

Wallace's 'Malay Archipelago.'—Since the days when my lamented friend, John Craufurd, made the English public well acquainted with all the leading geographical and statistical features of the

Indian Archipelago, the most remarkable work which has been published is that which has just appeared from the pen of our Associate, that eminent naturalist Alfred Russel Wallace.* As we took an interest in Mr. Wallace's expedition when first planned by himself, and received from time to time papers from him on various portions of his travels, we may well feel a pride in his great success, and in the striking contributions to various departments of science which have been the result of his eight years' wanderings.

As Mr. Wallace justly observes, the vast group of islands extending from Sumatra to the Islands east of New Guinea are equal in the extent of surface which they cover to one of the primary divisions of the earth's surface, although the region in most maps is almost ignored as a geographical whole, being divided between Asia and the Pacific Islands. The Malay Archipelago extends for more than 4000 miles in length from east to west, and is about 1300 in breadth from north to south. Its area is equal to that of all Europe and great part of Western Asia combined, and some of its islands are larger than France or the Austrian empire. The region, moreover, is exceedingly diversified, both in physical features and in animal and vegetable productions. One of the chief volcanic belts upon the globe passes through the archipelago, and produces a striking contrast between the scenery of the volcanic and non-volcanic islands. The organic productions are, to a great extent, peculiar, and remarkable for the beauty of their forms, and, in the case of the fruits and spices, their value to mankind. The task which Mr. Wallace set before him was to visit all the principal parts of this great equatorial region and explore its physical geography and natural history—a task which employed him during eight years from 1854 to 1862.

The result of Mr. Wallace's researches which chiefly interests us as geographers, is the establishment of a natural division between the eastern and western portions of the archipelago; a sketch of which, with the principal facts and reasonings leading to it, was given by him in a remarkable paper read before us soon after his return, in June 1863. The first suggestion of this division seems to have been supplied by the animal productions, which are so widely different in the western and eastern halves of the Archipelago, the great islands of Sumatra, Java, and Borneo, on the one hand, containing the elephant, rhinoceros, wild cattle, and a vast number of genera and species of mammals and birds allied to, or

* 'The Malay Archipelago; the Land of the Orang Utan and the Bird of Paradise.' 2 vols. (Macmillan and Co. 1869.)

identical with, those of Continental Asia, whilst New Guinea and the Moluccas are destitute of all these Asiatic forms of life, and, in their stead, contain numerous genera of Australian types. The two faunas thus wonderfully contrasted nearly meet at a central line, which runs north and south along the channels between Borneo and Celebes, and between the small islands Bali and Lombok in the Java Sea. Between the two islands last mentioned the channel is only 15 miles wide, yet the two sides of this narrow strait differ as essentially in their animal life as Europe does from America.

In establishing this division Mr. Wallace applies the same principle which is followed by some European geologists and naturalists, in working out the relations of animal life and their bearings on the former geological connexion of countries now separated by the sea; for example, in the case of the British Islands and the continent of Europe. The fact that our islands are peopled by animal and vegetable forms, with few exceptions identical with those of the neighbouring continent, led, in the first place, to the conclusion that they were united by land at a period not further remote than the peopling of North-Western Europe by its present species of organic beings; and this hypothesis has now been confirmed in a remarkable manner by geological investigations of post-tertiary deposits, which prove that this connexion must have existed. The shallowness of the intervening sea is also accepted as an argument in favour of the recent union of these land areas. Mr. Wallace assumes, with many other eminent naturalists, that this principle may be carried further, and that when the terrestrial animal productions of islands, or islands and their neighbouring continents, are dissimilar from each other, it may be concluded that there has been no connexion between them in recent geological times. It must be allowed that some facts lend great support to these conclusions; for example, it is found that where there is great dissimilarity in the organic forms between lands compared in this manner, they are usually separated by a deep sea instead of a shallow one; and, if all geological changes had been slow, the depth to which the sea-bed had sunk might be taken as a kind of rough measure of the lapse of time. Applying this test to the Malay Archipelago, Mr. Wallace has found that the seas lying between the great islands of Borneo, Java, and Sumatra (in short, all the islands having Asiatic forms of life) and the Asiatic continent, have a maximum depth of not more than 50 fathoms: and, at the other extremity, New Guinea and the neighbouring islands are connected with Australia by a similar shallow sea. The space, how-

ever, between these two areas of lands and shallow sea is occupied by a very deep sea, and the Australian types seem to diminish in numbers, in advancing westward from New Guinea, as we approach the channel that divides the "Austro-Malayan" from the "Indo-Malayan" portions of the archipelago.

For the details of this remarkable subject, which unites the science of Geography with those of Geology and Natural History, and also for the curious speculations on the modifications of species, I must refer you to Mr. Wallace's book. So well has he elaborated his leading generalization, and so thoroughly has he made it his own, that already other writers are beginning to term the dividing channel between the two halves of the archipelago "Wallace's line." In addition to this ingenious speculation, the two volumes contain a store of interesting and important facts relating to the physical geography of the various portions of the archipelago, and to the native inhabitants, climate, and productions of the remote islands which he visited.

Much, however, as Mr. Wallace is to be admired as a great naturalist and a most attractive writer, I cannot, as an experienced geologist, subscribe to his assumption that *all* former changes of the outline of the earth were produced slowly. On the contrary, it seems to me that the profound chasm which he describes as existing between the islands of Bali and Lombok has more probably resulted from one of those deep and sudden ruptures of the crust of the earth which the field geologist meets with so very frequently. It would, indeed, require a detailed examination of the cliffs and shores of these opposite islands (a point on which the author is silent) before we can refer the enormously deep channel which separates them to the ordinary action of a marine current during countless ages. Having, at our last anniversary, endeavoured to combat the doctrine of uniformity of causation through all time, I will follow up the subject towards the end of this Address by comparing some of the present with the former changes of the earth's surface.