts the work will be found to be literally “a romance of real life.” True, that on glancing through the pages the general reader is at first repelled by the huge array of italicised technical names and long tabular lists of animals, but if he plods on patiently to the end he will find that, notwithstanding his ignorance of scientific zoology, he has gained a vast amount of information of high value. In a work intended primarily for scientific students, this bristling array of uncouth names could not, in the present unsatisfactory state of biological nomenclature, be dispensed with, though it is a pity that, on account of the existing system of naming, so much of zoology and botany that might otherwise be intelligible is a sealed book to the many. But the general reader will not lose much by skipping the tables, at least, though these must prove of great value both to the teacher and the student of zoology.

Mr. Wallace divides his work into four parts. In the first part he endeavours to expound the principles and describe the general phenomena of the distribution of animals over the globe, which he divides into six great zoological regions. In the second part, as a necessary preliminary to the subsequent and most important parts of the work, he gives a brief sketch of what is known of the distribution of extinct animals in various parts of the world, the animals mainly referred to belonging to the great class of mammals. The third, and what is likely to prove the most interesting part to the general reader, deals with zoological geography. In this part Mr. Wallace takes each of the six regions into which he divides the globe in succession, describes its general zoological characteristics, and subdivides it into a number of sub-regions, the zoological peculiarities of which are pointed out in detail. At the end of the chapter devoted to each region he gives tables of all the families of animals, and of the *genera* of mammals and birds found therein, indicating those which are peculiar to the region. The last part deals with geographical zoology, its purpose being to show systematically the distribution of the chief families of land animals throughout the various regions referred to. While this part contains much of interest to the general reader, its chief value will be as a guide to the zoological student.

It would be out of place in these columns, even if we had space, to discuss the many scientific questions suggested by Mr. Wallace’s work. We shall content ourselves with giving in brief space some idea of this, the latest statement on the geographical distribution of animal life on the globe. A thoughtful observer cannot but be struck with the apparent capriciousness of this distribution. Why are certain animals found in one region, and not in another equally well suited, to all appearance, for their support? Why are elephants and lions so plentiful in Africa and entirely absent from tropical South America? What is the cause of the great difference between the monkeys of the Old and New World? How is the strange, antiquated fauna of Australia, so unlike that of any other continent, to be accounted for? Why should there be such a marked difference between the animal life on the two shores of a narrow strait as is seen in the Malay Archipelago, or on the two banks of a river like the Amazon?

Mr. Wallace, as we have said, divides the land surface of the globe into six great zoological regions, for he wisely abstains from discussing the distribution of life in the ocean. These regions are to a considerable extent coincident with the great continental divisions, and are mainly those suggested by Mr. Sclater many years ago from a study of the distribution of birds on the earth. Other divisions have been proposed by eminent naturalists, and while much could be said in favour of some of them, that adopted by Mr. Wallace seems to us to answer most of the purposes which such a division should serve. The principle of Mr. Wallace's division is partly zoological, partly geological. In the former case he shows that each of his regions contains such a large proportion of families and genera of animals peculiar to, and characteristic of, itself, having their habitat therein, and scarcely, if at all, overstepping its limits, as naturally to separate it from all the others. This zoological division is again in most instances supported by what is known of the past geological condition of the earth—at least, in tertiary times; for further back Mr. Wallace hardly deems it necessary to go to explain the present distribution of animals. To this first region, adopting Mr. Sclater's nomenclature, he gives the name of Palæarctic ("Ancient North"). The Palæarctic Region includes all Europe and Asia, along with the part of Africa to the north of the Tropic of Cancer, except Southern Arabia, India, South China, and the countries and islands to the south. It is impossible here to enter into all the reasons for the inclusion of this immense extent of surface in one zoological region. It possesses a very considerable proportion of animals of all classes peculiar to itself. There are sound *data* for concluding that at one time it had a much more uniform climate than it has at present, tropical and semi-tropical in its character; that the Mediterranean Sea was a series of inland lakes; and that Europe was connected with North Africa by stretches of land extending across from Greece, from Sicily, and at the Straits of Gibraltar, and that what is now the Sahara was covered by water. In this remote period animals which now are only found in tropical and semi-tropical countries flourished over most of the extensive region, and it was only when the Palæarctic conditions became unfavourable that they migrated to more congenial climates. This region is subdivided into four sub-regions—Europe, with the exception of the Mediterranean Peninsulas, forming one; North Africa, along with these Peninsulas, a second; the greater part of Asia, a third; and Mongolia, Manchuria, and North China, a fourth. The natural boundary between Europe and Asia is not the Ural Mountains, but a line extending from the north of the Caspian Sea and running parallel to, and a little west of, the river Obi. There is reason to believe that the Caspian Sea, Lake Aral, and the numerous marshy lakes to the north of these, are the remains of a great arm of the Arctic Ocean, which formed a marked boundary between Europe and Asia. How the change of climate in this extensive region was produced we cannot stay to inquire; there are evidences, which most geologists consider convincing, that at no very remote period an ice-cap of great thickness covered much of the Northern Hemisphere, as Greenland is covered at the present day. The "everlasting hills" are one of the most recent and least durable features of the earth, and at some time during the tertiary epoch the Himalayas were raised to their present height, combining with other causes to produce so marked a change in climate as almost totally to alter the character of the fauna in the Palæarctic Region. The lions, and elephants, and rhinoceroses, and hippopotami and other great mammals, whose remains have been plentifully found in Europe, made their way southwards across the connecting isthmuses, driving before them or extinguishing animals of a lower type and less strength which had preceded them in migration. The present fauna of Europe Mr. Wallace considers distinctly modern, though the Palæarctic Region he believes to be the original home of all the faunas of the globe.

The second, or Ethiopian, Region includes all Africa south of the Tropic of Cancer, with Madagascar and the neighbouring groups of islands. This region is divided into four very distinctly-marked sub-

regions of unequal area, and to account for its present very mixed and in many respects peculiar fauna, Mr. Wallace supposes that it must have been more than once connected with and severed from the Palæarctic Region. It contains specimens, as in the lemurs of Madagascar, of very early types of mammals, which must have migrated southwards during a remote connexion of the two continents, but which were reduced or driven into out-of-the-way corners at a later period, when the great mammals found their way southwards. This region is characterized as much by the absence of certain animals dominant in the Old World Continent as by the presence of groups peculiar to itself; by the absence of such animals, *e.g.*, as the bears, the moles, the camels (imported by man), the deer, goats, and sheep, the wild ox, and wild boar. The absence of these groups of animals, Mr. Wallace thinks, can only be accounted for by the persistence through long epochs, of barriers isolating Africa from the rest of the world. The Ethiopian sub-region, which includes Madagascar and the Mascarene Islands, is one of the most remarkable zoological districts of the globe. At one time it must have been united to Africa, when the latter was separated from the Northern Continent, and probably extended much further to the south and east than at present. It is supposed, indeed, that a continent, or at least a series of islands, extended north-eastwards as far as the Malay Archipelago, a region which has been named Lemuria, from the lemuroid animals that are so characteristic of what still remains of it. Animals of the lemuroid, insectivorous, and rodent kind, and others which zoologists consider of a comparatively low type, are supposed, at the time Madagascar formed part of Africa, to have been spread over the whole region. But, as we have said, these gave way to a great extent before the larger and more powerful mammals, the more characteristic types having survived in Madagascar simply on account of its timely insulation. The reader must go to the work itself for the interesting details, of which we are able to give mere hints.

The Oriental region includes India, South China, and neighbouring Continental lands, with Sumatra, Java, Borneo, the Philippines, and a few other islands. The line bounding this region often separates islands between which is only a narrow strait, and Mr. Wallace's reasons for such separation are of the highest interest. These islands have been in various ways and at various times joined to the Asiatic Continent, but the order and manner of such juncture Mr. Wallace shows to have been very different from what a mere geographer, or even geologist, would have divined. With regard to the Oriental Region generally, the Himalayas, as we have already mentioned, are supposed to have reached their present elevation at a comparatively recent geological date. Before that, Northern India, which was probably divided from South India and Ceylon and their extensions by a broad sea, formed part of the Palæarctic Region. On the mountains attaining their present elevation a marked difference in climate between the two parts of Asia thus separated was the result, and a consequent separation of the fauna into two distinct divisions.

The Australian Region—the fourth great zoological region, according to the system adopted by Mr. Wallace—is, in some respects, the most curious and interesting on the face of the earth; zoologically, indeed, it is a fragment of an older world. It includes, besides Australia and New Zealand, the large island of New Guinea, and the islands between that and including the Celebes, along with most of the Pacific Islands, from the Sandwich Islands on the north to Pitcairn Island on the south. The line separating this region from the Oriental passes between the two neighbouring islands of Bally and Lombok, and the history of the past physical geography of the region as indicated by its zoology is of the most curious interest. The mammals and birds of Australia are distinct in character from those of any other region of the globe. The only two orders of Old World mammals, for example, represented in Australia are the winged bats and the Muridæ (rats and mice)—animals which are cosmopolitan in their range. Nearly all

the other animals, especially in Australia proper, belong to types to be met with elsewhere only in a fossil state—kangaroos, ornithorynchus or duck-billed platypus; echidna, or porcupine ant-eater, &c. Many of its birds, while allied to those of other regions, more or less remotely, have attained to strange developments in form, and plumage, and habits. Nearly all the mammals in particular belong to inferior types, which elsewhere have given way before those of higher organization. This can only be accounted for by the supposition that the Australian Region must have been separated from the Palæarctic Region at a very early period, probably as far back in the Secondary Period, before the higher class of animals had begun to spread, or before they had been developed. Thus it has been able to preserve for us specimens of the fauna which was spread over our globe while yet it was in a state of comparative youth. New Zealand forms a separate sub-region; indeed, so peculiar is its fauna, that some naturalists consider it worthy of being erected into a region by itself. On account of some slight resemblances between the marsupials of South America and those of Australia, it has been inferred that there was at one time a southern connexion between the two countries. Mr. Wallace, however, does not regard the evidence as sufficient to prove a continuous connexion, and believes that the marsupials were derived from a common Old World source. The Celebes group of islands present some strange anomalies, and are very nearly as closely allied to the Oriental as to the Australian Region, showing that at different times they must have had connexions with both regions.

The other two zoological regions into which Mr. Wallace divides the land-surface of the globe, and to which we can only barely refer, are the Neotropical, embracing South and Central America and part of Mexico; and the Nearctic, consisting of all North America. The Neotropical Region especially is marked by zoological features of the strongest interest, being immensely rich in peculiar families and genera, closely approaching in this respect Australia itself. Many of its quadrupeds belong to the lower types, and its birds have attained to strange developments. The marked peculiarities of this region, Mr. Wallace thinks, can only be accounted for by the long isolation of South America; and there is little doubt that for a very long period, and at different times, the narrow isthmus connecting the two parts of the New World was under water. It is highly probable, also, that at one period South America was only a group of large islands, of which Brazil, Guiana, and the Andean region are the developments, the Amazon marking the site of a great arm of the sea. The West Indian Islands present so many peculiarities as to lead to their erection into a distinct sub-region. Originally they probably formed part of Central America, and may have been united with Yucatan and Honduras in one extensive tropical land. But their separation from the continent occurred at a remote period, and they have since been broken up into numerous islands, which have probably undergone much submergence in recent times. This has led to a poverty of the higher forms of life, with other remarkable specialties.

The Nearctic Region, while of immense extent, contains a large area unfavourable to the maintenance of animal life, and the wonder is that it should possess such a variety of groups and such a multitude of forms in every class of animals. The fossil zoology of this region is of the highest interest. For example, it is known that when America was discovered it contained no horses; but the most indubitable evidence has been obtained that horses did at one time flourish upon the continent, and their fossil remains, we are told, enable us to trace back the equine type through various stages to a remote date at which its form was very different from that of the existing horse, when—for example, it had several toes, where now it has only a single hoof. Mr. Wallace does not favour the formation of separate Arctic and Antarctic regions.

We have thus endeavoured to give some faint idea of the methods followed by Mr. Wallace and the results obtained. The original home of all the classes of animals whose varied forms are now spread over the earth is in the old continent of Europe-Asia. Thence, in successive waves, they spread by various routes over the face of the globe; by a northern connexion into the New World, by various once-existing land routes into Africa, and by long-since severed bridges into the great Australian region. How, according to Mr. Wallace, existing modifications and mixtures have been effected the reader must find out from the work itself. Temperature Mr. Wallace reckons of not so much account as a barrier to the spread of land animals as physical and organic conditions. Birds and even insects he shows probably took the same routes as the larger animals, and a wide sea is almost as great a barrier to these two classes as it is to mammals. A curious fact, confirmatory of some of Mr. Wallace's inferences, is that the birds which migrate in Spring and Autumn between Europe and Africa take mainly the three routes by Greece, by Malta, and by Gibraltar, across which the old land connexions are supposed to have existed. With man, the only truly cosmopolitan animal, Mr. Wallace prudently refrains from dealing.

Altogether it is a wonderful and fascinating story, whatever objections may be taken to theories founded upon it. Mr. Wallace has not attempted to add to its interest by any adornments of style; he has given a simple and clear statement of intrinsically interesting facts, and what he considers to be legitimate inductions from them. Naturalists ought to be grateful to him for having undertaken so toilsome a task. The work, indeed, is a credit to all concerned—the author, the publishers, the artist—unfortunately now no more—of the attractive illustrations, and last, but by no means least, Mr. Stanford's map-designer.

¹ "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. Two vols. (London, Macmillan and Co.) 1876.

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The Alfred Russel Wallace Page, Charles H. Smith, 2015.