

WALLACE'S TROPICAL NATURE.*

THE present volume by Mr. Wallace gives a glimpse of the tropics from a new point of view. The climate, the luxuriant vegetation, and the varied forms of animal life in the equatorial zone have been described with minuteness by many naturalists. But there appears to have been still wanting a comprehensive treatment of the subject, an exposition of the phenomena which are *essentially* tropical, and an explanation of the relations of such phenomena to each other. It is clear that if some of these relations, such as those of climate to color, and of organic structures to surroundings, are placed in the strong light thrown upon biology by the theory of descent, they may probably receive much needful explanation. This task has been attempted by Mr. Wallace. When we remember that from his investigations in the tropics he originated, independently of Mr. Darwin, the theory of derivation now most widely known as the Darwinian theory, we can better realize the clearness of his vision and his fitness for the undertaking. A twelve years' residence in the tropics, under favorable conditions for exploration, afforded him abundant materials, from which he has selected enough for a bold outline sketch of tropical nature. There is no confusion from multiplicity of details, nor is there left upon the mind any impression that facts unfavorable to the theory have been suppressed. The reader is taken into the confidence of a candid guide, and is shown even those things which one trembling for the safety of a favorite hypothesis might have concealed.

The present volume consists of two parts: the first deals in a general way with the climate, plants, and animals of the tropics as related to one another; the second part comprises several special essays upon kindred topics, all of which have a bearing upon the main subject. It is with only a portion of the first part that the present notice now concerns itself—namely, the relations of climate to vegetation at the equator.

The equatorial zone, in which the chief characteristics of tropical nature are most clearly manifested, and which Mr. Wallace has taken for special study, comprises about twelve degrees north and south of the equator. The striking feature of its climate is the remarkable uniformity of temperature. The annual range is less than thirty degrees, and the daily range about ten degrees, Fahrenheit. Many causes conspire to bring about this high temperature and maintain its uniformity. Mr. Wallace cites among them the constant high temperature of the soil and of the surface waters of the ocean, the great amount of aqueous vapor in the atmosphere, the great extent of the intertropical regions, which causes the winds that reach the equatorial zone to be always warm, and the latent heat given out during the formation of rain and dew.

"In this favored zone the heat is never oppressive, as it so often becomes on the borders of the tropics; and the large, absolute amount of moisture always present in the air is almost as congenial to the health of man as it is favorable to the growth and development of vegetation. Again, the lowering of the temperature at night is so regular, and yet so limited in amount, that, although never cold enough to be unpleasant, the nights are never so oppressively hot as to prevent sleep. During the wettest months of the year, it is rare to have many days in succession without some hours of sunshine, while, even in the driest months, there are occasional showers to cool and refresh the overheated earth. As a result of this condition of the earth and atmosphere, there is no check to vegetation, and little if any demarcation of the seasons. Plants are all evergreen; flowers and fruits, although more abundant at certain seasons, are never altogether absent; while many annual food-plants, as well as some fruit-trees, produce two crops a year."

Local conditions in limited regions may slightly modify these general features. Mr. Wallace states that the excessive violence of meteorological phenomena generally supposed to be characteristic of the tropics is not by any means true of the equatorial zone. Electrical disturbances are much more frequent, but not generally more violent than in temperate regions. "Uniformity and abundance, rather than any excessive manifestations,

* 'Tropical Nature, and Other Essays.' By Alfred R. Wallace. London and New York: Macmillan & Co. 1878.

are the prevailing characteristics of all the climatal phenomena of the equatorial zone." In this zone of equable climate there is a forest belt a thousand miles wide. Its northern and southern borders are unevenly fringed by lower woods, then by open country which ends in arid plains and deserts. The evergreen, equatorial forest consists mainly of unbranched trunks, which are not thickly crowded, and which suggest the columns of an immense edifice. The roof of foliage is almost unbroken, and the gloom of its depths is the only twilight of the tropics. The trunks are seen, on closer inspection, to be of many different kinds. In the forests of the temperate zone there is a monotonous repetition of identical shapes—the forests of pines are pines alone, the oak forests have chiefly oaks. But in the forests of the equator the columnar trunks are of many different species and of great diversity of form. Some of them are cylindrical, others are broader at base, and many have wing-like projections or buttresses which radiate from the trunk like flat roots. These buttresses spring from various heights, in some cases thirty feet or more, and with such space between them that it would, if roofed over, form a good-sized hut for several persons. These strong slabs, which flank the trunk, contribute much mechanical support. The same end is reached in other ways by other trees. Some have secondary aerial roots, which thicken until they can bear much strain in stress of weather. Beneath the higher forest there is a second, of shade-loving trees; and beneath the latter an undergrowth of shrubs, of ferns, and of dwarf palms. Clothing the ground of the forest there is a carpet of Selaginella, the clubmosses of our florists, and this is often varied with a few herbaceous plants having unattractive flowers.

The climbing plants in the tropics form a conspicuous feature of the vegetation. Many of these twine around other slender trunks and hang in festoons from branch to branch. They are often twisted around each other, forming cables; but more frequently they are independent of such mutual support.

"In the shade of the forest they rarely or never flower, and seldom even produce foliage; but when they have reached the summit of the tree which supports them, they expand under the genial influence of light and air, and often cover their foster-parent with blossoms not its own. Here, as a rule, the climber's growth would cease; but the time comes when the supporting tree rots and falls, and the creeper comes with it in torn and tangled masses to the ground. But though its foster-parent is dead it has itself received no permanent injury, but shoots out again until it finds a fresh support, mounts another tree, and again puts forth its leaves and flowers. . . . When these accidents and changes have been again and again repeated, the climber may have travelled very far from its parent stem, and may have mounted to the tree-tops and descended again to the earth several times over."

But where are the flowers of the tropics? These are less conspicuous and less abundant than are the flowers in the temperate zone. A few brilliantly-colored, showy blossoms are found in favored localities, but these are so rare as to be exceptions. The correlations of colored flowers with insects are supposed to afford an adequate explanation of this scarcity:

"The varied forms of life are linked together in such mutual dependence that no one can inordinately increase without bringing about a corresponding increase or diminution of other forms. The insects which are best adapted to fertilize flowers cannot probably increase much beyond definite limits, because in doing so they would lead to a corresponding increase of insectivorous birds and animals which would keep them down. The chief fertilizers—bees and butterflies—have enemies at every stage of their growth, from the egg to the perfect insect, and their numbers are therefore limited by causes quite independent of the supply of vegetable food. It may, therefore, be the case that the numbers of suitable insects are totally inadequate to the fertilization of the countless millions of forest-trees over such vast areas as the equatorial zone presents, and that in consequence a large proportion of the species have become adapted either for self-fertilization or for cross-fertilization by the agency of the wind."

A few of the lower forest-trees bear conspicuous blossoms, but these are low down on the trunks, and are visited by the low-flying butterflies. The sensitive plant of the tropics has, of course, attracted Mr. Wallace's attention. When a sensitive mimosa is rudely touched the leaflets close and the whole leaf shrinks into its narrowest compass. Mr. Wallace suggests that, since these plants are all low-growing herbs or shrubs with delicate foliage, they might possibly be liable to destruction by herbivorous animals, and might escape by their singular power of suddenly collapsing before the jaws open to devour them. "It is curious that, as most of the species are somewhat prickly, so easy and common a mode of protection as the development of stronger spines should here have failed, and that its place should be supplied by so singular a power as that of

simulating death, in a manner which suggests the possession of both sensation and voluntary motion."

In this volume Mr. Wallace brings out very clearly the fact that the plants of the equatorial zone have not had to contend against unfavorable atmospheric influences. The struggle has been with other plants and with animals, and under nearly uniform conditions. Therefore, as a result of the abounding energy of plant-life under wholly favoring and uniform conditions, every nook of the forest has some specially-adapted form. "The never-ceasing struggle for existence between the various species in the same area has resulted in a nice balance of organic forces, which gives the advantage now to one, now to another species, and prevents any one type of vegetation from monopolizing territory to the exclusion of the rest."

The work is written in an engaging style and without technical terms. In a subsequent notice we may consider Mr. Wallace's chapters on Color and Climate.