20. History of Life on Earth

Earth is the only planet in our solar system which sustains life. But earth was not the same as it is today. It was a ball of gases when it was first formed about 4.5 billion years ago. Earth cooled and chemicals of life were synthesized in water – **chemical evolution**.

Biodiversity came to exist through **biological evolution** for which a valid mechanism termed **Natural Selection** was provided by **Charles Darwin** (Father of Modern Evolution) which was later modified in the light of progress in various fields of biology and called **Neodarwinism**.

Fossils

Fossil Plant *Ammonite* *Dinosaur* *Archaeopteryx*

Fig. 1. Fossils are an evidence for Biological Evolution

Fossils are remains of plants and animals that have been preserved in rocks or oil or amber. A study of fossils tells us how life on earth has changed or evolved. Fossils form evidence for Biological evolution.

Build Your Understanding

- How did chemical evolution occur?
  - Primitive atmosphere had gases like CH_4, NH_3, H_2 and CO_2 and water vapour.
  - Temperature was extremely high.
  - Earth cooled, water vapours condensed and there were torrential rains.
  - Water collected on earth's crust into which were washed down these gases.
  - They combined to yield biomolecules like nitrogenous bases, glucose and amino acids which further formed proteins and nucleic acids.
- All kinds of organisms came into existence through **Organic Evolution**

Evolution and Darwin

  - Charles Darwin emphasized that all (i) kinds of organisms are related through ancestry and (ii) that **Natural Selection** is the force which causes evolution.
  - It is not the individual which evolves but the entire population of that area evolves. **So, the unit of evolution is a population.**
  - It has its own gene pool (gene pool: all kinds of genes found in a population/ species).

– Variation arises in the gene pool through mutation and recombination
– Natural selection causes greater reproduction of beneficial variant genes.

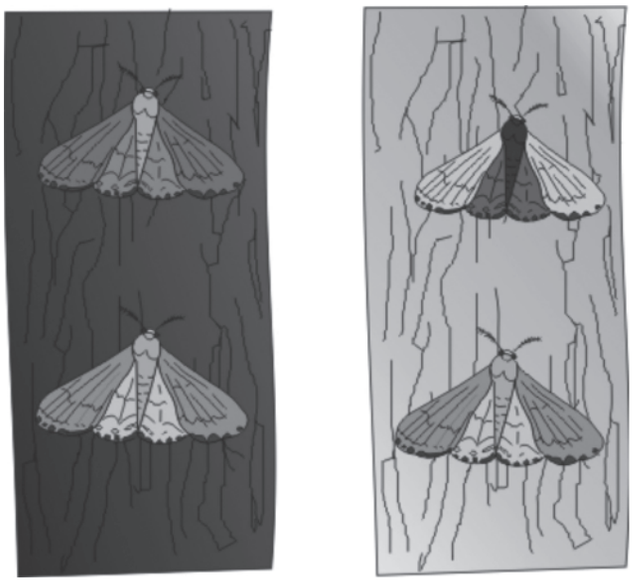


Fig. 2. Natural Selection in Action

- Levels of evolution:
  – Micro evolution–Evolutionary changes in the gene pool at the level of population.
  – Macro evolution – also called adaptive radiation, leads to formation of new species and genera.
- Stages in Human evolution:

  The two trends in human evolution are (i) larger brain and (ii) bipedal gait (walking on two legs)

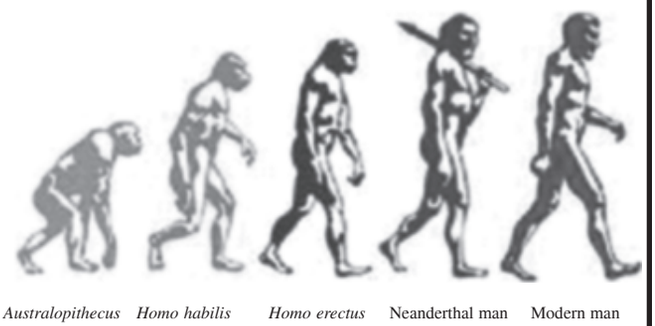


Fig. 3. Stages of Human evolution

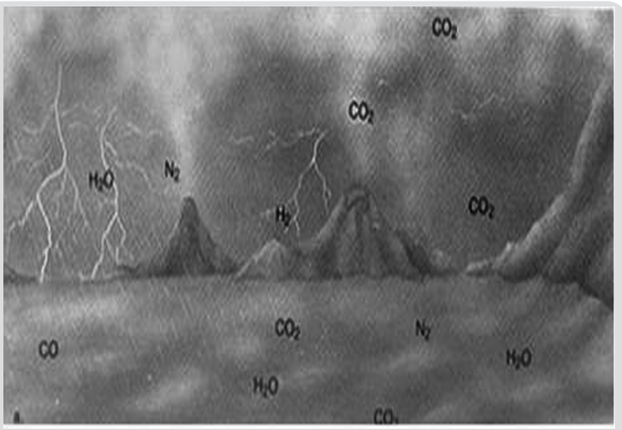
Stretch Yourself

1. Arrange in the proper sequence, the stages of human evolution mentioned below.

   Homo sapiens neanderthalensis, Australopithecus, Homo sapiens sapiens, Homo erectus.
2. Differentiate between chemical and biological evolution.
3. Natural selection is still considered as a valid and reliable mechanism for evolution. How does it operate? Also cite an example.

Test Yourself

1. Here is a picture of primordial atmosphere. Name the missing gases.



2. How did Oparin and Haldane explain the origin of life? Who experimentally proved it and how?
3. What do you understand by 'Biological Evolution'? What was its outcome? How does it operate in Nature?
4. Who is considered the father of evolution? State briefly his contribution in this field.
5. Give a brief account of human evolution.
6. How does micro evolution differ from macro evolution?