

Evolution of Life

Evolution is a "Gradual, orderly and irreversible changes from one condition or form to another condition or form".

Types of evolution

A. Inorganic evolution

Inorganic evolution is the changes take place in inorganic matters

B. Organic evolution

Gradual, orderly and irreversible process of development of complex and diverse form of life from the pre-existing simple form of life is called organic evolution.

Patterns or types of Organic evolution

a. Divergent evolution

Process of development of different functional structures in a group of organisms that were form from a common ancestor. It is also called as Adaptive radiation. For example; hand in man, wings in birds and fore limbs in frog etc.

b. Convergent evolution

Process of development of similar functional structures or adaptational features in a group of organisms that were not form from a common ancestor. It is also called as Adaptive convergence. For example, gill in fishes and gills in crustaceans.

c. Progressive evolution

Process of development of complex and diverse forms of organisms from simple forms of organisms.

d. Retrogressive evolution

Process of development of simple forms of organisms from complex forms of organisms.

e. Parallel evolution

Process of development of quite similar characters or features in two different forms of organisms independently, although they were developed from related ancestral lines. For example, development of running habit in horse and deer.

similarities in composition of chromosome pointed out the common ancestry of living organisms.

5. Evidence from Genetics

Genetics is branch of biology which deals with variations and heredity of organism. The hereditary variation in an organism is brought by mutation and recombination of genetic materials like DNAs and genes. Recombination after hybridization yield new combination of genes. This all process creates the new genetic material which cause the evolution of new species from common ancestral stock.

Theories of Evolution

Many theories have been put forward to explain the mechanism of evolution of living beings. Some of the theories of evolutions are as following;

1. **Theory of Inheritance of Acquired characters or Lamarck's theory or Lamarckism**
2. **Theory of Natural Selection or Darwin's theory or Darwinism**
3. **Modern Synthetic theory**
1. **Theory of Inheritance of Acquired characters or Lamarck's theory or Lamarckism**

It was the first theory that attempted to explain the process of organic evolution of organisms. It was postulated by French biologist Jean Baptiste Lamarck (1744-1829 AD) in his book 'Philosophie of Zoologique' published in 1809 AD. According to this theory, an environment plays an important role for variation in organisms and variations that acquired by organisms during their life are inherited to their off-springs. Thus, theory is also called theory of Inheritance of Acquired characters. This theory consists of following postulates

a. Tendency of grow

Every organism has tendency to grow of size up to a certain limit due to internal force of life. The limit of growth of its parts of body or whole body is determined by the life itself.

b. Environmental Effect or Formation of New organs

Environment in which the living organisms live influence them and this influence leads to change in their habits. Then, the organs of an organism become modified in appropriated way in direction response to a changing environment. This results the formation of a new organs.

c. Effect of Use and Disuse organs

The efficiency and development of an organ is directly proportional to its use that is the more frequently and continuously used of organs become more strengthened, developed and enlarged but disused organs become gradually disappeared or vestigial during course of evolution.

d. Inheritance of Acquired characters

All the changes happened during the life time of organisms are called acquired characters. These characters are inherited and go on accumulation through generation after generation. Finally, in the long course of time the off springs are entirely different from their ancestor. In this way new species is evolved from common ancestor.

Examples of Lamarck's theory

a. Formation of web between toes in water birds

The ancestors of present water birds were the terrestrial birds. Due to scarcity of foods or struggle to find the foods on land, they migrated into the water in search of food. Then, their toes became spread in order to move in water. The skin extended between the toes and form webs for swimming.

b. Loss of limbs in snakes

The ancestor of snake crawled through thick bushes and grasses. Thus, they stretched their body to pass through them and the body became elongated. For passing through the narrow spaces, the limbs were not use and finally disappeared by continuous disuse of organs. Thus, the snake lost their limbs.

c. Formation of long necked Giraffe

The present long necked giraffe had evolved from short necked animal. When grasses became scarce, they began to eat the leaves of trees. As tree became big and grew up, the animal required a continuous effort to reach the leaves of trees. Then, they stretched their neck and fore limbs and increased the length of these parts. That transmitted to their off springs in each succeeding generation. As a result, long necked giraffe with long legs were evolved.

Criticism or Drawback or Objection of Lamarckism

Lamarck's theory does not stand longer because it failed to explain the exact mechanism of evolution.

1. The main objection of this theory was assumption of inheritance of acquired characters. Acquired characters can bring changes in body or somatic cells but not in germ cells and only germinal variations inherited to off springs. For examples;
 - a. The powerful muscles acquired by athletes are not inherited to his/her off springs.

- b. Boring of nose and ear in women have been practiced for centuries in various parts of world, however their babies have no any trace of hole in nose or ear.
 - c. Eyes which are being used continuously and constantly developed defects instead of being improved.
2. According to Lamarckism, organism have tendency to evolved towards greater complexity but highly developed flowering plants are usually very small in size.
 3. The desire or need of animal alone cannot lead to formation of new organs.

[Note: Weismann experiment

German biologist **August Weismann** conducted an experiment on mice to test Lamarckism. He cut the tails of mice for 20 successive generations to see if this has any effect on tail length. It was found that the length of tails in offspring were more or less same. Thus, he concluded that acquired characters were not inherited and proposed theory known as **Germ plasm theory**.

Germ plasm theory

German biologist **August Weismann** proposed the **Germ plasm theory**. According to this theory, **“There are two types of cells in an organism; Somatic cells and Germinal cells or Germ cells. The effect of environment and use and disuse of organs affect only somatic cells which are not inherited, whereas the changes in germinal cells are only inherited”.**]

Neo-Lamarckism

Modified form of Lamarckism in the light of recent researches is called Neo-Lamarckism. It is stated that

- Environment influences the organisms that cause the variation in them.
- Some of variations acquired by an individual can be passed to its off springs.
- Only those variations are inherited which affect germ cells
- Some somatic variations are also inherited if somatic cells gave rise to germ cells
- Internal force and appetency do not play role in evolution.

2. Theory of Natural Selection or Darwin’s theory or Darwinism

Charles Robert Darwin was a famous naturalist who was born on 12 February, 1809 AD at Shrewsbury, England. At age of 22, he went voyage for about 5 years on a famous ship H.M.S. Beagle and he collected a large volume of evidences for the fact of origin of species from South America and Galapagos Island. Then, he proposed the theory of Natural Selection published in his book of title “The Origin of Species by Natural Selection” in 1859 AD. The theory of Natural Selection has following postulated;

A. Over population of off springs