

Welcome Students for the paper titled Molecular Biology and Evolution. The title of the Unit is Concept of Evolution, Origin of Life and Speciation, module is Theories of Evolution, Lamarckism, Neo-Lamarckism, Darwinism, module number is 24.

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The outline of the e-content is to define Lamarckism, explain salient features and principles of Lamarckism, define Neo- Lamarckism, explain the concept of neo - Lamarckism, define Darwinism and to explain the Principles of theory.

On completion, the students should be able to define lamarckism, Neo - lamarckism, Darwinism, and the concept and principles of the theories.

Lamarckism is the first evolutionary theory proposed by Lamarck, is also called inheritance of acquired characters.

Salient features - complex animals are formed from simple living organisms any change in the environment influences the plants and animals the changes in the environment provide new needs for the organisms. In response to the new needs organisms develop new structures the new structures developed by the organisms in response to the environment are called acquired characters. These acquired characters are transmitted generation after generation and in this way a new species is produced.

Four principles of Lamarckism - Internal urge of organisms - animals and plants have the ability to grow and increase in size. Due to the internal urge and ability of the animal maximum size is attained.

Environment and new needs - any change in the environment results in the response of the animals to changes. This changes in the environment brings about new structures or characters.

Use and Disuse Theory - when an organ is put to greater and constant use that particular organ develops well when an organ is not used for a long time it gets reduced in due course of time it degenerates and disappears completely from the organism. example of use theory - evolution of long neck in giraffe - ancestral giraffes had short neck and had uniform length in the fore and hind limbs. scarcity of grass forced the giraffe to feed on tree leaves, this resulted in a slight increase in the neck region. example of disused theory -; the cave is characterized by complete darkness, cave animals cannot use their eyes, eyes degenerate in extreme cases eyes disappear completely example Proteus anguineus ( amphibian )

Inheritance of acquired characters - the transmission of characters, developed by an organism during its lifetime to the young one is called inheritance of acquired characters- example the long neck of Giraffe is transmitted to the offspring, generation after generation; the degenerated wing of kiwi is an acquired character it is inherited by its progeny generation after generation.

Neo- lamarckism is the modern version of Lamarckism, its the theory of organic evolution. It explains the origin of new species by the inheritance of acquired characters. Neo Lamarckism gives experimental evidences for Lamarckism - example inheritance of bony plates in stickleback Gasterosteus , this fish lives in sea water, brackish water and fresh water. Marine stickleback has 20 to 30 bony plates on the mid dorsal line of the trunk, brackish water fish has 3 to 15 bony plates fresh water fish has no bony plates. when a fresh water fish is brought into the sea water it gradually develops the bony plates this is an acquired character and this character is inherited by its offspring

when a marine fish is brought into the fresh water it loses all the horny plates this plateless condition is also inherited by the offspring.

Darwinism or Natural Selection Theory - Evolutionary idea contributed by Charles Darwin is called Darwinism or Natural Selection Theory. It explains the theory of evolution. It comprises of five principles.

Overproduction or Geometric ratio of Increase, Struggle for Existence, Variations, Survival of the Fittest, Origin of New Species.

Over-production or Geometric ratio of increase - animals and plants produce young ones by reproduction it leads to overcrowding examples a salmon produces 28 million eggs in a season, Ascaris produces 7 lakhs of eggs in 24 hours, a single oyster lays about 50 million eggs in a season if all these eggs hatch and if all the young ones reproduce for five generations they will form a volume of about 8 times the size of the earth.

Struggle for existence- as the reproduction is high animals increase in a geometrical ratio no increase in space food and other needs leads to competition it is a struggle for existence.

Intra-specific struggle and inter-specific struggle environmental struggle.

Intraspecific struggle- competition between the members of the same species is heavy, they live in the same environment so their needs, requirements remains the same. example struggle between two male deers or two bison bulls.

Inter-specific struggle- competition between the members of the different species. example in a pond the snakes chase the frogs for their prey, frogs try to escape for their survival, in a forest tigers chase the deer, deer have to escape for their survival.

Environmental struggle - competition between animals and environmental factors caused by shortage of food, water and oxygen, lack of light, lack of shelter, predators, diseases natural calamities all these factors checks the reproductive potential and keeps the population from growing indefinitely.

Variations are the differences in characters between the individuals occurs even between the offspring of the same parent. example the length of the same fingers of the two hands may differ in some person, in plants one leaf is different from the other in shape size veination.

Favorable variations- characters useful to the possessor in struggle for existence example the strength and aggressiveness of dogs the high speed of the deer.

Unfavorable variations - characters which are useless or harmful to the possessor in the struggle for existence.

Survival of the fittest - organisms with favorable variations succeed in the struggle for existence unfit organisms perish. These organisms are the fittest for survival nature decides the fitness or unfitness organisms selected by nature reach sexual maturity and reproduce young ones receive advantageous variations from their parents.

Origin of new species or Speciation- Darwin states that new species arise by the cooperation of all above principles. Overproduction leads to struggle for existence animals are provided with bulk variations environment selects the animals with favorable variations these animals mate and favorable characters are transmitted to new generation. In the succeeding generation also natural

selection operates. A new organism arise by accumulation of favorable variations for a number of generations .