

TROPICAL NATURE, AND OTHER ESSAYS. By ALFRED R. WALLACE. New York: Macmillan & Co. Pp. 356. Price, \$3.50.

MR. WALLACE'S new volume consists of some eight essays, of which the first four only can be strictly considered as coming within the scope of his principal title. Two of the chapters have already appeared in *Macmillan's Magazine*; one has been published in the *Fortnightly Review*, and one was originally delivered as a presidential address to the Biological Section of the British Association in 1876. Hence the whole work comprises a slightly heterogeneous mixture, and the first three essays have rather the appearance of an afterthought, inserted for the purpose of giving a consistent *raison d'être* to the publication, than that of a complete and consecutive treatise. But, of course, Mr. Wallace can never be otherwise than ingenious and interesting, nor does the present volume form any exception to the general excellence of his compositions.

The author sets out by stating that, while the luxuriance and beauty of tropical Nature are a well-worn theme, which has often suffered from the undue exaggeration of its exponents, no attempt has yet been made to give a broad sketch of those phenomena which are *essentially* tropical, and which mark the chief differences between equatorial and temperate climates. This desideratum he seeks to supply, from the exceptional experience of a long residence in the hottest regions of the Eastern and the Western Hemisphere alike. In pursuance of the design thus laid down, the first

essay treats of "The Climate and Physical Aspects of the Equatorial Zone," both as regards their actual phenomena and the causes which lead to their production. Though possessing, of course, little absolute novelty, the facts are well arranged, and so displayed or illustrated as to bring the salient points of tropical meteorology in a very vivid manner before the untraveled student. The second essay, on "Equatorial Vegetation," contains an admirable sketch of the tropical flora, viewed in its *ensemble*, besides a vigorous exposition of the common but fallacious belief that large and brilliant flowers are exceptionally frequent in hot climates. Mr. Wallace succeeds in giving a clear and sufficient notion of the richness and profusion of vegetable growth without rousing any suspicion of that false theatrical glamour which ordinary writers have cast around the subject. The third essay deals with "Animal Life in the Tropical Forests," dwelling especially upon the *Lepidoptera* and *Hymenoptera* among insects; the parrots, pigeons, and picaræ among birds; and the monkeys and bats among mammalia—all of which form the peculiarly equatorial types of their several classes.

But it is with the fourth essay, on "Humming-Birds," reprinted from the *Fortnightly Review*, that the real interest of the work begins. Mr. Wallace gives a short sketch of the structure and habits of these birds, and then takes the species which inhabit the island of Juan Fernandez as illustrations of the action of variation and natural selection. In a bold and successful *a priori* reconstruction of their history, amply justified by the incidental verifications which crop out during the course of the argument, he traces their origin, with great probability, to two separate accidental migrations, under stress of weather, from the opposite coast of Chili. At the same time he shows the probable causes of the resulting variations, and starts a theory of organic coloration, which is more fully treated in the two succeeding essays. He then points out the strong structural resemblances between swifts and humming-birds, while demolishing the supposed connection between the latter and their Eastern representatives, the sun-birds—a connection based entirely upon adaptive and functional pe-

cularities, necessarily common to two families whose modes of life are so exactly analogous. No better practical specimen of the new biological methods than that afforded by this essay could possibly come into the hands of readers with good common-sense and little special scientific knowledge.

The fifth and sixth essays, on "The Colors of Animals and Sexual Selection," and on "The Colors of Plants and the Origin of the Color-Sense," lead us at once into the region of controversy. They appeared originally in *Macmillan's Magazine*, but they have since been enriched by numerous additions and alterations, in accordance with suggestions from Mr. Darwin or other correspondents. In the first of these two papers, Mr. Wallace brings a powerful battery to bear against the accepted doctrine of sexual selection, and it must be confessed not without effect in shaking, if not in demolishing, that stronghold of Darwinism. He contends that color is a natural product of organic forms, which may be checked or intensified by natural selection, but whose occurrence is quite normal, and so stands in need of no separate explanation. All colors in animals may be classified under four heads—protective colors, warning colors, sexual colors, and typical colors. The two former do not now require further definition; but sexual differences of hue he attributes not to conscious selection of mates, the occurrence of which is emphatically doubted, but to a special necessity for concealment in one or other sex; as, for example, in the incubating females of birds, or in the males among those species in which that sex undertakes the duty of hatching. This explanation would refer the variety in coloring to natural selection alone, acting unequally upon the several sexes, and so causing a partial suppression of bright tints. The vast majority of animal markings Mr. Wallace attributes to typical coloring; that is to say, a conventional or meaningless distribution of pigment, serving mainly for purposes of recognition between the members of the same species. Though it would be rash too readily to accept or reject these careful and well-reasoned conclusions, it seems probable that an intermediate belief will ultimately prevail. Certainly, Mr. Wallace has shown beyond a doubt that natural selection will adequately and simply account

for many curious phenomena which Mr. Darwin believed to be due to conscious preference. The partial elimination of this markedly Lamarckian element in the theory of descent cannot but be regarded as a distinct gain, though few readers will be inclined entirely to agree with the author in his total rejection of sexual selection.

The sixth essay applies the same general principles to the colors of plants, and contains some interesting speculations on the beauty of Alpine flowers, and on the difference between succulent fruits and nuts. It also touches briefly on the question of the development in insects and vertebrates of a faculty for the perception of colors, with remarks upon the theories lately advanced by Geiger, Magnus, and Gladstone. This and the succeeding paper are chiefly noticeable for their exposition of the author's opinions upon certain ultimate teleological questions. In his book upon the Malay Archipelago, Mr. Wallace advocated the belief that all the beauty of the external world was due to natural causes, without any divine afterthought as to its effects upon the human mind. But, since that time, the implications contained in the doctrine of evolution seem to have clashed with earlier prejudices, and driven this otherwise acute and vigorous thinker into a coquetry with so-called spiritualism, which has vitiated much of his later work. In the present volume he suggests that the colors of the organic world, though developed by ordinary laws, may have been specially directed by some superior agency with reference to the final enjoyment of their beauty by man. In short, he inclines to the purely gratuitous supposition that butterflies, birds, and flowers, acquired brilliant tints in the Secondary and Tertiary periods, partly in order that men might look upon them in the Quaternary. And the essay which we are now considering concludes with the ominous sentence, "The emotions excited by color and by music, alike, seem to rise above the level of a world developed on purely utilitarian principles." It is greatly to be regretted that the joint discoverer of the theory of natural selection should allow himself to make use of such painfully dyslogistic and unscientific language.

The seventh essay, the presidential address, bears the title of "By-paths in the Do-

main of Biology," and consists of two totally distinct portions. The first comprises an excellent monograph, in the author's happiest manner, on the influence of locality upon coloration, and brings together a number of valuable facts upon which future theory may be founded when the time becomes ripe. But the second part is a criticism upon the views generally entertained by the scientific world on the origin and antiquity of man: and the conclusion toward which (though nowhere clearly stated) it implicitly points is the author's favorite dogma that the human intellect has *not* been evolved by the same natural causes which have developed the human organism. As elsewhere, Mr. Wallace seems disposed to believe in a special and solitary miracle, whereby a new form of consciousness was suddenly and supernaturally foisted upon the human brain. Readers of Mr. Herbert Spencer's "Psychology" will scarcely incline to accept this incongruous and ill-digested hypothesis.

The eighth essay treats of the "Distribution of Animals as indicating Geographical Changes." The author here treads again on firmer and more familiar ground, and his conclusions carry considerable weight.

As a whole, the work, in spite of many crudities and a marked increase of the teleological bias, is fully worthy of Mr. Wallace's deservedly high reputation. Every page is laden with fruitful and suggestive ideas; while the same charming and natural style as ever carries on the reader with unflagging interest from the first page to the last. The book is one which will arouse much controversy upon special questions; but it cannot fail to extort praise for its width of view, its subtilty, its firm grasp of principles, and its perfect mastery of facts. It should find a place at once in the library of every thinking naturalist and every general reader who feels an interest in the great and absorbing problem of organic evolution.