Sunday, 25 September 2022 9:14 AM

7.3 Evidences for Evolution :-

- Evidence that evolution of life forms has indeed taken place on earth has come from many quarters.
- In support of organic evolution some important evidances are as follows

(1) Palaeontological evidences (Evidences from fossil records)

(2) Evidences from comparative anatomy and morphology.
  - ① Homlogous organ
  - ② Analogous organ
  - ③ vestigeal organ
  - ④ → connecting link
  - ⑤ → Atavism

(3) Embryological Evidences

(4) Biochemical Evidences

(5) Biogeographical Evidences

(1) Paleontological evidence :- From fossil records it has been concluded that evolution has taken place from simple to complex in gradual manner.

- Fossils are remains of hard parts of life - forms found in rocks.
- Different - aged rock sediments contain fossils of different life forms who probably died during the formation of particular sediment. for eg. Rocks of proterozoic Era contain few fossils. The palaezoic era contains abundant fossils of invertebrates, fishes, amphibians. The rocks of mesozoic era have the fossils of great reptiles (dinosaurs) and primitive birds and mammals In the Coenozoic Era, the fossils of various mammals are abundant.
- some of them appear similar to modern organisms (acc to given fig)
- A study of fossils in different sedimentary layers indicates the geological period in which they existed.
- The study showed that life - forms varied over time and certain life forms are restricted to certain geological time span. Hence, new forms of life have arisen at different times in the history of earth.

A/R

- Age of fossils can be calculated by radioactive - dating method.

(2) Evidences from embryology :→

Embryological support for evolution was also proposed by Ernst Heckel based upon observation of certain features during embryonic stage common to all vertebrates that are absent in adults. For example → the embryos of all vertebrates including human develop a row of vestigeal gill slits just behind the head but it is a functional organ only in fish and not found in any other adult vertebrates.

- Haeckel gave biogenetic law, " ontogeny repeats phylogeny " means organism repeats its ancestral history during its development. However, this proposal was disapproved on careful study performed by Karl Ernst von Baer. He noted that embryos never pass through the adult stages of other animals.

- Development of many vertebrate organs (eg heart, brain, kidney) indicate the possible path of evolution as well as the common ancestry of vertebrates.

(3) Comparative anatomy and morphology :→

These are similarities and differences among organisms of today and those existed years ago. These evidences are as follows.

(i) Homologous organ :- The organs which have the

Same origin and fundamental structure but are different functions are called Homologous organ

- These organ developed along different directions

HR due to adaptations to different needs

- Homologous structures are a result of divergent evolution.

- Homology indicates common ancestry.
- Homology is based on divergent evolution.

Example.

(a) fore limbs of whales, bats, cheetah and humans show similarities in pattern of bones. Means these forelimbs perform different functions in these animals but, they have similar anatomical structures - all of them have humerus, radius, ulna, carpals, metacarpals and phalanges.

(b) Vertebrate hearts or vertebrate brains.

(c) Mouth parts of insect

(d) In plants, the thorns of Bougainvillea and tendrils of cucurbita, both arising from axillary position

***

(ii) Analogous organs :- The organs which have similar functions but are different in their structural details and origin are called analogous organs. These structures are result of convergent evolution.

Examples :- ⓐ wings of butterfly (or insect) and birds

ⓑ eyes of octopus and mammals

ⓒ Flippers of Penguins & Dolphins

ⓓ sting of Honey bee and Scorpion

ⓔ Sweet potato (root modification) and Potato (stem modification) are for storage of food.

- We can say that it is the similar habitat that has resulted in selection of similar adaptive features in different groups of organism but toward the same function.

(iv) Vestigial organs → They are believed to be remnants of organs which were complete and functional in their ancestors.

(v) Connecting links →

eg. Euglena

(vi) Atavism → sudden appearance of certain ancestral characters.

(4) Biochemical Evidence :- similarities in proteins & genes performing a given function among diverse organisms give clue to common ancestry.

(5) Biogeographical evidences :- ⓐ Restricted distribution

There were in South America mammals resembling horse, hippopotamus, bear, rabbit etc. Due to Continental drift, when south america joined north America, these animals were overridden by North American fauna. Due to same continental drift pouched mammals of Australia survived because of lack of competition from any other mammals.

ⓑ Adaptive radiation (Divergent evolution) :-

development of different functional structure from a common ancestral form

or

Process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (Habitats) is called Adaptive radiation.

Example :- (i) Darwin finches of Galapagos Islands

Darwin observed small black birds (later called Darwin's finches) on Galapagos Islands. He realised that there were many varieties of finches in the same island. All varieties, he conjectured evolved on the island itself. from the original seed-eating features, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches.

(ii) Australian Marsupials : A number of marsupials, each different from others evolved from ancestral stock, but all within the Australian island continent

(iii) Placental mammals in Australia

© Adaptive convergence (convergent Evolution)

when more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats).

seen in case of Australian marsupials and placental mammals. eg. Placental wolf and Tasmanian wolf- marsupial.