

of fungi belonging to the same genus as the one we have been considering, or else to the closely allied genus *Pythium*. In illustration of this I will mention one case only.

It is always possible to obtain well-grown specimens of the fungus *Pythium* by sowing cress seed fairly thick, and keeping the soil well watered and sheltered. Now what does this mean? Nobody imagines that the fungus arises spontaneously, or is produced in any miraculous manner; and in fact we need not speculate on the matter, for the fact is that by keeping the crowded cress seedlings moist and warm we favour the development of the *Pythium* (spores of which are always there) in somewhat greater proportion than we do the development of the cress. In other words, when the cress is growing normally and happily under proper conditions, it is not because the *Pythium* is absent, but because (under the particular conditions which favour the normal development of healthy cress) it grows and develops spores relatively so slowly that the young cress seedlings have time to grow up out of its reach. The recognition of this struggle for existence on the part of seedlings is of the utmost importance to all who are concerned with the raising of plants.

H. MARSHALL WARD.

NATURAL SELECTION AND ELIMINATION.¹

MR. DARWIN'S phrase, "natural selection," is applied to such processes, other than those involving the agency of man, as result under Nature in the survival of the fittest. These processes fall under two heads, which have not, I think, been sufficiently distinguished. For the first of these I here retain the word *selection*; for the other I suggest the term *elimination*.

In natural selection the favourable varieties are chosen out for survival: in natural elimination the failures or comparative failures are weeded out. In the one, Nature is employing conscious agents upon the upper or superior end of the scale: in the other, Nature is, through conscious or unconscious agencies, at work on the lower or inferior end of the scale.

Variation is constantly taking place; and the variations may be favourable or unfavourable or neutral. Under selection the favourable variations will be chosen out; the unfavourable and the neutral may go. Under elimination the unfavourable disappear; the favourable and the neutral remain. By how much the favourable variations are in excess, by so much will the race tend to advance. I see no reason why neutral variations should be eliminated, except in so far as—in the keen struggle for existence—they become relatively unfavourable.

In the valuable and suggestive paper in which Mr. G. J. Romanes dealt with physiological isolation, he brought forward the inutility of specific characters as one of the three cardinal difficulties in the way of natural selection considered as a theory of the origin of species. So long as we consider selection proper, this objection is valid. But under elimination (by far the more potent of the two) there is no reason why specific features without utilitarian significance should be weeded out. Undoubtedly, in the long run, useful variations will tend more and more to preponderate, since, the longer and keener the struggle, the greater the tendency for neutral variations to become relatively unfavourable. And this conclusion is in harmony with the teachings of biology. For, as Mr. Romanes remarks, "it is not until we advance to the more important distinctions between genera, families, and orders that we begin to find, on any large or general scale, unmistakable evidence of utilitarian meaning."

Natural elimination is intimately associated with the struggle for existence, which may indeed be regarded as the reaction of the organic world called forth by the action of natural elimination. The struggle for existence

is the result of a threefold process of elimination (cf. "Origin of Species," chap. iii.). First, elimination by the direct action of surrounding conditions; secondly, elimination by enemies (including parasites); and, thirdly, elimination by competition.

Natural selection (in the narrower sense suggested) is a much rarer process, and one that only comes into play when intelligence, or (since it may be objected that selection is in some cases instinctive) when the mind-element comes definitely upon the scene of life. Perhaps one of the best examples is the selection of flowers and fruits by insects and fruit-eating animals. But even here (at least in the case of flowers) the process of elimination also comes into play: for the visitation of flowers by insects involves cross-fertilization, the advantages of which Mr. Darwin so exquisitely proved. So that we have here the double process at work, the fairest flowers being selected by insects, and those plants which failed to produce such flowers being eliminated as the relatively unfit.

If we turn to the phenomena of what Mr. Darwin termed "sexual selection," we find both selection and elimination brought into play. By the law of battle the weaker and less courageous males are eliminated, so far as the continuation of their kind is concerned. By the individual choice of the females, the finer, bolder, handsomer, and more tuneful wooers are selected.

When we have to consider the evolution of human folk, the principle of elimination is profoundly modified by the principle of selection. Not only are the weaker eliminated by the inexorable pressure of competition, but we select the more fortunate individuals and heap upon them our favours. This enables us also to soften the rigour of the blinder law; to let the full stress of competitive elimination fall upon the worthless, the idle, the profligate, and the vicious; but to lighten its incidence on the deserving but unfortunate.

It is my belief that our views of evolution gain in clearness by the separation of these two processes by which the survival of the fit is brought about. Whether the use of the term "natural elimination" alongside of and in subservience to "natural selection" would be of service to those who are students and teachers of evolution doctrines, I must leave others to judge.

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THE FAUNA AND FLORA OF THE LESSER ANTILLES.

ALTHOUGH much has been done of late years, both in the United States and in Europe, towards the investigation of the fauna and flora of the smaller West Indian Islands, or Lesser Antilles, as it is better to call them, much remains to be effected before we can be deemed to have an accurate knowledge of the natural products of these islands. And it is most important that steps should be taken to remedy this deficiency without further delay. As the tide of civilization advances—more slowly, perhaps, it is true, over these islands than in many other parts of the world's surface—the special peculiarities which each individual island possesses among its animal and vegetable indigens are fast becoming overwhelmed by the more powerful animals and plants that accompany the inroads of civilized man upon the wilderness of Nature. As in other places, where settlers from Europe arrive, rats and mice eat out the indigenous animals, and exotic weeds starve out the native plants. It is therefore most desirable that, while there is yet time, exact information should be obtained of the flora and fauna of these islands, every one of which seems to exhibit features more or less peculiar to itself.

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