

THURSDAY, JUNE 22, 1876

WALLACE'S GEOGRAPHICAL DISTRIBUTION
OF ANIMALS

The Geographical Distribution of Animals, with a Study of the Living and Extinct Faunas, as Elucidating the Past Changes of the Earth's Surface. By Alfred Russel Wallace. Two Vols. 8vo. (London: Macmillan and Co., 1876.)

THE question of the number and boundaries of the primary zoological regions of the Globe has recently been discussed by Prof. Newton in his article on "Birds," in the new edition of the "Encyclopædia Britannica." After remarks on the failure of previous writers to solve this problem in a satisfactory manner, Prof. Newton comes to the conclusion that the outlines of distribution laid down in 1857 by Mr. Sclater, although founded only upon the study of the erratic class of birds, have "not merely in the main, but to a very great extent in detail, met with the approval of nearly all those zoologists who have since studied the subject in its bearing upon the particular classes in the knowledge of which they themselves stand pre-eminent." In point of fact, Mr. Wallace himself was one of the first naturalists to accept Mr. Sclater's views on this subject. Writing from the remote island of Batchian, in the Indian Archipelago, in March 1859, after perusing Mr. Sclater's well-known memoir on the Geographical Distribution of Birds,¹ Mr. Wallace says, in a letter to Mr. Sclater published in the first volume of the *Ibis*,² "With your division of the earth into six grand zoological provinces I perfectly agree, and I believe they will be confirmed by every other department of zoology as well as by botany." In the two excellent volumes now before us, in which are embodied the results of several years continuous labour upon this and kindred branches of the same subject, it will be seen that Mr. Wallace has not altered his opinion. The six great primary zoological regions of the globe proposed by Mr. Sclater in 1857 are fully adopted, and form the basis of Mr. Wallace's whole treatment of the subject. But one slight change even in their nomenclature is made—that of substituting "Oriental" as the name of the Region embracing South Asia and the adjacent islands for Mr. Sclater's term "Indian." In fact, after discussing the general principles and phenomena of distribution and what little we as yet know concerning the distribution of extinct animals, the main portion of Mr. Wallace's volumes is occupied by an elaborate sermon on Mr. Sclater's text, and on its application to other classes of animals. The various phenomena of life exhibited in the Palearctic, Ethiopian, Oriental, Australian, Neotropical, and Nearctic regions are treated of in succession, and their similarities and their differences are discussed. To this is added a sketch of the geographical distribution of the principal families of terrestrial animals arranged systematically, which forms the fourth part of this important work. Of this last portion, which is, in fact, a book of reference containing an account of the distribution of all the families, and

¹ See "Journal of the Proceedings of the Linnean Society," Zoology, ii. p. 232.

² Letter from Mr. Wallace concerning the Geographical Distribution of Birds. (*Ibis*, 1859, pp. 449.)

of most of the genera of the higher animals arranged in systematic order, we propose to speak in a subsequent article. For the present we will confine our attention to the first three parts of Mr. Wallace's work.

The introductory chapter, with which the first volume of the "Geographical Distribution of Animals" is commenced, although it states the object of the work plainly enough to the mind of the scientific reader, seems a little too brief and concise to explain the nature of the problem under discussion to the general public. It must be borne in mind that the very idea of the existence of any regular laws of distribution is a novelty to most people—even, we regret to say, to many who call themselves naturalists. It is to be regretted, therefore, we think, that Mr. Wallace has not devoted a few more pages to the general explanation of the subject of which he treats, to the pointing out of the many subordinate problems which it involves, and in particular to the further explanation and definition of such technical terms as "habitat," "stations," "range," and "representative species," which confront us in some of the very first pages of his work.

In his second chapter Mr. Wallace discusses the means by which animals are dispersed, and devotes a good deal of space to the question of migration. Now, migration is, no doubt a very important phenomenon, but whether it has much to do with the general theory of distribution appears to be rather doubtful. It occurs only in one or two groups of animals; and, as Mr. Wallace himself observes, "we must, except in special cases, consider the true range of a species to comprise all the area which it occupies regularly for any part of the year." Migration, therefore, primarily affects the distribution of a species within its own specific area, and only has to do with the general question of distribution so far as it may increase the tendency of a species to vary its range. With Mr. Wallace's views on the subject of dispersal generally we cordially agree. There can be no question that, in the "glacial epoch" and in the more recent geological changes which have taken place on the earth's surface, the key of the present complicated phenomena of distribution should be sought, although many of them have had a much earlier origin. "Almost every mile of land-surface has been again and again depressed beneath the ocean; most of the great mountain chains have either originated or greatly increased in height during the Tertiary period; marvellous alterations of climate and vegetation have taken place over half the land-surface of the earth; and all these vast changes have influenced a globe so cut up by seas and oceans, by deserts and snow-clad mountains, that in many of its more isolated land-masses, ancient forms of life have been preserved, which, in the more extensive and more varied continents have long given way to higher types."

Mr. Wallace now proceeds to enter upon the grand question of Zoological Regions, entirely ignored, as he truly says, by the older school of naturalists. To them, provided they got the object, it little mattered whence it came. "The Brazils," the "East Indies," or the "South-sea Islands," was considered ample information as to the locality of any specimen, even if it were thought necessary to give such information at all. How could such men appreciate the idea of Zoological Regions? They

had a sort of vague notion that certain forms were peculiar to hot climates, and that certain others were only found in cold countries, but that was about all they knew or cared to know. Of the necessity of precise knowledge on the subject of locality they were absolutely incredulous.

"To the modern naturalist, on the other hand," as Mr.

Wallace most truly observes, "the native country (or 'habitat' as it is technically termed) of an animal, or a group of animals, is a matter of the first importance; and as regards the general history of life upon the globe, may be considered to be one of its essential characters. The structure, affinities, and habits of a species, now form only a part of its natural history.

"We require also to know its exact range at the present day and in prehistoric times, and to have some

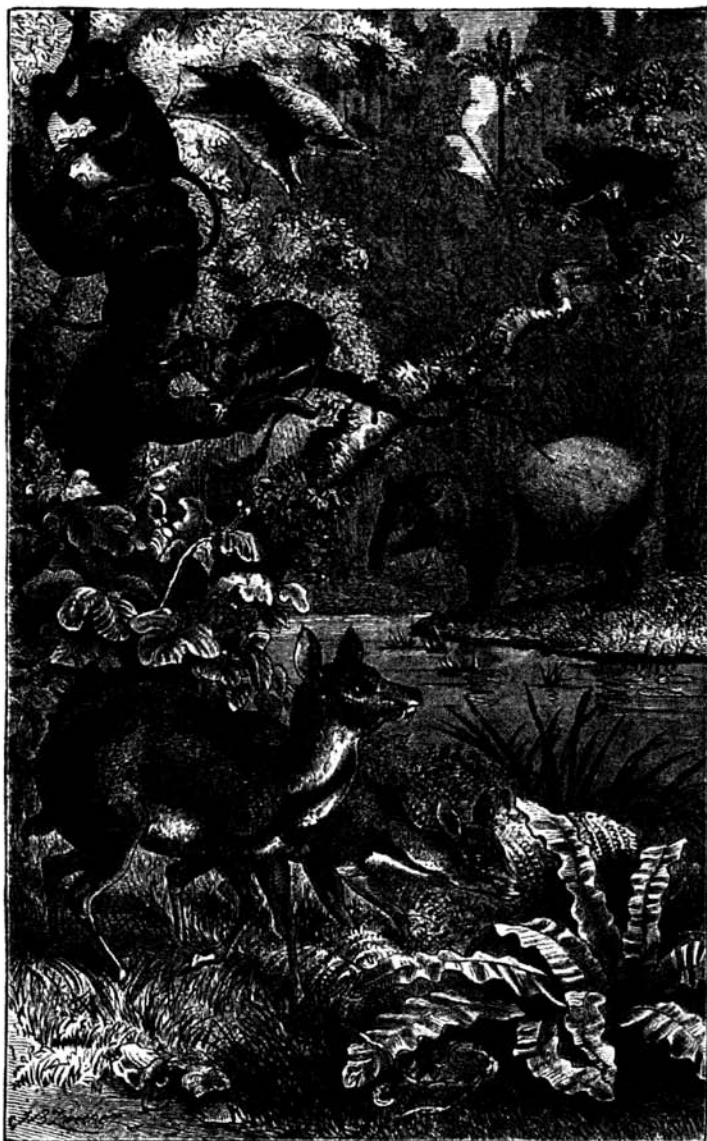


FIG. 1.—Forest in Borneo.

knowledge of its geological age, the place of its earliest appearance on the globe, and of the various extinct forms most nearly allied to it. To those who accept the theory of development as worked out by Mr. Darwin, and the views as to the general permanence and immense antiquity of the great continents and oceans so ably developed by Sir Charles Lyell, it ceases to be a matter of

surprise that the tropics of Africa, Asia, and America should differ in their productions, but rather that they should have anything in common. Their similarity, not their diversity, is the fact that most frequently puzzles us."

Yet, in spite of the increased attention paid to locality by Swainson, Waterhouse, Strickland and all the more

highly educated class of naturalists within the last fifty years, it was not until 1857 that the plan of determining the great zoological regions of the earth's surface not from *a priori* reasons of heat and cold, nor from the ordinary views of geographers, but by the minute study of the actual ranges of the more important and best known groups of animals was suggested. Mr. Sclater's Regions,

then originally established from consideration of the ranges of the principal families and genera of birds, were quickly applied by Dr. Günther to reptiles and batrachians, and subsequently by Mr. Sclater himself to mammals. Working from the same stand-point, various naturalists have of late years tried to improve upon them, amongst others Mr. Blanford, Mr. Blyth, and



FIG. 2.—Scene in New Guinea.

Prof. Huxley. Mr. Wallace will have none of these—nay, so convinced is he of the correctness of Mr. Sclater's original "happy thoughts"—that he will not even listen to the inventor's own emendations of his original regions. "So that we do not violate any clear affinities"—he observes, "or produce any glaring irregularities, it is a positive, and by no means an unimportant advantage to

have our named regions approximately equal in size, and with easily defined and easily remembered boundaries."

He therefore condemns "all elaborate definitions of inter-penetrating frontiers" and "regions extending over three-fourths of the land-surface of the globe" as "most inconvenient—even if there were not such differences of opinion about them." He admits that the "most radical

zoological division of the earth" is made by "separating the Australian regions from the rest," and that the best natural division of the remainder is effected by cutting off the Neotropical region. We should then have three primary zoological regions, which first Prof. Huxley, and afterwards Mr. Sclater, in his oral lectures on geographical distribution seemed to consider as of nearly equal importance. On this Mr. Wallace remarks that "in isolation and speciality, determined by what they want, as well as by what they possess, the Australian and Neotropical regions are undoubtedly each comparable with the rest of the earth. But in richness and variety of forms they are both very much inferior, and are much more nearly comparable with the separate regions which compose it." After discussing this subject at some length, and disposing shortly of Mr. Allen's system of "circumpolar zones," Mr. Wallace comes to the conclusion that a consideration of all the facts zoological and palæontological, indicates that the great northern division, or *Arctogæa*, is as much more important than either Australia or South America, as its four component parts are less important. He therefore reverts to the six original regions proposed by Mr. Sclater in 1857, as the most workable, and most conveniently adapted for the study of zoological distribution.

Thus much having been settled, Mr. Wallace proceeds to point out the limits of the six great regions, and to indicate the sub-regions into which they may be best divided. As regards the latter part of this task there is much difficulty. It must be confessed that the sub-regions in many cases are as yet only approximately determined, and that those adopted by Mr. Wallace are in several instances open to serious question. For example, "the great central mass of South America, from Venezuela to Paraguay" is constituted in the present work as a single division of the Neotropical region under the name of the "Brazilian Sub-region." But there can be no doubt that within this area there are two, if not three, distinct sub-regions which deserve recognition. The fauna of south-eastern Brazil, so admirably investigated by Prince Max. of Neuweid, Burmeister, Reinhardt, and other well-known naturalists, is very distinct from that of the great Amazonian valley, and the adjacent flats of Guiana and the Orinoco. Many genera are peculiar to each of them, and a whole host of representative species perform similar functions within the respective areas. Herr von Pelzeln's divisions of the Neotropical region, and those employed by Messrs. Sclater and Salvin in their papers published in the Zoological Society's *Proceedings*, are much more natural than those suggested by Mr. Wallace. We fear that in spite of what he says on the subject our author has rather allowed a hankering after uniformity to lead him astray and to induce him to restrict his sub-regions to four in each case.

The chapter on Classification which next follows, and concludes the first portion of the work, contains some very apposite remarks. A natural classification of animals is, as Mr. Wallace observes, of first-rate importance in discussing matters of distribution. But, except in the case of a few groups, we have by no means yet attained to a natural classification of animals, and even as regards these we are, in the opinion of many naturalists, still very far from it. It is only therefore some few of the classes

of animals that are sufficiently known to be useful for the study of distribution. As such Mr. Wallace selects the Vertebrata, the butterflies, and six families of Coleoptera amongst the insects, and the terrestrial and fresh-water land-shells amongst the Mollusca. Of these better-known groups he gives us tables of the arrangement which he proposes to adopt for the illustration of his remarks on their geographical distribution.

(To be continued.)

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II.

THE second part of his great work on Geographical Distribution Mr. Wallace devotes to the discussion of fossil animals. It might seem at first sight, as our author observes, rather out of place to begin the systematic treatment of this subject with extinct animals rather than with recent ones. But those who take the trouble to read these most interesting chapters will be speedily convinced to the contrary. Imperfect as is our knowledge of the geological past, enough has been already ascertained to enable some enchanting theories to be started which account to a greater or less extent for some of the most difficult problems of the present. As regards the comparatively recent extirpation of large and important forms which has taken place in Europe, in North America, and in South America alike since Post-Pliocene times, "it is clear," our author tells

¹ Continued from p. 168.

us, "that we are now in an altogether exceptional period of the earth's history," some idea of which it is very necessary to realise. "We live in an impoverished world, from which all the hugest and fiercest and strangest forms have recently disappeared." The cause of this great change over such a large part of the world's surface was, in Mr. Wallace's opinion, the "glacial epoch," which, according to Mr. Belt's theory, heaped up most of the water in the earth in mountains of ice round the two poles and left the great ocean-beds comparatively dry. This, we are told, "must have acted in various ways to have produced alterations of the levels of the ocean as well as vast local flows, which would have combined with the excessive cold to destroy animal life." We are not sure that this is a *very* satisfactory explanation of the simultaneous disappearance of the great Irish Elk from Europe

and the *Megatherium* from South America, but it is at all events *some* explanation of an obscure point, and deserves careful consideration. So also do those few cases in which geological evidence is already sufficient to give us indications of the original birth-place of some of the mammalian types, and of the mode in which has come about their present state of distribution.

The third section of Mr. Wallace's great work, which we now enter upon, is, in fact, the most important of the whole, and that to which the previous chapters may be regarded purely as introductory. Having shown us what the six great divisions of the earth's land-surface, zoologically considered, are, and how it may have come to pass that they are what they are, Mr. Wallace takes them one after the other in order, and gives us a separate memoir upon each of them, and their special zoological

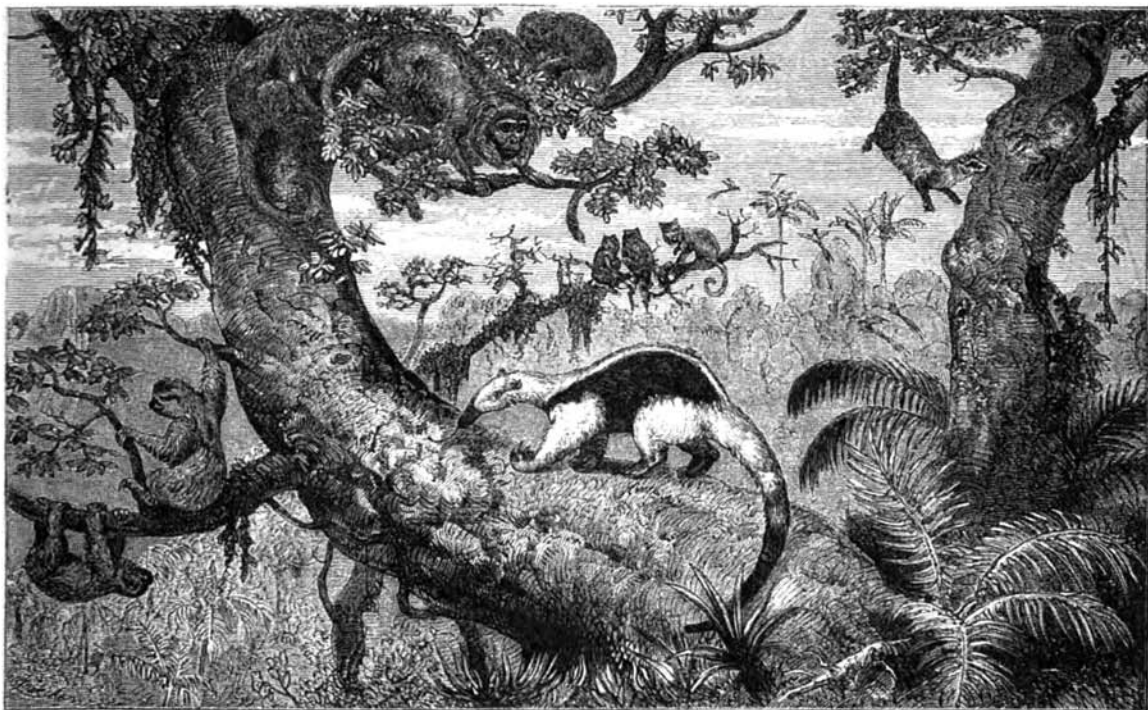


FIG. 3.—A Brazilian Forest, with characteristic Mammalia.

characteristics. After a description of their territorial outlines, illustrated by hypsometrical maps in which the boundaries of the sub-regions are likewise indicated, general remarks are given upon their leading zoological features. The chief forms of mammals, birds, reptiles, batrachians, fishes, butterflies, beetles, and land-shells, which characterise them are pointed out. The Sub-regions into which they are divisible are then taken up and treated in greater detail, and the leading authorities from whose labours the necessary facts have become known to us are cited. At the end of each memoir "tables of distribution" are added, in which are given—first, a list of the families of the selected groups of animals represented within the Region, with an indication of their range, if any, beyond the Region, and secondly, a similar list of the genera of the terrestrial mammals

and birds, with an indication of their ranges both within and beyond the Region. Three or four plates, drawn by the late Mr. J. B. Zwecker, accompany each memoir.

These are intended to illustrate the physical aspect and zoological character of some well-marked division of the region, and as only such species are figured as "do actually occur together in a state of nature," the scenes represented are "at all events not altogether impossible ones," which is more than many of our artistic friends can say of *their* productions! While we could have wished that Mr. Zwecker had resorted in some cases to the Zoological Society's Gardens rather than to previously published figures for the models of some of his animals, we must acknowledge generally the truthfulness of these illustrations and the faithful manner in which they have been executed. At home alike in the tropics of the Oriental

and of the Neotropical regions, no one surely could have been more competent than Mr. Wallace to select the most characteristic forms for these plates, and we have great pleasure in reproducing some of them in these columns.

To those who know anything of Natural History the enormous labour involved in the compilation of these six memoirs will be at once apparent. The mass of details to be gone through in bringing together the most prominent known facts connected with the mammals, birds, reptiles, amphibians, fishes, butterflies, beetles, and land-shells of every different part of the world's surface, is a task that the boldest naturalist might well stand aghast at, especially when it is recollected that these details have to be picked out from several hundred different works and periodicals published in every quarter of the

globe. That errors can be escaped in such a compilation even by a writer so cautious and so competent as Mr. Wallace is manifestly impossible. No intellect could expect to obtain personal acquaintance with more than a few selected branches of such a multifarious subject, and for the rest an author must trust to second-hand information. The selection of such second-hand information and its reduction into a uniform shape, is of itself a task of appalling magnitude, and we can only congratulate Mr. Wallace on having had strength and leisure to accomplish such a Herculean labour.

The fourth and last part of Mr. Wallace's work contains, as we have already explained, a review of the distribution of the different groups of animals which he has selected for the illustration of geographical distribution arranged in systematic order. The families are taken up

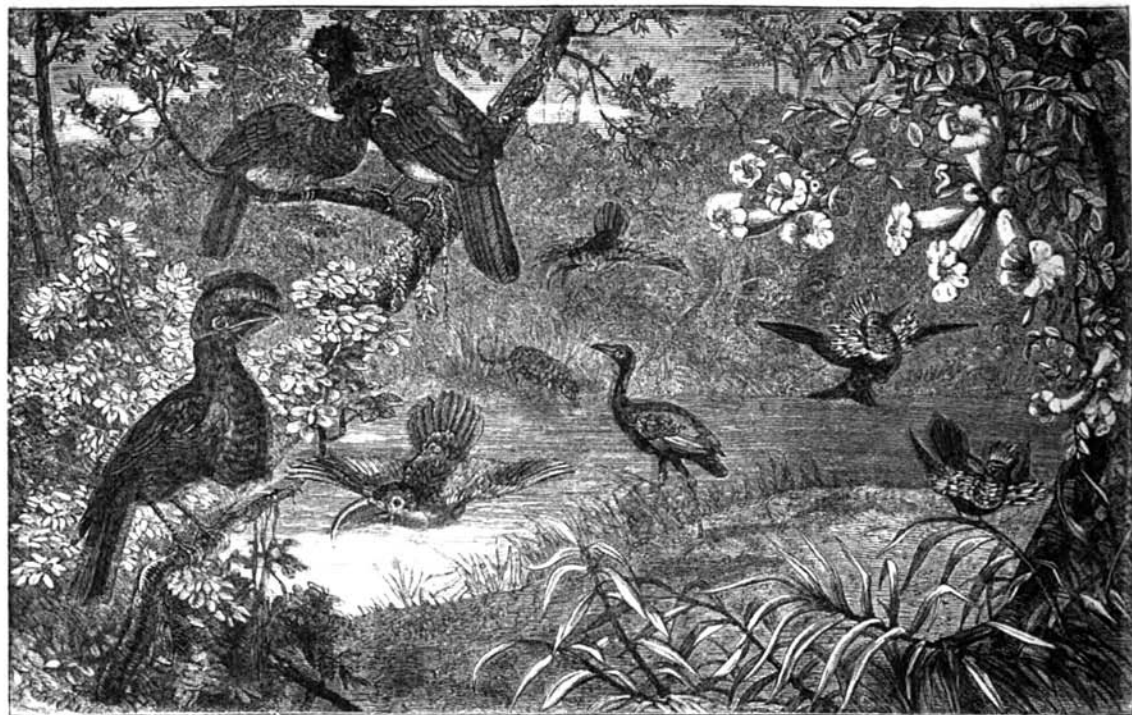


FIG. 4.—A Forest Scene on the Upper Amazon, with some Characteristic Birds.

one after another, the principal genera are mentioned, and notes are given on the more remarkable species. At the end of each order is appended a series of remarks on the general distribution of the whole group. This is in fact the storehouse of information from which the essays on the six zoological regions have been compiled, and should in strictness have preceded the third section of the work instead of following it. The author wisely recommends persons not well versed in zoology to read the more important parts of it—especially the observations at the close of each order—before they begin Part III. As regards this systematic treatise the observations which we have already made on the difficulties to be mastered in the compilation of the memoirs relating to the six geographical regions are still more

applicable. It would be easy to point out many passages in which Mr. Wallace has not in our opinion made the most judicious choice of authorities. Errors of detail are, however, as has been already stated, unavoidable in a work of this extent—happy is he who makes fewest of them! Even in the case of some of the largest and most prominent families of the great class of mammals, naturalists are by no means yet agreed as to the number of species and genera that should be admitted. For example, Mr. Wallace, we observe, assigns "four, or perhaps five" rhinoceroses to Africa, but Prof. Flower—one of the highest living authorities on this class of animals, in a recent paper read before the Zoological Society of London—could only recognise *two*. Mr. Wallace admits the validity of *Elasmognathus* of

Gill as a genus of Tapirs, and adopts Dr. Gray's multitudinous division of the well-defined and eminently natural group of Eared Seals (*Otaria*). Many naturalists would hesitate before following Mr. Gill and Dr. Gray as authorities on these (or perhaps we may add on many other) subjects. But such and similar errors on questions of detail do not, we believe, affect the validity of Mr. Wallace's general conclusions. After the miserable stuff usually thrust before us in even the best and most recent treatises on geography, when the question of distribution comes to be touched upon, it is truly refreshing to turn to Mr. Wallace's broad and enlightened views on this subject. Future compilers of geographical manuals will have an easy task when they come to this most important but hitherto most ill-used part of their work, if they will only cast aside all that they have previously written, and borrow freely from the volume now before us.

Mr. Wallace has already registered many claims on the gratitude of naturalists present and future. In their interest he has explored the tropics of the east and the wildernesses of the west, and has brought home numberless novelties. He has written one of the best and most instructive books of naturalists' travels ever yet issued. He was, as is well known, the joint inventor with Mr. Darwin of the theory of "Natural Selection." But beyond all these scientific feats—and they are no mean ones—he has accomplished a task that will extend his fame even more widely amongst those who love science, as the author of the first sound treatise on zoological geography.