

SCIENCE

Stanford's Compendium of Geography and Travel. Based on Hellwald's 'Die Erde und ihre Völker.'—Australasia. Edited and Extended by Alfred R. Wallace. With an Ethnological Appendix by A. H. Keane. (Stanford.)

MR. STANFORD has been fortunate in the selection he has made of writers to assist him in this useful compilation. The names of Mr. Keith Johnston and of Mr. Bates are a sufficient guarantee for the excellence and accuracy of the volumes they produced, and the work now before us, by Mr. Wallace, cannot fail to add to his well-earned reputation as a naturalist. His personal experience in the scenes which he depicts has been invaluable to him. He has laboured under disadvantages from which the others were free, having derived comparatively little assistance from Hellwald; for although this work is nominally based upon the researches of that writer, he tells us in his preface that only one-tenth part of the matter is really drawn from that source. He has also had to deal with a portion of the world possessing less of historic tradition than any other; the description of it is therefore, comparatively speaking, confined to the natural aspect of those countries and to their wonderful geological history.

Notwithstanding this, Mr. Wallace has compiled a book not inferior to either of its predecessors. The only improvement which we would suggest is a more copious reference to the numerous sources from which the conclusions have been drawn. This would materially assist those who may wish to study the subject still more fully. We are led to this remark from the fact that in one or two unimportant particulars the writer's statements do not accurately coincide with our personal impressions.

The area over which our author's observations range exceeds Asia:—

"Beginning at the west, we have the Malay Archipelago, comprising the largest islands in the globe (if we exclude Australia) and unsurpassed for the luxuriance of its vegetation as well as for the variety and beauty of its forms of animal life. Further to the east we have the countless islands of the Pacific, remarkable for their numbers and their beauty, and interesting from their association with the names of many of our greatest navigators. To the south we have Australia, a land as unique in its physical features as it is in its strange forms of vegetable and animal life. Still further in the Southern Ocean lies New Zealand, almost the antipodes of Britain."

The whole of this Mr. Wallace terms "Australasia," and rightly; the Malay Archipelago, Java, Borneo, and possibly the Philippines, were clearly until very recent times the southern portion of the Asiatic continent. The shallow seas which divide them from it, and the identity of their Flora and Fauna, place this fact beyond a doubt. Proceeding eastwards we meet with seas of enormous depth, and immediately find in the Moluccas, New Guinea, and Australia plants and animals totally distinct from those of Asia. It is generally received by geo-

logists that the separation between them must have occurred since the Oolitic formation.

The Australian continent itself must formerly have been much more extensive. New Guinea is only separated by straits of not more than nine fathoms depth. Tasmania evidently once formed a portion of the mainland. The greatest encroachment seems to have been upon its eastern coast, where the Great Barrier reef, twelve hundred miles in length by seventy miles in width, divided from the shore by a channel varying from five to one hundred miles, indicates where the coast line must have run. This is a coral formation; as it is known that the coral insect can only work at a small distance below the surface of the water, and as the ocean bed is here more than two thousand feet deep, it is evident that there must have been that amount of subsidence at the very least. We are told elsewhere that a rise in the sea level of five hundred feet would convert the whole continent into a group of islands. Indeed, Mr. Wallace contemplates the possibility of such a result.

"Australia must, in fact, be regarded as a continent of the Secondary or early Tertiary period, now gradually disappearing, and this phenomenon of subsidence is displayed even on a still vaster scale throughout the whole extent of the South Pacific Ocean. All the so-called 'atolls,' or true coral islands, have been built up on a foundation of sunken land, and the bottom of the ocean is itself even now subsiding more and more; of the former lands now submerged beneath the ocean waves nothing has survived except the highest mountain crests, still represented by the countless South Sea islands."

Sir Joseph Hooker thinks that there are indications of a former connexion with Africa, and Mr. Wallace is disposed to agree with him. The islands of St. Paul and Amsterdam may indicate where an intervening land once formed a stepping-stone for the intermigration of the plants and animals of Australia and South Africa. Both authorities are agreed that there must have been a great extension of land to the west and south; in no other way can they account for the peculiarly rich Flora of West Australia. A large area must have been required for the development of so many special types as are to be found here clustered together. We wish that our space permitted us to pursue further the botanical question, which has been ably and enthusiastically handled by Sir Joseph Hooker. The extreme antiquity of the country, its perfect isolation since the Mesozoic age, and its strange development both of animal and vegetable life, give a deep interest to all speculations about its past history.

The great geological mystery of this land is undoubtedly the desert Sandstone; it is unquestionably a lacustrine formation, and covers nearly one-third of the continent, extending from the west of Queensland right across it to West Australia. Its age is as yet unascertained, but it is supposed to belong to the later Tertiary or Pliocene period. This whole region seems to have been subjected to great sub-aerial degradation. Rock pillars standing out from its central plains to a height of nearly two hundred feet, indicate where the original surface was. This tract is for the most part a dreary waterless waste.

Interesting as these speculations are in a scientific point of view, the clear description given of the gold formation will command more general attention. The Tertiary gold-drifts are believed to date from the older Pliocene period, though a portion of them may perhaps be Miocene. These drifts all rest upon, and may have been derived from, the lower Silurian strata which contain the "reefs," as they are termed by the miners, or auriferous quartz veins from whence the gold in the "drifts" has been derived. These "drifts" have been penetrated to the depth of five hundred feet before reaching the bottom, and occasionally before reaching the Silurian bottom-rock beds of basalt are met—lava flows which had occurred during the accumulation of the "drifts." The "leads" and "gutters," on being properly mapped out, turn out to be a system of ancient water-courses, in which the alluvial gold is now discovered. The most valuable "finds" have been made in this alluvial mining. A large quantity of very poor quartz subjected to great denudation may produce an abundant "gutter," but it is to the quartz reefs themselves that we must look for a permanent supply. Some of these have been worked to a depth of two thousand feet, without any apparent diminution in richness.

The surface of the interior of this great island-continent is for the most part hopelessly sterile. "As Tartary is characterized by steppes, America by prairies, and Africa by its deserts, so Australia has a feature peculiar to itself, and that is its scrubs." In the south-east of South Australia there is an unbroken tract of the "mallee" scrub, covering nine thousand square miles. Such tracts are almost always destitute of water. The "mulga" consists of bushy acacias armed with thorny spines, through which neither man nor horse can force a way. The "heath" covers vast level sandy tracts, dusty in summer and boggy in winter, with a tangled vegetation two feet high, of the greatest interest to the botanist, but dreaded by the explorer. "The most terrible production of the Australian interior is the 'spinifex,' or porcupine grass (*Triodia cirritans*), which extends for hundreds of miles over sandy plains, and probably covers a greater amount of surface than any other Australian plant."

Full justice is done by Mr. Wallace to the gallant bands of explorers who had to encounter such obstacles. He gives graphic sketches of the journeys of Eyre, Sturt, Leichhardt, M'Douall Stuart, the first successful traveller from south to north, and of the ill-fated Burke, who, although he reached the Gulf of Carpentaria, lost his life on his return journey. A curious instance may be here mentioned illustrating the rapidity of settlement—that in six years after his death from starvation in a wilderness a public-house and racecourse stood on the scene of his death. Still more striking is the fact that along M'Douall Stuart's route there now runs the telegraph wire, and that it is proposed to make a railway along this route from Adelaide to Port Darwin.

The extraordinary growth of our southern colonies, which Mr. Wallace describes with pride, must be accounted for by the fact that only the most eligible sites have been in the first instance occupied. The general barren-

ness of the interior, the want of steady rains and of rivers, preclude the hope that it can ever be the home of a dense population, or that the same destiny is in store for it which is promised in North America. Notwithstanding the great heat, and floods and droughts which alternately make Lake George, in New South Wales, a lake twenty miles in length by eight in width, and in other years leave it as dry as the table upon which we write, the climate is healthy in the settled districts. The death-rate amongst the white population is nineteen per thousand against twenty-five in this country. In West Australia, since its settlement fifty years ago, the death-rate has been only one per cent. against two and a half in England. Many diseases to which people are subject here are unknown there.

We have devoted so much space to the mainland of Australia that we are precluded from noticing the still more strange geological problems presented by New Zealand in its volcanoes, geysers, glaciers, and mountains. For the same reason we can only recommend our readers to study for themselves Mr. Wallace's glowing accounts of the Malayan Archipelago, of the ravishing beauty of New Zealand and the isles of the Pacific.