

RECENT WORKS ON SCIENCE.

Tropical Nature and other Essays. By Alfred R. Wallace.
London: Macmillan and Co. 1878.

MR. A. WALLACE is a zoologist whose prolonged and careful study of the fauna and flora of the globe, amidst their most luxuriant native haunts, makes his well-considered writings of great value. His keen love of bold and daring sport, his intense sympathy with nature, his quickness and depth of observation, and withal his scientific severity of description, make what he can tell us of the splendid solitudes of *Tropical Nature* peculiarly welcome. But in addition to this his fame and capacity as a philosophical biologist is second to none—not even to that of his great rival, Charles Darwin. Hence we look with eagerness in a new production from the pen of such a man, to see how the observations which he records, of otherwise unobserved zoological facts, are believed by him to sustain, or otherwise, the leading biological doctrines of our time. It is well known that Mr. Wallace independently and nearly at the same time formulated in his own mind the Darwinian doctrine of the Origin of Species; but he gave way, that Mr. Darwin might—as probably it might have been subsequently shown he had by priority a right to—work out the doctrine as its originator. But Mr. Wallace has given us contributions on the subject which are of the highest moment; and not the least so are those in which he points out what he believes to be the inapplicability of the doctrine as an explanation of the origin of man as now existing on the globe. It is therefore

a matter in which all who are concerned to find the truth on such a subject must have more than usual interest when Mr. Wallace subjects the details of the doctrine of the "survival of the fittest" to the scrutiny of new facts, or of old ones more thoroughly investigated.

The book is delightfully written. The subject, of course, in any other hands could have little freshness; but every page is quickened with new light, and carries to the mind conceptions of the luxuriance and natural magnificence which it seeks to describe.

The climate and the appearance of the equatorial zone are well presented. It is uniform in all parts of the globe: at Singapore or Batavia; in the Moluccas or New Guinea; at Para, the sources of the Rio Negro, or on the Upper Amazon, the equatorial climate is essentially the same. The reasons why the equatorial temperature is so equable are very lucidly explained—the most important of which are, of course, the impediments to heat radiation at night, and the large amount of heat liberated during the condensation of the aqueous vapour of the atmosphere in the form of rain or dew. The equatorial atmosphere frequently approaches the point of saturation, and the great weight of vapour which by expansion its high temperature enables it to hold in suspension, causes a very slight fall of temperature, and consequent atmospheric condensation, to issue in heavy rains or copious dews at comparatively high temperatures. The consequence is that the rain-drops become rapidly larger in passing through the saturated air, and by this process as well as by that of the formation of dew, the heat which was employed in retaining the water in a gaseous form, and was then unperceived, is liberated; and keeps up the high thermal condition of the air.

The heat, however, is "never oppressive," as it so often becomes on the borders of the tropics. The large amount of moisture in the air is "congenial to the health of man" if he will only comply with the necessities of the climate. The lowering of the temperature at night is also very gradual and regular, so that it is never cold enough to be unpleasant, and yet is strictly limited in amount and hence is never so oppressively hot as to prevent sleep. During even the rainy season there is rarely a day without sunshine, and in the driest months of the year there are occasional refreshing showers. The consequence is that there are no sharply marked seasons: plants are ever green, and flowers and fruit are never absent.

The subject of equatorial *twilight* is also accurately dealt with. There has been much popular exaggeration as to the shortness of its duration. The sun, of course, descends vertically at the equator, and not obliquely, as in latitudes north and south of the equatorial zone. This explains the length—greater or less—of the

twilight in northern or southern latitudes. It is well known that our twilight is shortest at the time of the equinoxes, and Mr. Wallace believes that equatorial transition from daylight to darkness is not more than a third shorter than this.

At two periods of the year the sun is absolutely vertical, and there are no shadows at noon; which to an inhabitant of temperate zones is a very striking phenomenon. The splendid constellation Orion passes vertically overhead; while the Great Bear is only to be seen low in the northern horizon. Towards the south is the Southern Cross—and the “Magellanic clouds”—a kind of nebula.

The general belief that in the tropical zone there is a magnificent display of floral beauty is not sustained by fact. The truth is that, in proportion as general vegetation becomes more abundant and luxuriant, flowers form a less and less prominent feature. This is true in temperate and even frigid zones. It is mountains, meadow pastures, and hill sides that produce gay and various flowers—much more so, certainly, than our woods and forests. Hence in the luxuriance of the tropical zone there are few flowers. Orchids are rare in the dense forests, and the flowers the forest trees bear are inconspicuous; hence weeks or even months may be passed without looking upon a brilliant or showy flower. The forests of this zone are too gloomy for the light-loving flower. But the forests themselves are grand indeed—“overwhelming by their vastness, and by the display of a force of development and vigour of growth rarely or never witnessed in temperate zones.” The variety of form and species is immense; and parasites, epiphytes, and creepers fill every available space with remarkable modes of life.

But there is a remarkable fact for the philosophical biologist, put with great clearness in this relation. If a traveller is arrested with any special species, and wishes to find more like it, he may often turn his eyes in every direction in vain. There are all around trees of varied forms, dimensions, and colours, but they are *rarely found to be repeated*. There are many *similar* forms, but on close examination they prove to be distinct. It is only at long intervals and long distances that a repetition of any specific form can be found.

Here we undoubtedly have products dependent on environment. The appearance of multiplications of individuals of the same form and species, as in the pine or oak forests of more temperate regions, is dependent manifestly on a permanence of unequal climate conditions. Atmospheric conditions are above all others essential to the growth of plants. As we approach the Pole the variety of groups and species diminishes, until we find only a few specially organised forms which are able to maintain their existence. In the extreme north, pine or birch trees; in the

desert, a few palms and prickly shrubs alone survive. But in the equable tropical zone there is no such struggle against climate; every form of vegetation has become alike adapted to its genial heat and abundant moisture, which have in all probability changed but little through all the geological epochs since this great flora has existed. In the unceasing struggle for existence between the various species in the same area there has resulted a "nice balance of organic forces," which gives the advantage now to one, now to another species, and therefore prevents monopoly by any one form, and so hinders gregarious growth.

The same explanation goes to account for the production of a vast variety of smaller trees which can grow and flourish beneath the shade of the greater trees, and also the luxuriant special adaptations of the tropical forest. Every tree supports numerous other forms of vegetation. They are all crowded with epiphytes; "their forks and horizontal branches are veritable gardens." Creeping ferns and arums run up the smoothest trunks; climbers mount over the highest tree tops. Every crevice is the centre of luxuriant growth, and every fallen and decaying trunk is sheltered in its decadence by a graceful drapery. A ceaseless round of ever-active life weaves the fairest scenery of the tropics into one monotonous whole, of which the component parts exhibit in detail untold variety and beauty.

Very curious are the relations found to exist between ants and vegetation. In the Malay Islands are several curious shrubs which grow as parasites on other trees, and whose swollen stems are true ants' nests. When very young the stems are like small irregular prickly tubers, in the hollows of which the ants establish themselves, and these in the course of time grow into irregular masses of the size of large gourds, completely honeycombed with the cells of ants. The hollow stems of circopias are always inhabited by ants, and the species of acacia found by Mr. Belt to be a special dwelling for ants is still more remarkable; this plant itself is infested by a leaf-cutting ant which destroys it; when it is young, the thorns which are found to play so important a part in its history are soft and full of luscious ant-food; into this the ants go; the thorns grow large, and the plant develops special honey glands on its leaf stalks, and other small fruit-like bodies, which are eaten by the ants; they are thus provided by the plant with barracks and food. And what is the return to the acacia? Why, that the ants become a willing army, successfully fighting off the leaf-cutting ants, and so preserving its life!

Equally singular are the remarkable forms of leaf and stick insects inhabiting this zone of the earth. The protection which their mimicry of leaves and twigs—dead, decaying, or living—gives them, is the only way in which such forms can be accounted for.

The most prominent of the tropical fauna are the butterflies, arising from their numbers, their size, and their brilliance of colouring. Among birds the parrots are foremost, and among mammals the apes; and, on the whole, animal life is more varied and abundant here than in any other part of the globe. And this has doubtless arisen from the permanence of the tropical conditions. All other parts of the earth have been devastated by glacial and other changes, but this has remained permanent—thronged with life—and exposed without cessation to the influence of organism upon organism, developing the greatest variety of forms and filling up every vacant space which an organic form could occupy.

A description of the gorgeous colouring and superb plumage of the humming birds precedes the most important element in this very important book. It is known to all readers of recent philosophical writings that there are many remarkable characteristics of the animal world which could not be accounted for by the principles of natural selection. Such are the extraordinary excrescences permanent on some forms of insects and birds, but more especially the gorgeous and at times highly artistic plumage of the feathered tribes. None saw this more plainly than Dr. Darwin, and consequently he conceived and sought to establish as an additional agent in the origin of species what was known as “sexual selection”—that is to say, the influence which colour and form would have in determining the individual choice of the sexes. Now Mr. Wallace disputes the efficiency of this for producing the results attributed to it in the long and slow modification of species. It is true he admits that the male bird or insect is brightest and most coloured; but he contends that this is due to the greater vigour, activity, and intenser vitality of the male. He points out that the colours of an animal usually grow paler and fade during disease or weakness; while at the period of pairing, when the fighting strength is at its best, the colours of all are most brilliant; while in those comparatively exceptional cases where the female bird is the most brilliantly decorated, it is they that are most pugnacious and possess most vital energy.

It does not appear that this is destructive of the influences, whatever they may amount to, of sexual selection; it is simply an exposition of *another* method by means of which change is or may be brought about. The fact that molecular changes may be brought about by “vital energy”—a matter which none can dispute—will account for the variations in colour which a given group of males at the pairing time may present, and thus may provide the very variety which will determine the “selection” of the female bird, and so secure the perpetuity of the slight change in colour which vital energy produced. But we think that Mr. Wallace has come practically much nearer the *modus operandi* of

nature than Dr. Darwin. He has carried us back farther ; he has given us an idea of the *operation of a law* according to which minute changes may take place and be perpetuated by selection. It is the vagueness of certain philosophical explanations that is so fatal to them. "Sexual selection" is a method which operates to a certain undiscovered extent. But what makes its action possible ? No answer is given or considered needful. Mr. Wallace is pointing in the direction of an answer—and to what does it tend ? Predetermined law : the last outcome of the first Divine impulse at creation. The watch is a beautiful piece of mechanism, but what is known as the chronometer is better. Why ? It not only like the watch keeps accurate time, but it surpasses the watch in this, that whilst it, if taken to the Pole, would go too fast, or to the tropics, would go too slow, the chronometer is endowed with a *compensating power designed* to make its rate regular through all vicissitudes of climate. Organic forms *rigid* would impress us as the product of unmeasured intelligence and power ; but organic forms endowed with a *compensating power*—a power of rhythmic change to meet ever-varying contingencies—impress us as works that display a grander and more impenetrable intellectual greatness and beauty.

It is in the light of broad and persistent research, by minds that have no bias, that truth on subjects so profound can alone be discovered.