

8. THE STORY OF LIFE ... AND ORGANISMS

CONTENT

- **Origin of life** - Oparin-Haldane Hypothesis
- **Theories of organic evolution** – Lamarck, Darwin, Russel Wallace and deVries..
- **Evidences of evolution** – Fossil studies and other sciences.
- **Human evolutionary chain** – Primates and ancestors of man.
- Interference of man and survival of animals.

Major Ideas

1. According to Oparin-Haldane Hypothesis first form of life evolved in oceans as a result of chemical reactions of inorganic molecules, for millions of years, after the origin of earth [chemical evolution]
2. The first formed were single-celled anaerobic organisms. After several million of years, organisms with the capability of photosynthesis formed and hence, free oxygen seen in the atmosphere. The presence of free oxygen caused the emergence of aerobic microorganisms in the earth.
3. Stanley Miller, Harold Urey, Juan Oro, Cyril Ponnampereuma are scientists who conducted experiments which substantiated the Oparin-Haldane Hypothesis.
Panspermia, Origin of life near volcanoes in the oceans etc. are other views related to the *origin of life*.
4. Jean Baptist Lamarck proposed the theory of Inheritance of Acquired characters, in which he said, continuous use or disuse of an organ results variations to develop changes in the structure of that organ (Acquired characters). These will be transmitted to the next generation to form new species.
But scientists criticized Lamarck's view.
5. Both Charles Robert Darwin and Alfred Russel Wallace arrived the importance of nature in the process of evolution. The theory of Natural Selection proposed by Charles Darwin states that *variations develop in each species. Only those variations, which are favourable to that nature, survive and those which are unfavourable get eliminated*.
How ever, Darwin could not describe the causes of variations.
6. Hugo de Vries described that sudden and heritable changes (mutation) lead to evolution.
Neodarwinists say variations occur due to gene or chromosomal mutations and when the organisms undergo natural selection, only favourable variations exist in that environment. Isolation also causes mutations.
7. Comparative study of structure of different organisms, cell study (cytology) and physiology, Classification Molecular studies and fossils study (Paleontology) provide evidences for evolution.
8. Man come under Hominoidea family of primates order of mammals. Apes and man include in the Hominoidea family, which, we believe that, evolved from Dryopithecus.
9. Ardipithecus, Australopithecus, Homo habilis, Homo erectus, Homo neanderthalensis, Homo sapiens [Cromagnon], Homo sapiens sapiens are different ancestors of man.
10. Eugene Dubois, Donald Johanson and Leakey Family are famous Paleoanthropologists, who discovered fossils of human ancestors.
11. The origin and extinction of different species is a phenomenon occurring in the flow of time. Though many extinction of species occurred due to natural phenomena, involvement of man in nature also caused elimination of organisms from earth. Golden frog and Dodo are examples.

1. The views related to the *origin of life* ?
Oparin-Haldane Hypothesis (Theory of chemical evolution), Panspermia, Origin of life near volcanoes in the oceans
2. The major ideas in the Oparin-Haldane Hypothesis (Theory of chemical evolution),
 - Origin of the earth
 - Reactions of inorganic molecules like hydrogen, ammonia, water vapour and methane in the atmosphere of primitive earth
 - Formation of simple organic molecules like amino acids
 - Formation of oceans due to rains for millions of years
 - Formation of complex organic molecules
 - First form of life
3. According to Oparin-Haldane Hypothesis, the energy sources for the chemical reactions are, UV rays from the sun, lightning, volcanic eruptions
4. Why is it believed that the first formed organisms may be single-celled anaerobic organisms ?
Free oxygen was absent in the primitive earth's atmosphere.
5. Name the scientists who conducted experiments which substantiated the Oparin-Haldane Hypothesis.
 - ◆ Stanley Miller, Harold Urey (1953) - synthesis of amino acids.
 - ◆ Juan Oro (1961) - synthesis of amino acids, peptide molecules and adenine.
 - ◆ Cyril Ponnampnera (1963) - synthesis of adenosine molecules.
6. The ideas of J.B. Lamarck about organic evolution ?
Theory of Inheritance of Acquired characters
Continuous use or disuse of an organ results in variations to develop changes in the structure of that organ (Acquired characters). These will be transmitted to the next generation to form new species.
7. Why did scientists criticize Lamarck's view ?
The changes in the body (Acquired characters) that occur in the life time of an organism do not affect its genetic constitution and hence not possible to transmit to the next generation.
8. Theory of Natural Selection proposed by Charles Darwin.
Variations develop in each species. Only those variations, which are favourable to that nature, survive and those which are unfavourable get eliminated.
 - * Organisms of one kind, when produced in large numbers (Over Production), compete for food, space and other limited resources (Struggle for Existence). In this struggle, organisms with favourable variations survive in that nature (Survival of the Fittest). Over a long period, the favourable variations accumulate, resulting in the formation of new species.
9. Scientist, who arrived at Darwin's inferences on evolution ?
Alfred Russel Wallace.
10. Alfred Russel Wallace : Indonesian Islands ; -----? : Galapagos Islands .
11. How did Darwin understand that the 13 different finches found in the Galapagos Islands came from a common ancestor ?
Though the finches were similar in sound and nesting habits, only they showed differences in food and food habits. So, Darwin thought that they were evolved from the seed-eating South American ground finch.
12. Book published by Charles Darwin with his theory, Natural Selection ?
Origin of Species
13. In what ways did Hugo de Vries describe evolution ?
Hugo de Vries described that sudden and heritable changes (mutation) lead to evolution.
14. How do variations occur in organisms ? (How is Neodarwinism explaining organic evolution ?)
Variations occur due to mutations in genes or chromosomes. Isolation, (due to various reasons like continental drift, natural calamities, formation of deserts, mountains or rivers) is another cause for continuous mutations and thereby variations. When organisms undergo natural selection, only those with favourable variations exist.
15. Give examples for evolution by isolation.
Australian pouched mammals, Arabian-Bactrian camels.

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16. 'Comparative study of structure gives evidences to evolution'. How?

Though there are differences in the external structure (morphology) among different organisms, there are certain similarities in their internal structure (anatomy).

17. Both Cytology (study of cells) and Physiology (study of life processes) support the uniqueness of organisms. Can you say, how?

All organisms are made up of cells with protoplasm. There are similarities among the cell organelles and cellular activities. Hereditary factors are gene, seen in DNA and the structure of DNA is alike in all. Biochemical reactions like cellular respiration occur in all organisms. There are similarities in growth, excretion etc.

18. What conclusion may arrive through the processes of scientific classification?

All organisms are evolved from common ancestor.

19. Define fossils?

Fossils are remnants or traces of organisms that lived in the past, preserved in earth crust.

Fossils can be seen in different forms in amber, rock/soil, lava and ice.

20. What evidences of organic evolution do the study of fossils (Paleontology) reveal?

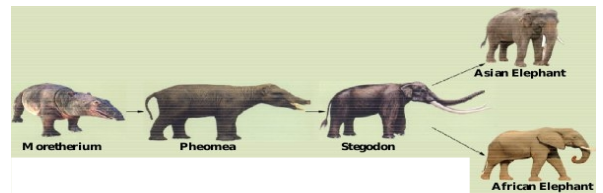
- ◆ There has been a gradual change from simple structure to complex forms of life.
- ◆ Linking fossils like Archaeopteryx reveal the evolution of one form of organisms from another form.
- ◆ The evolutionary stages of vertebrates from fishes to amphibians, reptiles, birds and mammals could be satisfactorily explained through fossil studies.
- ◆ Extinction of some species as well as the emergence of new species.

21. Though Archaeopteryx is considered as the ancestors of birds, it had reptilian characters. What are they?

Teeth in the beak, fingers (claws) in the forelimbs, extended vertebral column up to its tail (tail with vertebra).

22. Observe the illustration and write down the structural changes in the evolution of elephants.

- | | |
|--------------------------|---------------------------------|
| Legs grew strong. | Neck became short. |
| Growth of proboscis | Ear pinna became enlarged. |
| Enlargement in the size. | Number of teeth decreased. |
| Molars modified. | Modification of teeth as tusks. |
- Many air cavities were formed inside the cranium.



23. What are the characteristics which make man different from other animals?

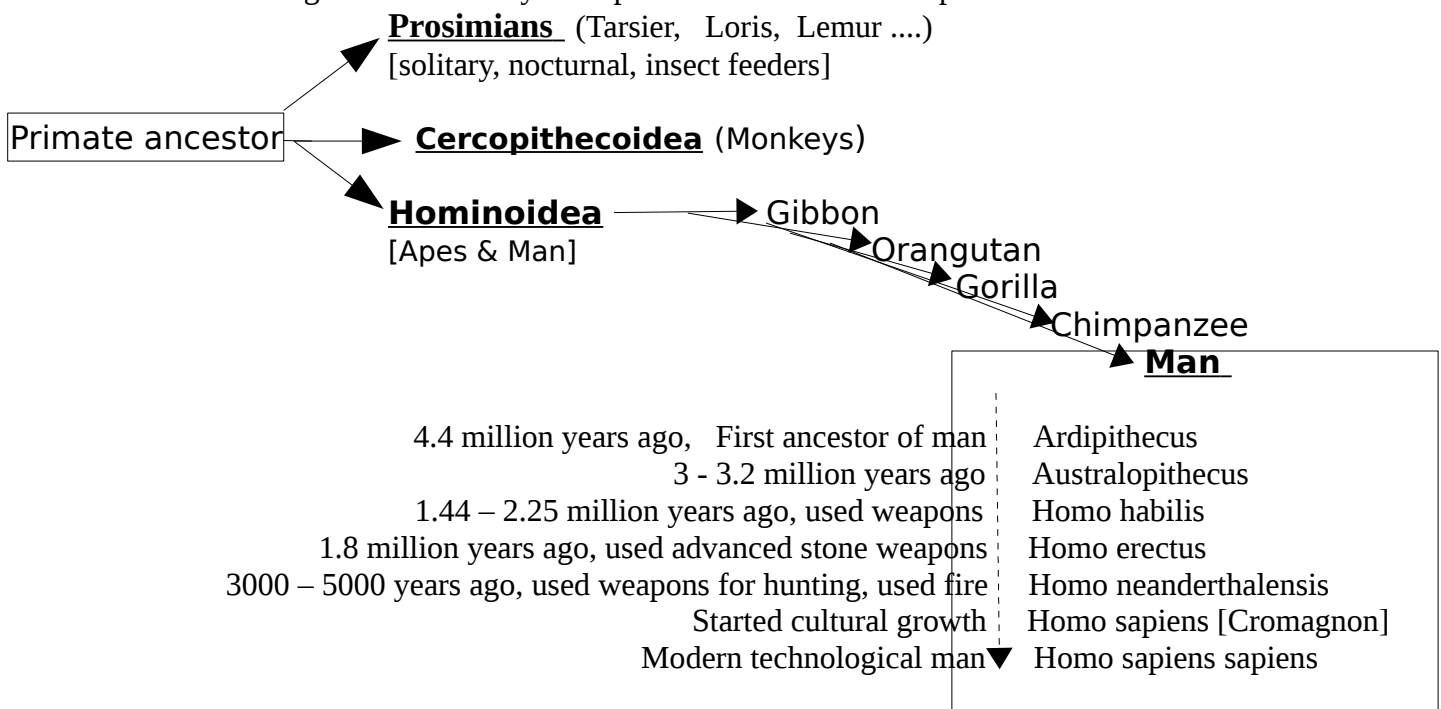
Walk on two legs, developed brain, intelligence and memory power, communication using language

24. What are the physical limitations of man? How can he survive these limitations?

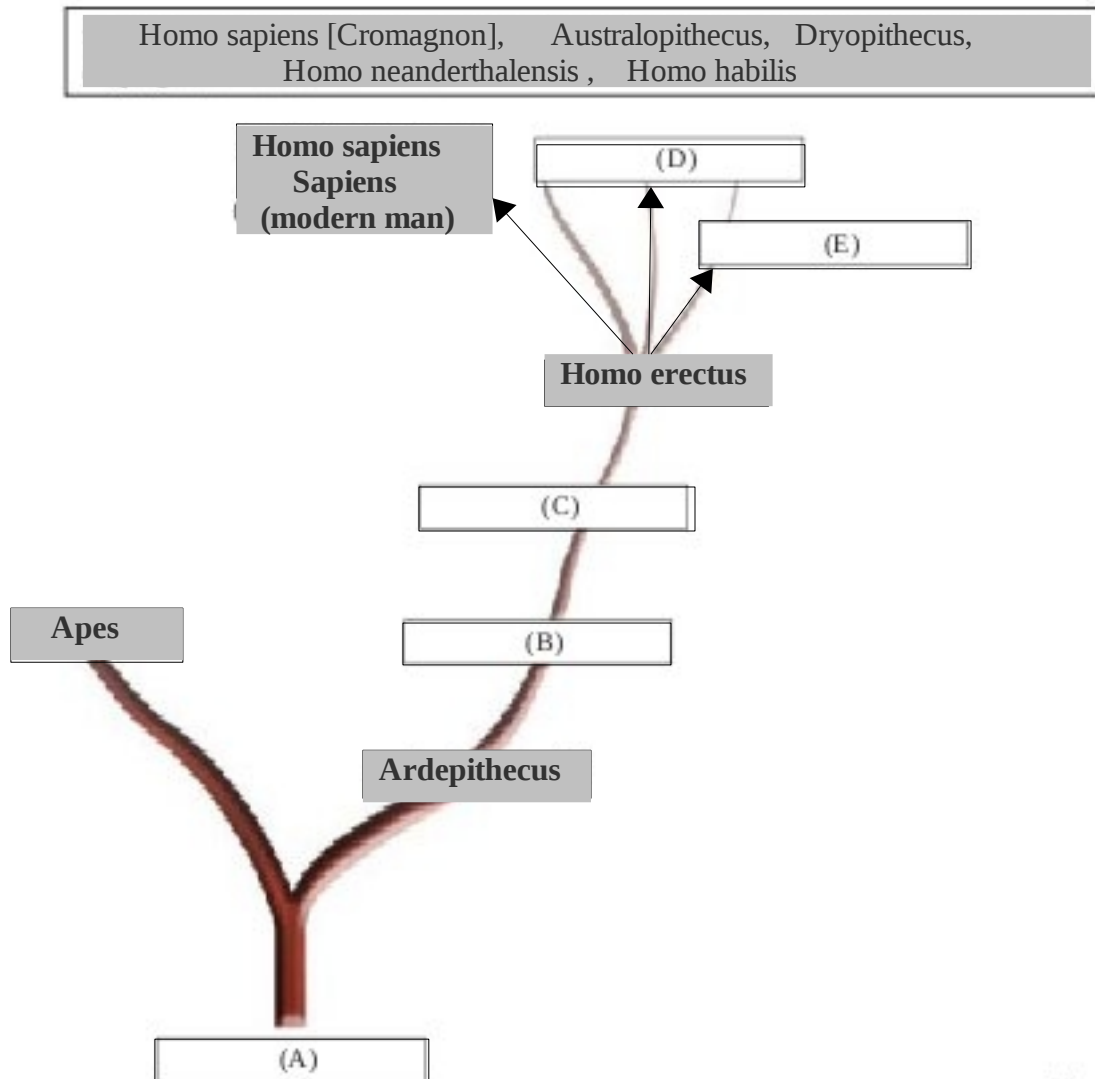
Unstable physical structure, Sensation of smell and hearing is far less than many animals, man has no ability to fly or lead aquatic life

With the help of sophisticated devices he developed with his intelligence, man has been able to overcome all his limitations.

25. Flow chart showing the evolutionary development of man from the primate ancestor.



26. Common features of primates ?
5 fingers in arms and legs, flat nails, opposable thumb, eyes that can be focussed simultaneously on one object, a pair of nipples .
27. The common ancestor of apes and man ?
Dryopithecus [14 – 20 million years ago]
28. The oldest fossil of the genus ,Homo ?
Homo habilis
29. Paleoanthropologists and their contributions,
Eugene Dubois – Discovered the fossil of Homoerectus (Java man) (1891)
Donald Johanson - Discovered Australopithecus (Lucy) (1971)
Leakey Family - Mary Leakey discovered footprints of human ancestors embedded in lava (1976)
30. Molecular studies can infer the period of seperation of different groups from their ancestor. How ?
Globin is the protein part of haemoglobin. Amino acids in the alpha and beta chains of haemoglobin are different in each species. This differences are due to the mutations occurred in the sequence of nucleitides of the corresponding genes. Through the molecular study of DNA, we can assess the rate of mutations and thereby understand the period of seperation of different groups from their common ancestor.
31. Complete the illustration using appropriate words given in the box



32. Eugene Dubois : Homo erectus; Donald Johanson : ----- ?
33. Examples for extincted species ? Dodo bird, Golden frog.
34. The development through exploiting nature and its resources with out causing any harm , is termed to be ----- ? Sustainable development.