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[p. 6a]

‘Wallace on Natural Selection.’

Contributions to the Theory of Natural Selection. A Series of Essays. By Alfred Russel Wallace. Crown 8vo. pp. 384. Macmillan & Co.

We believe that Mr. Wallace’s right to share with Darwin the credit of originating the theory of natural selection is practically undisputed. Both seem to have been engaged upon the subject at the same time, each in ignorance of the researches of the other. Mr. Darwin, by the thoroughness with which he has carried out his investigations and the skill with which he has set them forth, has secured the popular fame of founder of the new scientific creed; but Mr. Wallace has proved that he independently discovered the same truths and pointed out their important application. The present volume contains his earliest essays on the subject, with a number of more recent contributions to scientific periodicals, and some additional matter not previously published. We may pass over those papers in which he merely anticipates Darwin, though they will be found well worth reading. We purpose to call attention just now to some very curious natural phenomena of which Mr. Wallace has given, so far as we know, the best and fullest account ever published. These are the phenomena of mimicry and other protective resemblances among animals, on which a valuable essay from his pen was published in *The Westminster Review* in 1867. He touched upon the same subject rather briefly in his excellent work on “The Malay Archipelago,” noticed in these columns about a year ago. Natural mimicry is a part of the beautiful provision of nature by which certain defenseless animals are endowed with peculiar facilities of concealment from their enemies, and certain creatures of prey are so colored as not to be readily seen or recognized by their victims. Desert animals as a rule are desert colored, and the lion crouching upon the sand must be almost invisible. The birds, reptiles, and small mammals of the desert, where there are neither trees, brushwood, nor undulations of the surface by which they can be concealed, are without exception of the color of the soil. Arctic animals are generally white; but in those latitudes where the snow melts in Summer their fur changes at that season to some other color, because white would then be the most conspicuous of all. The plumage of the ptarmigan in Summer harmonizes so exactly with the lichen-colored stones among which it delights to sit, that a person may walk through a flock of them without seeing a single bird, while in Winter, its white plumage is an almost equal protection. A South-American beetle frequents only one species of tree, whose rough bark it so closely resembles that it is absolutely invisible until it moves. Certain small beetles in the East generally rest on the mid-rib of a leaf, where they look so much like pieces of bird’s dung that the naturalist often hesitates before picking them off. Two allied species of butterflies, the *Kallima inachis* of India, and the Malayan *Kallima paralecta*, are protected in a still more wonderful way. The upper surface of their wings is very showy, as they are large and adorned with a broad band of rich orange on a deep blue ground. The under surface is variable, no two being found alike, but every specimen resembles some kind of dead leaf. Not only is the resemblance perfect in the color, but we find that even the blotches, mildew, fungous growths, and holes observed on dead leaves are imitated here with wonderful exactness. Now the habits of these insects are unlike those of other butterflies. They frequent dry forests, and never settle on a flower or green leaf, but rest on a dead branch. The wings are then closed together, back to back, concealing the head and antennæ. The apex of the upper wings is produced into a sharp point. The lower wings terminate in a short narrow tail which just touches the twig upon which the insect is reposing, and presents every appearance of a stem. From the tail to the apex runs a dark curved line, like the mid-rib of a leaf, and from this radiate oblique lines representing the lateral veins. We thus have “a disguise,” remarks Mr. Wallace, “which may be said to be absolutely perfect, and

the protection which it affords is sufficiently indicated by the abundance of the individuals that possess it." There are certain insects of the family of Phasmidæ, or Spectres, which are called "walking-stick insects" from their singular resemblance to twigs and branches. "Some of these are a foot long and as thick as one's finger, and their whole coloring, form, rugosity, and the arrangement of the head, legs, and antennæ are such as to render them absolutely identical in appearance with dead sticks. They hang loosely about shrubs in the forest and have the extraordinary habit of stretching out their legs unsymmetrically, so as to render the deception more complete. One of these creatures obtained by myself in Borneo was covered over with foliaceous excrescences of a clear olive green color, so as exactly to resemble a stick grown over by a creeping moss or *jungermannia*." On the principle of natural selection it is easy to understand how this protective coloring should be perpetuated. Take the higher animals for instance. There is not a single white land-bird or quadruped in Europe except the few alpine or arctic species to which white is a protective color. Yet in many of these creatures there seems to be no inherent tendency to avoid white, for white varieties appear under domestication and thrive as well as the others. In a state of nature the white varieties, however, would be at a disadvantage in the struggle for existence. A white rabbit would be more surely the prey of hawk or buzzard, and a white carnivorous animal being especially conspicuous would have more difficulty in pursuing its prey and in time of scarcity would be apt to starve to death. Thus natural selection would gradually exclude all varieties except those protected by their color.

Far more wonderful, however, than the protection of color is the phenomenon of mimicry. It has long been known that certain insects bear a strange external resemblance to others with which they have no real affinity whatever, but the significance of this fact has not been understood until lately. It may now be considered established that in an overwhelming majority of cases the animals which resemble each other have the same habitat, and while one group is very numerous the other which resembles it is much less abundant. It is generally found (and probably would always be found if our means of observation were more complete) that the larger group has some peculiar means of defense—either a weapon which its enemies fear, or a disagreeable taste, or a pungent odor; and the smaller group being without such defense finds its safety in its close resemblance to the group which nature has more formidably armed. Instances of this mimicry are most common among the papilionidæ. In the forests of tropical South America there is a very abundant family of butterflies (*Heliconidæ*), characterized by brilliant colors, large size, and heavy flight. They would certainly be caught by insectivorous birds, but nature has provided for their defense by giving them a very strong, pungent, medicinal odor so disagreeable to birds that the butterflies seem to enjoy complete immunity. Now in no fewer than five distinct genera of butterflies and moths there are numerous individuals which so closely resemble the *Heliconidæ* as to be practically undistinguishable from them. These counterfeit *Heliconidæ* are without the pungent flavor which protects the true family, and their only safety is in humbugging the birds by putting on a livery which does not belong to them. The tropics of both hemispheres abound in similar cases of mimicry, and there are instances also among the North American butterflies and English moths. There is a very common English white moth which most birds will not touch, and this is imitated by the female of another genus which appears about the same time. It is a still more remarkable fact that certain defenseless moths imitate bees and wasps which have an undeniable protection in their stings. There are parasitic flies whose larvæ feed upon the larvæ of bees, and most of these flies are so exactly like the particular species of bees they prey upon, that they can enter the nests unsuspected and deposit their eggs. There is a genus of spiders in the tropics which closely resemble the ants upon which they feed. Tropical spiders often imitate other insects, and some, which rest on the axils of leaves, can hardly be distinguished from flower-buds. There is a large caterpillar which bears a startling resemblance to a poisonous viper, the three [p. 6b] segments behind its head being dilatable at will while on each side is a large black pupillated spot like the snake's

eye. In tropical America there is a genus of venomous snakes ornamented with brilliant colors disposed in a peculiar manner, and in the same country we find several genera of harmless snakes having no relation whatever with the above but marked exactly the same. In Australia and the Moluccas there is a genus of honeysuckers called *Tropidorhynchus*, rather formidable birds, strong and active, with powerful grasping claws, long, curved, sharp beaks, and great courage and pugnacity. In the same country there is a group of orioles (*Mimeta*), much weaker birds, who have lost the gay coloring of their allies, and put on, as if for safety, the dull plumage of the honeysuckers. Near Rio Janeiro is found an insect-eating hawk (*Harpagus diodon*) and in the same district is a bird-eating hawk (*Accipiter pileatus*) resembling it so closely that on the wing, and seen from below, the two are undistinguishable. The *Accipiter* is enabled more easily to approach its prey by being mistaken for the insect-eater which the birds are not afraid of. The most curious point is, however, that the *Accipiter* has a much wider range than the *Harpagus*, and in districts where the insect-eater is not found it no longer resembles it.

Mr. Wallace argues very clearly and we think conclusively that these extraordinary phenomena can only be explained on the principle of natural selection, and that they have for their purpose the preservation of the species. His views are confirmed by the analogous phenomena of differences of color between the sexes, as well as by the fact that in some cases of protective resemblance it is only the female that mimics another genus. Among the lower animals the female is not only much more important for the preservation of the species than the male, but is generally less capable of defense, and more exposed to attack, particularly on the nest. She consequently stands in especial need of concealment. In a large majority of the cases in which male birds are of gaudy plumage, the females are quite plain. Sometimes the case is just the reverse, but then we find that it is the male which sits on the nest and performs the dangerous function of hatching the young. When both sexes are bright-colored, like the king-fishers, parrots, wood-peckers, and some others, the nest is either made in some dark hole, or covered with a dome. Thus in the process of natural weeding-out it has come to pass that, where one sex is exposed to especial danger, only those individuals which by their dull color are most readily concealed have survived, and a dull color for that sex has become an established characteristic.

We have no space at present to examine Mr. Wallace's two essays on "The Development of Human Races under the Law of Natural Selection," and "The Limits of Natural Selection as applied to Man." The subject to which they refer is beset with too many difficulties to be adequately treated in the few pages he has been able to devote to it; but he brings forward ingenious arguments to show that while natural selection may account for a diversity of races it is utterly inadequate to develop man from the lower animals.

*The Alfred Russel Wallace Page*, Charles H. Smith, 2017.