

RACIAL SENESCENCE IN RELATION TO THE THEORY OF NATURAL SELECTION

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The birth and growth, decline and death of the individual are phenomena so apparently fundamental and universal as to raise the question whether they do not apply also to groups of individuals. It is in fact observable that they do apply to human families, tribes, and races (Gini, 1930), so why not to species, orders, and phyla in the organic world in general.

Thoughts in this direction are not mere speculation for as a result of experimental studies it has been determined that "populations grow in size according to the same mathematical law that individual animals and plants follow in the growth of their bodies in size" (Pearl, 1925, p. 208). Arber (1920, pp. 211-213) has summarized evidence showing that plants introduced into new environments first have a mere foothold, then run a course "through opulent maturity, to a point approaching senility, which may ultimately lead to complete extinction." The history of various introduced animals leads to a similar conclusion.

Tolmachoff (1930, p. 283) points out that while the preservation of a race is dependent upon the ability of the organisms composing it to reproduce, there is a decrease of reproductive power in the higher and more specialized animals. He considers that advancing sterility "is probably the axis on which the whole process of extinction revolves."

Child (1915, pp. 465, 194) who has written a book on the subjects of "Senescence and Rejuvenescence" states "Senescence is a characteristic and necessary feature of life and occurs in all organisms," and "That a process similar to senescence has occurred in the evolution of the higher organisms from the lower is suggested by various lines of evidence."

Woltereck (1933, p. 518) takes the view that senescence is a universal phenomena, saying: "This remarkable periodicity of a plastic and a non-plastic stage an an immanent factor is not confined to the great organic types, the classes and orders of animals and plants, and the small types, the single genera or species. Every individual of every kind of organism, man included, shows the same periodicity, the same characteristic curve of development, beginning with the time of youth, rich in potentialities, further continuing as a period of maturity, the potentialities to change more and more, becoming lost, and finally showing the decline, the old age without potentialities, then the end. The same curve, not formed from outside, but immanent in all organisms, in individuals, in species, in the great types."

It is significant that paleontologists from their scrutiny of the history of organisms through vast periods have been especially attracted to the theory of senescence. For a conspicuous instance, Alpheus Hyatt "believed that the race, like the individual, has only a limited store of vitality and that both must develop, progress, decline, and die in obedience to one and the same law" (Mayer, 1911, p. 137). Hyatt was led to these views by a study of the fossil Ammonites and other shells. Beecher (1901, p. 98) relates "that the greatest development of spinose organisms occur just after the culmination of a group, and, as this period clearly represents the beginning of the decline of the vitality of the group, the spines are to be taken as the visible evidence of this decadence. A similar observation has been made by Packard, who after passing in review the geological development of the Trilobita, Brachiopoda, and Ammonoidea, states that 'these types, as is well

known, had their period of rise, culmination, and decline, or extinction, and the more spiny, highly ornamented, abnormal, bizarre forms appeared at or about the time when the vitality of the type was apparently declining.' " Haldane (1935, pp. 27, 28) refers to the matter in the following language, "Now this process of 'racial senescence' was not peculiar to the Ammonites . . . It seems to have occurred also in the Graptolites, Foraminifera, and other groups . . . It is not very easy to reconcile with evolution by natural selection."

In any event, accounting for such extinctions by a hypothesis of racial senescence, analogical with that of individual decline, seems preferable to one in any way involving natural selection. The term natural selection, in itself misleading, is unjustifiably applied to the results of assumed selective mortality prior to reproduction. Convincing argument can be made, but it is obvious also to ordinary observation, that mortality regularly leaves an average, not a selected, sample of the population. It is a stabilizing (Petrunkevitch, 1924) or conservative, not a progressive or evolving, influence. It neither causes nor guides the course of evolution which is orthogenetic.

The striking size and armament of some of the extinct animals have attracted wide attention and have prompted such remarks as that, "characters appear to go on developing past their point of maximum utility" and "One is left with the impression that the evolutionary process somehow acquired a momentum which took it past the point at which it would have ceased on the basis of utility" (Haldane, 1935, p. 23). As a specific case in point, Trueman (1922, p. 265) notes that curvature of the left valve of the oyster (*Gryphaea*) evolved until it pressed against the right valve interfering with the opening of the shell, and he remarks, "it is obviously difficult to account for evolution in a direction that inevitably leads to the extinction of the lineage, if evolution is the result of the operation of natural selection." In such cases the principle of natural selection cannot apply, for only useful variations can be selected. Postulation of an evolving force or "momentum" seems unavoidable.

"The geological record is full of cases where the development of enormous horns and spines . . . has been the prelude to extinction. It seems probable that in some of these cases the species literally sank under the weight of its own armaments" (Trueman, 1922, p. 120). Again the conclusion is unfavorable to the theory of natural selection, for in cases where the course of evolution is toward extinction it cannot result from a process that "works solely by and for the good of each being" (Darwin, ? 1912, p. 472).

However, races may become senescent without developing extravagantly in any obvious way. Faunas and floras of remote geologic times as a rule are extinct in their entirety, yet they included small and simple, as well as the large and elaborate, forms. If we can reason as to their prevalence from present conditions, the relatively unmodified types must have been numerically preponderant. The large and heavily armored organisms naturally have greater representation in the paleontological record, but there is no question that the smaller and more delicate types existed at the same time, and (from a food-chain argument alone) in superior numbers.

Giant or dwarf, potent or defenseless, all travel the same road of racial senescence. "Looking at evolution as it has taken place one feels driven to the conclusion that the large majority of the forms that have evolved have been failures" (Broom, 1933, p. 70). If this paleontologist had said "all eventually prove failures" he would have been nearer the mark, and in agreement with another who wrote "Given time, the fate of all species is extinction" (Reid, 1922). The facts ill comport with the alleged presence of a constant perfecting principle, a survival of the fittest, which, logically should make species immortal. The decadence and extinction of the products of evolution throw a sardonic light on postulated natural selection which if admitted as a factor at all, must be credited

with selection of failures, of ever vanishing races, a selector that permits all to descend into oblivion. In fact survival of the fittest and extinction seem diametrically opposite terms of mutually exclusive significance. If the one exists, the other does not and extinction is a fact.

In accounting for extinctions, the hypothesis of racial senescence, which is entirely compatible with survival of the ordinary and with orthogenetic doctrine, has a natural acceptability. On the other hand, explaining extinction by a process of survival of the fittest involves such a contradiction of ideas as to make it entirely unacceptable.

Darwin alluded briefly to the problem but is singularly unconvincing. His ideas may be grouped as involving extinction through transformation, through competition, and through usurpation of place. Transformation is not a natural selection phenomenon as it does not involve competition. Further it does not explain how certain lines of evolution have been totally obliterated. Competition and usurpation of place may be considered together for it is manifest that neither could have occurred in the case of numerous extinct creatures whose place has never been filled. For instance, there is no natural environmental reason why camel-like forms represented there as fossils should not now live in the desert regions of the southwestern United States. Horses, reintroduced, thrive in the wild in both North and South America on ranges where their fossil analogues abounded. Such cases convincingly indicate that the causes of extinction were internal to the organisms concerned and not external or selective. Nothing could have usurped the place of various extinct creatures that were the physical superiors of anything that lives on the earth today. No they merely finished their courses, they yielded, not to a conquering competitor nor even to environmental deficiency, but to the running down of their own vital mechanisms. It is something that comes to every individual and to every race—senescence, the unavoidable.

The question remains as to how under natural selection, postulating a process of continual preservation of favorable variations and of survival of the fittest, any line of descent could become extinct. It is a question that, except for the generalities above discussed, Darwin does not attempt to answer. Haldane's (1935) effort to help does not seem successful. He states that it is a "fallacy that natural selection will always make an organism fitter in its struggle with the environment" (p. 119) and that variations "which possess survival value for the individual may lead to degeneration and extinction of the species" (p. 162).

However these suggestions may be classed, they certainly are not good selection doctrine. Contrast with the first, Darwin's (? 1912, p. 73) assertion that "It may metaphorically be said that natural selection is daily and hourly scrutinizing, throughout the world, the slightest variations; rejecting those that are bad, preserving and adding up all that are good, silently and insensibly working, *whenever and wherever opportunity offers*, at the improvement of each organic being in relation to its organic and inorganic conditions of life."

As to the second of Haldane's ideas, it involves such a contradiction of terms as to be rejected at once. It seems obvious that "variations which possess survival value for the individual" cannot "lead to degeneration and extinction of the species," as the species can be extirpated only through the elimination of individuals and if they have variations with "survival value" they will not be eliminated.

Duerden (1920, p. 180) who evidently had some belief in natural selection said in his discussion of degenerative changes in the ostrich, "Natural selection is powerless to check permanently the relentless, degenerative influences which are at work and when the retrogressive changes have gone sufficiently far to interfere with activities essential to its existence the ostrich will disappear."

No one, as yet, has convincingly fitted selectionist doctrine to the phenomena of racial extinction and is not likely that anyone ever will. The requirements of

the situation seem to be fully met, however, by physiological explanations, all of which fall neatly in place under the general hypothesis of racial senescence.

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