

tawny lion is a typical example, and must be almost invisible when crouched upon the sand or among desert rocks and stones. His brother, the tiger, is a jungle animal and hides among tufts of grass or of bamboos, and in these positions the vertical stripes of his body so assimilate with the vertical stems of the bamboo, as to assist greatly in concealing him from his approaching prey. Such nocturnal animals as owls, goatsuckers, mice, bats, and moles, are dusky-colored. Flat fish, like the skate and flounder, are colored like the gravel beneath them. It is obvious that the most conspicuous of those animals serving as food for others will be the soonest detected, killed, and eaten; while the most conspicuous carnivorous animals will be the most easily avoided, and hence will be the most likely to perish for lack of sustenance. These facts, with numerous others cited by Mr. Wallace, fully sustain the general conclusion, that the colors of animals are in the main determined by the exigencies of the struggle for existence. Where animals are otherwise adequately protected—either by their peculiar habits, by a sting, a disgusting odor or taste, or by a hard carapace,—and where it is not needful for them to be hidden from the prey upon which they feed, then there is usually no reference to protection in their color.

Sexual Selection also plays an important part in Darwinian evolution. This form of selection depends, not on a struggle for existence in relation to other organic beings or to external conditions, but on a struggle between individuals of one sex, generally but not universally the males, for the possession of the other sex. The result is not death to the unsuccessful competitor, but few or no offspring. Generally, the most vigorous males, those which are best fitted for their places in nature, will have most progeny. But in many cases, victory depends not so much on general vigor, as on having special weapons, confined to the male sex. A hornless stag or spurless cock would have a poor chance of leaving numerous offspring. In many cases the gorgeous tints of the otherwise protected male animal are due to sexual selection,—to the continual selection of the more beautiful males by the females. By this means a great number of male animals, as all our gorgeous birds, including the bird of paradise, some fishes, reptiles, and mammals, and a host of magnificently colored butterflies, have been rendered beautiful for beauty's sake,—the more beautiful males having been continually preferred by the females,—but not for the delight of man. So it is with the music of birds. When the female is as beautifully colored as the male, as is often the case with birds and butterflies, the cause apparently lies in the colors acquired through sexual selection having been transmitted to both sexes, instead of to the males alone. It seems almost certain, that, if the individuals of one sex were, during a long series of generations, to prefer pairing with certain individuals of the other sex characterized in some peculiar manner, the offspring would slowly but surely become modified in this same manner. The truth of the principle of sexual selection necessarily leads to the remarkable conclusion that the nervous system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities. Courage, pugnacity, perseverance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colors and ornamental appendages, have all been indirectly gained by the one sex or the other, through the exertion of choice, the influence of love and jealousy, and the appreciation of the beautiful in sound, color, or form; and these powers of the mind manifestly depend on the development of the brain.

The most flourishing, or the dominant, species,—those which range widely, are the most diffused in their own country, and are the most numerous in individuals,—oftenest produce well-marked varieties, or incipient species. Thus the larger genera tend to become larger; and throughout nature the forms of life which are now dominant tend to become still more dominant by having many modified and dominant descendants. The larger genera, however, also tend to break up into smaller genera; and thus the forms of life throughout the universe become divided into groups subordinate to groups. The struggle for the production of

new and modified descendants will mainly lie between the larger groups which are all trying to increase in numbers. One large group will slowly conquer another large group, reduce its numbers, and thus lessen its chance of further variation and improvement. Within the same large group, the later and more highly perfected sub-groups, from branching out and seizing on many new places in the polity of Nature, will constantly tend to supplant and destroy the earlier and less improved sub-groups. Small and broken groups and sub-groups will finally disappear.

Natural selection, also, leads to divergence of character; for the more organic beings diverge in structure, habits, and constitution, by so much the more can a large number be supported on the same area. Therefore, during the modification of the descendants of any one species, and during the incessant struggle of all species to increase in number, the more diversified the descendants become, the better will be their chance of success in the battle of life. Thus the small differences distinguishing varieties of the same species steadily tend to increase, till they equal the greater differences between species of the same genus, or even of distinct genera.

It is the most closely allied forms,—varieties of the same species, and species of the same genus or of related genera,—that, having nearly the same structure, constitution, and habits, generally come into the severest competition with each other; consequently, each new variety or species, during the progress of its formation, will generally press hardest on its nearest kindred, and tend to exterminate them. We see this in the recent extension over parts of the United States of one species of swallow having caused the decrease of another species. The recent increase of the missel-thrush in parts of Scotland has caused the decrease of the song-thrush. How frequently we hear of one species of rat taking the place of another species under the most different climates. In Russia the small Asiatic cockroach has everywhere driven before it its great congener. In Australia the imported hive-bee is rapidly exterminating the small, stingless native bee. As natural selection necessarily acts by the selected form having some advantage in the struggle for life over other forms, there will be a constant tendency in the improved descendants of any one species to supplant and exterminate in each stage of descent their predecessors and their original progenitor. Hence all the intermediate forms between the earlier and later states, that is between the less and more improved states of the same species, as well as the original parent-species itself, will generally tend to become extinct. So it probably will be with many whole collateral lines of descent, which will be conquered by later and improved lines. If, however, the modified offspring of a species get into some distinct country, or becomes quickly adapted to some quite new station, in which offspring and progenitor do not come into competition, both may continue to exist.

On the Darwinian theory, the continued existence of lowly organisms offers no difficulty; for natural selection, or the survival of the fittest, does not necessarily include progressive improvement,—it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life. What advantage would it be to an infusorian animalcule, to an intestinal worm, or even to an earth-worm, to be highly organized? If it were no advantage, these forms would be left by natural selection unimpaired, and might remain for ages in their present lowly condition.

New species have appeared very slowly, one after the other, both on the land and in the waters. Species belonging to different classes and genera have not changed at the same rate, or in the same degree. The variability of each species is independent of that of all others; hence it is by no means surprising that one species should retain the same identical form much longer than others; or if changing, should change in a less degree. A species once lost will never reappear, even if the same conditions of life, organic and inorganic, should recur. For though the offspring of one species might be adapted to fill the place of another species in the economy of nature, and thus supplant it; yet the two forms—the old and the new—would not be identically the same;