NATURAL SELECTION A LIMITED ROLE

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Genetics has made trouble in the biology family. Let us discuss it.

In every realm of thought, certain words are used in a special sense. *Selection* is such a word in biology, and is used to mean the choosing of a limited number of individuals of a population to become the parents of the entire following generation. Animals of a certain type are chosen or seeds from a certain type of plant, and these are allowed to reproduce to the exclusion of the ones not so chosen. This process, when carried on by man, is called *artificial* selection; when the forces of nature produce a similar result it is called *natural* selection.

Selection is expected to make the forthcoming generation of plants or animals somewhat different from their ancestral generations, in that they will resemble the individuals which were selected. For instance in a field where ears of corn average eight inches in length, a farmer gathers ears for seed averaging twelve inches. If the crop raised from this seed averages more than eight inches, other conditions being equal, his selection is *effective.* If he chooses the biggest potatoes for planting and the crop of the following year consists of potatoes having no increased size, the selection is *ineffective.* His selection could be very methodical and thorough and vet ineffective, as will appear below.

Since natural selection is supposed to bring about evolution it is necessary to define evolution. Proponents and opponents agree that it is the theory that all kinds of plants, animals, and man have descended from very simple types: roses from algae, peacocks from Amoeba, and so on. It involves changes which are capable of forming more complex organs. and which can continue in a progressive series until notable progress in structure is accomplished.

For the sake of clear thinking we should stop with this definition since it suits both friends and foes. But some naturalists add any and all changes. great and small. temporary and permanent. and lump all of them together as the theory of evolution To follow the true definition, any change which does not contribute toward the changing of simple organisms to different and more complex organisms is not a part of evolution but should he called *variation* to avoid confusion. Much variation is temporary, alternative, or not a part of a series which add up to transformation.

While the theory of evolution is not new, it was believed in by only a few people until Charles Darwin secured its acceptance by expanding the idea of natural selection. With the amount of genetic information available in the middle of the Nineteenth Century it seemed that great changes might be made by the vicissitudes of nature such as weather and competition of other organisms. (Gregor Mendel's research was not yet known.) At that time, when the significance of chromosomes was a mystery and vague influences were mentioned instead of genes, natural selection did seem to be a powerful tool for building complex organisms. given enough time.

It was postulated that animals and plants change in every possible direction, and that these changes are heritable. Through predation, competition, and unfavorable food or shelter, many of these organisms lose their lives without leaving offspring. On the whole, it was postulated, the organisms which survive do so because they are superior, have better functioning organs or more complex structure. and if these traits are hereditary their offspring also will be superior. This process repeated a million times transforms a species into a larger and more complex species.

This process of natural selection, viewed from an armchair, looks so logical that a mere statement of it is a polemic in its support. But let us see how it has fared in the laboratory and breeding plot.

It is apparent that if the *genes* are changing *gradually* and in *all* directions, and if there is no limit to the degree of change, selection can be expected to change the species. But if the variation does not affect the genes, in other words is only somatic and not germinal, then the selection will be ineffective and the progeny will be the same, no matter which individual is selected to be the parent.

Johannsen, a Danish botanist, tried to illustrate evolution in a variety of bean called Princess. He chose beans of different size, weighed them, planted them, then harvested and weighed the beans which they produced. He found that large beans tended to produce large beans: that the propeny of large beans were larger on the average than the progeny of small beans, just as one might expect.

But after this generation the result was different. Johannsen kept the progeny of the different original beans separate and planted them in separate plots. in this way establishing nineteen groups which he called pure lines. Then within a pure line he chose large beans and small ones, planted them, and found that the average size of the progeny was about the same. His selection was *ineffective!* For instance. in pure line A, a bean weighing 70 centigrams produced seeds weighing 55.5 cg. on the average, while one weighing 40 cg. produced seeds weighing about the same, 57.2 cg. on the average.*

When I first read this report a number of years ago it seemed incredible to me for I had been taught that the more a breeder selects, the more progress he will make. This would be true if genes changed continually and without limit. In beans, being normally self pollinated, the limit was reached after one generation of selection. *Within a pure line,* all the *genes* for seed size are *alike.* The seeds themselves are not of the same size because some have a more favorable location in the pod than others but this is an environmental condition and not inherited.

Shun and East, working independently, established similar pure lines in corn, *Zea mays,* in which selection is ineffective. But while it takes but one generation to establish pure lines in beans it takes seven in corn, pollinating each stalk with its own pollen. Beans do their own self pollinating while corn is normally cross pollinated, and this accounts for the slower progress in attaining uniformity.

It had been known for a long time that when corn is self pollinated there is a loss of vigor and various latent defects appear, and some thought this process would revert the corn to its wild ancestor. But Shull and East found that there is no further loss of vigor after seven generations, during which time various pure lines or inbred strains appear, in which selection is ineffective.* Crossing of two pure lines restores the vigor, but no amount of this breeding of corn would transform it into another species. The end result of selection is not a transformation but a pure line; a purified essence of the species one started with.

In sugar beets also, the limit of effective selection has been reached. A start was made about 1800 with table beets testing six per cent of sugar. Large numbers of beets were tested each year and the sweetest were used to produce seed for the next crop. In 1878 the average per cent of sugar had risen from six to seventeen per cent. No doubt people were saying, “See how nature changes! The improvements made by man show that nature can make almost any change if given enough time.” But forty years later it was reported that there was no further increase in sugar, even though the same type of selection has been continued.**

Lest these examples seem strange to you (as they did to me at first) imagine that you have a bushel basket full of marbles of various sizes. In sorting out the various sizes it may take you some time to find the biggest one, but once you have found it, it is quite evident that the search is completed. It is just as futile to expect a gene to develop a more advanced character as to expect a marble to grow bigger.

Once in a while a mutation might occur but only once in thousands of generations. The mutant gene would be like a cracked marble, and one which causes the death of the plant or animal, as a majority of them do,* is like a marble broken so badly that it falls apart.

While these principles were being established by the geneticists in the first two decades of the Twentieth Century, other biologists still held the evolutionary views of the former century. Bateson of England spoke out plainly about the discrepancies, although he maintained that he did not care to break with the main idea of evolution. His facts, however, spoke for themselves and had great weight. This criticism, augmented by the wave of idealism following victory in World War I, started a protest in the United States which reached proportions hard to appreciate by people who do not remember it. The protest finally was assuaged by a number of prominent men signing a statement that they believed in God and also in evolution; which can be done of course, but with a warped idea of God because of disagreeing with the Bible. Thus the facts were obscured under a coat of whitewash.

When the biologists reached a synthesis of their ideas they still depended upon natural selection to bring about evolution, basing it upon mutations. One can see that if mutations were of such a nature that they contributed new and useful organs, if these additions made the organs coordinate better, if added vigor is conferred, and if these improvements are conferred in one generation to escape an awkward transition period, then mutations might contribute toward evolution. (Remember the definition, that evolution is the process of transforming simple protoplasm into modern plants and animals.) Very few, if any, mutations have been observed which meet all these requirements.

H. J. Muller, who won the Nobel prize for his work in mutations, in Washington, 1946, was cornered by a group of newspaper men who asked him to discuss the outlook for improving the human race. He answered, “Most mutations are bad. In fact, good ones are so rare that we can consider them all as bad.”* Dr. Muller and many other scientists are fearful that atomic explosions will cause mutations in the human race, and none of them hopes for benefits in those events.

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*L. H. Snyder and P. R. David, Prin. of Heredity, Heath, 1957, p. 223 f.

*D. S. Falconer, Quantitative Genetics, Ronald, 1960, p. 276.

* *D. F. Jones, Genetics in Plant and Animal Improvement, Wiley, 1924, p. 414.

*“Furthermore, Muller reasoned that if he were to search for mutations following treatment with irradiation, lethal mutations would be the kind to look for, since in nature they are by far the most frequent.” L. H. Snyder and P. R. David, Prin. of Heredity, Heath, 1957, p. 354.

*Time Magazine, Nov. 11, 1946, p. 96

There are mutations in plants and animals which are helpful *to man,* such as hornless cattle and seedless oranges, but it is hard to see how such changed forms would become established in nature if there is much competition. Hypothetical mutations sometimes are mentioned and are made to look very successful. In a biology textbook for high school, it is postulated that if a rabbit underwent a mutation which enabled it to run faster than dogs, and at the same time, another mutation which made it aware of attacks by birds, it would have added ability to survive. * True, indeed! But who ever *observed* such a rabbit? My indignation is aroused when children who have no recourse to the facts are exposed to such propaganda in the name of science.

Another weakness of natural selection as a theory to explain how animals became large and complex is the large number which remained tiny and relatively simple, yet survive very well. Some scientists say they are fitted to live in their environment and this is true, but in some cases their environment is the same as that of the more complex species.

Charles Darwin saw the problem and said that these little creatures did not need to become complex: "For what would it profit an Infusorial animalcule, for instance, or an intestinal worm, to become highly organized?"* Darwin gave the correct answer but weakened his theory, for the theory is based on the assumption that greater complexity is an advantage to an animal; that the ones which happen to become a little more complex have an advantage thereby and become more complex. This assumption, although seldom stated, is the necessary foundation of the theory.

It is easy to observe that it is not always the more highly organized plant or animal that survives. Hydra, that two-layered sac with tentacles, devours Daphnia which has a heart, intestine, gills, and even big, black eyes. A pine tree may shade and kill a daisy but it is classified as a lower plant because it does not have complex flowers. And certainly bacteria are not becoming extinct because of their simple structure.

In this paper we have pointed out the *limitations* of natural selection; necessarily so because at a time when genetic knowledge was limited it was credited with doing too much. But now let us look at the true function.

The Salton Sea is a body of water in southern California which was suddenly formed by the Colorado River spilling over into a large depressed area. "The first few broods (of fish) had an abundance of food and practically no predation, so they increased rapidly in numbers. The number of deformed fish in these early broods was high; but in subsequent years they disappeared as competition became more intense. "*

This story of elimination of defective has been repeated many times. In the complex development of a plant or animal there is sometimes a slip, an omission, a deformation, and an individual is formed which is unable to live a normal life. Natural selection takes these unfit ones out of the way. But so far from starting an advanced species. it only maintains a lower limit.

*Ella Thea Smith, Exploring Biology, p. 546.

**Charles Darwin, Variations, 1859, p. 8.

*D. Robertson and J. Sinclair, in Evolution and Christian Thought Today, R. Mixter cd., Erdmans, 1959, P. 79.