

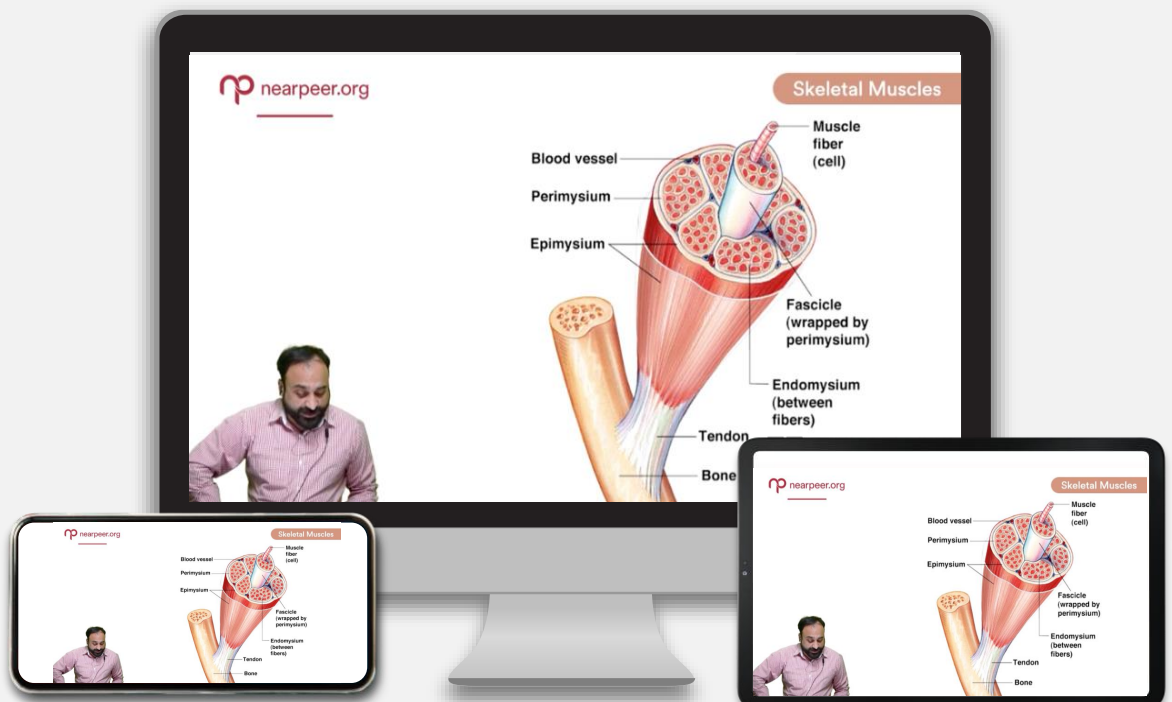
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Biology

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Evolution

Learning Objectives

Concepts of evolution

Inheritance of acquired characteristics

Darwinism

Darwin's theory evolution

Neo-Darwinism's

Evidence of evolution



Evolution

Series of processes which transform simple life to vast diversity.

OR

Change in allelic frequency of a population over the passage of time.

Lamarckism

“An organism can pass on characteristics that it acquired during its lifetime to its offspring.”
It is also known as **inheritance of acquired characters**.

Lamarck argued that those parts of the body used extensively to cope with the environment become larger and stronger, while those that are not used deteriorate.

Examples

- Lamarck cited that the blacksmith develops a bigger bicep in the arm because he works the hammer.
- The giraffe got their neck to new lengths by stretching it in pursuit of leaves to eat.

Darwinism

“All species of organisms arise & develop through the natural selection of small, inherited variations that increase the individual’s ability to compete, survive and reproduce.”

Darwinism - Main Postulates

Descent With Modification

The history of life is like a tree with multiple branching and rebranching from a common trunk

Natural Selection and Adaptation

- Production of more individuals than the environment can support
- Survival in the struggle for existence is not random but depends in part on the hereditary constitution of the surviving individuals.
- This unequal ability of individuals to survive and reproduce will lead to a gradual change in a population, with favorable characteristics accumulating over the generations thus leading to the evolution of a new species.



Difference between Darwinism and Lamarckism

LAMARCKISM	DARWINISM
It believes in the internal vital force.	It does not believe in the internal vital force.
It considers new needs or desire produce new structures and change habits of the organism.	They do not form part of Darwin's natural selection theory.
If an organ is constantly used it would be better developed whereas disuse of organ results in its degeneration.	An organ can develop further or degenerate only due to continuous variations.
It does not consider struggle for existence.	Struggle for existence is very important in this theory.
All the acquired characters are inherited to the next generation.	Only useful variations are transferred to the next generation.
Lamarckism does not believe in survival of the fittest.	Darwin's natural selection theory is based on survival of the fittest.

Evidences of Evolution

Evolution leaves observable signs. Darwin's theory of evolution was mainly based on the evidence from the geographical distribution of species and from the fossil record. Following are a few evidences of evolution:

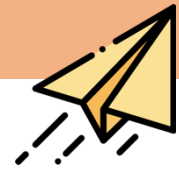
- Biogeography
- The fossil Record (Paleontology)
- Comparative Anatomy
- Molecular Biology

Biogeography

- It was the biogeography (geographical distribution of species) that first suggested the idea of evolution to Darwin.
- Armadillos are the armored mammals that live only in America. The evolutionary view of biogeography predicts that contemporary armadillos are modified, descendants of earlier species that occupied these continents, and the fossil record confirms that such ancestors existed.

The Fossil Record (Paleontology)

- The earliest fossils were of the prokaryotes.
- The chronological appearance of the different classes of vertebrate animals in the fossil record is a good example. Fossil fishes, the earliest vertebrates, with amphibians next, followed by reptiles, then mammals and birds. This sequence is consistent with the history of vertebrate descent. The evolution of horse provides an example of such a history.



Comparative Anatomy

Anatomical similarities between species grouped in the same taxonomic category bring another support to the theory of the Descent with modification.

Homologous Organs	Analogous Organs
Organs that are functionally different but structurally similar	Organs (structures) that show similarity in function but they are structurally different
Shows divergent evolution	Shows convergent evolution
E.g. the forelimbs of human, cats, whales, bats.	E.g. the wings of bat, birds and insects etc.

Vestigial Organs

Vestigial organs are historical remnants of structures that had important functions in ancestors but are no longer essential presently.

E.g. the skeletons of whales and some snakes retain vestiges of the pelvis and leg bones of walking ancestors, vermiform appendix in carnivores, ear muscles in man etc.

Molecular Biology

- Evolutionary relationships among species are reflected in their DNA and proteins and in their genes and gene products.
- If two species have genes and proteins with sequences of monomers that match closely, the sequences must have been copied from a common ancestor.
- Taxonomically remote organisms, such as humans and bacteria, have some proteins in common. For instance, cytochrome c, a respiratory protein is found in all aerobic species.