

Principles of Evolution: Darwinism & Neodarwinism

Darwinism & the theory of Natural Selection-

In 1858, two Englishmen published jointly in the Proceedings of the Linnaeus Society, papers on a new concept of evolution. This concept, the theory of the Natural Selection, was destined to influence greatly the thinking of modern man in many different fields and so become the basis of most modern biological concepts of evolution. In 1859 Darwin published his findings in full in a book, "The Origin of Species by Natural Selection or the preservation of favoured races in the struggle for life".

Facts that influenced Darwin's thoughts:-

During the period in which Darwin developed his natural selection theory, three main points affected his thinking — (i) During his voyages he read Charles Lyell's Principles of Geology; which attempted to explain the past changes in the Earth's surface on the basis of processes operating in nature. It gave Darwin the basis for appreciating some of

the fossil material that he found. It also affected the Darwin's thinking about causes of evolution.

2. Darwin was aware of the similarities of many domesticated animals and plants to wild forms and realized that men have selected individual plants and animals with desirable traits for breeding. In this way, various lines of domesticated forms have been developed. He found himself asking the question: Might not some sort of selection operate in nature to produce various highly adapted forms found on the Earth?

3. Darwin was also influenced by Thomas Malthus' concept of "An Essay on Population". He was concerned about increasing human population. He pointed out that human, animal population as well as plant and animal population tends to increase at such rate that its number outstrip its resources. And because there is not food or space enough for all, there is a struggle for existence. He reasoned that favorable varieties would be preserved and unfavorable ones were destroyed & the result would be the formation of new species.

Darwin's Concept →

Darwin, along with Wallace, explained organisms evolution as — "The change in species by the survival of an organisational type exhibiting a natural variation, that gives it an adaptive advantage in an environment, thus leading to a new environmental equilibrium by natural selection. Thus it is a continuous process of trial & error on a gigantic scale, for all of living matter is involved. It includes following elements —

1. The Universal Occurrence of Variations:-
Variations is the characteristic of every group of animals and plants and there are many ways in which organisms differ. Although, Darwin & Wallace did not understand the cause of variations and assumed it was one of the innate properties of living things.

2. An Excessive natural rate of multiplication:-
Every species is the absence of environmental checks, tends to increase in a geometrical manner. If population of one species doubles in one year, then it will quadruple next year. Thus, more organisms of each kind are born than they can possibly obtain food and survive. Since the no. of species remains fairly constant, therefore most of them will perish. So, all the offsprings of a given species are not fit to survive.

3. Struggle for Existence — Since more individuals are born than

Can survive from, there is a intraspecific or interspecific or environmental struggle for survival, a competition for food, water and space. This contest is an active kill or be killed struggle, or one less immediately apparent but no less real such as the struggle of plants or animals to survive drought or cold.

4. Elimination of the unfit and the survival of the fittest → Some of the variations exhibited by living things make it easier for them to survive, others are handicaps which bring about the elimination of their possessors. This idea of "the survival of the fittest" is the core of the theory of natural selection.

5. Inheritance of the mutations or recombination that make for success is the struggle for Existence — The surviving individuals of one generation will give rise to the next generation and in this way, the successful variations are transmitted to the succeeding generations. The less fit will tend to be eliminated because they have reproduced. Successive generations in this way tend to become better adapted to their environment; as the environment changes, further adaptations occur. The operation of natural selection over many generations may produce descendants which are quite different from their ancestors, different enough to be separate species. Furthermore, certain members of a population with one group of variations may become adapted to the environment

in one way, while others, with a different set of variations, become adapted in a different way or become adapted to a different environment. In this way, two or more species may arise from a single ancestral stock.

Criticism of Darwinism →

- (i) The greatest weakness of Darwinism is that it did not explain the origin and transmission of variations. Although, he tried to explain it through theory of pangenesis but that was not worthy.
- (ii) Darwin's theory did not account for the beginning of organs, or it can be said that it remains concerned with the survival of fittest, but not for arrival of the fittest. Thus, to give rise to such specializations or as elaborate mimicry or the electric organ of the torpedo, which are of apparent advantage only in the perfected state. Thus Natural Selection acts only upon minute gradations toward perfection.
- (iii) Natural Selection cannot account for degeneracy. For example, an organ is no longer useful and hence disappears, it is to state the effect and not the cause. If under changed conditions, a character built up by natural selection becomes a menace, the reversal of the selection can accomplish its removal but this will not suffice when the characteristic is an indifferent one.
- (iv) This theory cannot explain new variations, which would be lost by dilution, as the individuals possessing them breed.

with others without them.

New-Darwinism

After Darwin's theory, a lot of explanations came in favour and against it. To explain certain drawbacks of Darwin's theory, Neo-Darwinism came into existence, which is a modified form of Darwinism.

The New-Darwinians like T.H. Huxley and Herbert Spencer of England, D.S. Jordan and Asa Gray of United States, Haeckel and Weismann of Germany believed that natural selection has accounted everything that is involved in evolution. Weismann & his followers rejected Darwin's theory except its principal element of natural selection. These Neo-Darwinians, though distinguished between genotype and somatoplasms of living organisms in their genotype theory, yet they could not yet appreciate the role of mutations in evolution. While Darwin believed that the adaptations result mainly by a single source i.e. natural selection. New Darwinians thought that adaptations result from multiple forces and natural selection is only one of these many forces. Thus New-Darwinism was incomplete and partly wrong because it lacked present understanding of genetics.