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Theories of Evolution

Pre-Darwinian Ideas of Evolution — This can be divided into three parts (1) Theory of eternity i.e life forms remains unchanged forever. (2) Theory of special creation i.e everything in the world is created by God (3) Theory of Catastrophism introduced by Cuvier, a palaeontologist- believed that catastrophes bring about the death of old fauna and their extinction causes creation of new fauna.

Lamarck's Theory — Inheritance of acquired characters — The first modern theory of evolution was put forward in 1809 by the French biologist- Lamark. His theory can be resolved into three factors (1) **influence of the environment** i.e individuals of same species grown under diff. environmental conditions shows marked differences which accumulate through successive generations to produce new species. (2) **Use and disuse of parts** — These differences ~~in~~ or changes in case of animals are brought about by use and disuse of body parts. Use results into development of that part and disuse results into degeneration of that part. (3) **Inheritance of acquired characters** i.e new characters, however minute are preserved and transmitted to the offspring ex — long neck of Giraffe.

Darwin's Theory : Natural Selection — In 1859, an English biologist- Charles Darwin published his book "Origin of Species" in which he propagated his theory of natural selection

It is based on three important factors (1) **Over-production of offspring and consequent struggle for existence** i.e if all the offsprings are going to live increase in population will set in a competition for food, water and space and that will result into destruction of large no. of individuals
(2) **Variation and their inheritance** i.e no two individuals, ever coming out of the same parent stalk are exactly alike. There are always some variations, however minute they may be. Some variations are suited to the environmental conditions while others are not. These minute variations are preserved and transmitted to the offspring although no cause for these variations was assigned by him (3) **Survival of the fittest** — in the struggle for existence the individuals with favourable variations survive and these variations are transmitted to the offspring and those with unfavourable variations perish. Survivors gradually and steadily change generation after generation and ultimately give rise to new forms, which are better adapted to the environment
(4) **Natural selection** — All the above mentioned theories lead to species change steadily. It is environment that selects and preserves the better types and destroys the unsuitable forms.

Weismann's theory : Continuity of germplasm
In 1895 a German scientist Weismann, a disiple of Darwin, divided the organism's body into somatoplasm and germplasm. Somatoplasm gives rise to only body cells while germplasm produces

the reproductive cells. Somatoplasm is responsible for differentiation of tissues, development and growth of individuals and is exhausted and lost at the end of the life cycle so it is discontinuous, whereas germplasm is ever young and immortal and is continuous from generation to generation and is actually the bearer of hereditary characters. Each somatic cell has a single factor, whereas the germ cell contains all the factors that are found in somatic cells of the adult plant and animal. The inheritance of characters by the offspring depends upon these factors of the germ plasm only. There is always a struggle for existence among these factors. Weismann's assumption that germplasm is permanently curtained off from the somatoplasm is not a fact. With advance in knowledge it has been revealed that chromosomes come in direct contact with somatoplasm during nuclear divisions.

De Vries theory : Mutation – in 1901 Dutch botanist Hugo De Vries held that large variations appearing suddenly and spontaneously in the offspring in one generation are the cause of evolution. He called these variations as 'mutations'. While he agreed with Darwin's view, regarding natural selection, he held the view that new species are not formed by slow process of continuous variations. Since then various instances of plant and animal mutations have been found in nature. The mutation theory of De Vries is widely accepted.

Neo - Darwinism or Modern concept or Synthetic theory of Evolution : This was designated by Huxley in 1942 which emphasizes the importance of populations as the units of evolution and the central role of natural selection as the most important mechanism of evolution.

Postulates of Neo Darwinism ;

1. **Genetic Variability :** Variations form the raw material for evolution. The units of both heredity & mutations are genes located linearly on chromosomes. Various sources of genetic variability in a gene pool are (1) **Mutations** (2) **Chromosomal aberrations** like deletion, duplication, translocation, inversion etc (3) **Numerical Chromosomal mutations** like aneuploidy, polyploidy, hypoploidy. (4) **Gene or point mutations** due to recombination of genes, hybridization, physical mutagens, genetic drift etc.

(2) ~~Ge~~ **Natural selection :** through differential reprod^n i.e members best adapted to the environment reproduce at higher rates than those less adapted, so these genes become prominent in the gene pool and through comparative reproductive success

(3) **Reproductive isolation :** This allows the accumulation of variations leading to speciation by preventing hybridization. In the absence of reproductive isolation these variants freely interbreed which lead to intermixing of their genotypes, diluting their peculiarities and disappearance of differences b/w them. So reproductive isolation helps in evolutionary divergence.

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