

Department of Geology

B.Sc. Semester IIIrd

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Paper 1: Palaeontology

Unit 1: Introduction to Palaeontology, Process of Fossilization, Preliminary idea of the origin of life, Basic idea of trace fossils and their uses.

Introduction to Palaeontology

Palaeontology: study of fossils that is the study of life of past geologic ages. Fossils owe their existence to a break in natural cycle, thus the fossilization represents a transfer of natural from the biosphere to the lithosphere.

Fossilization: It is also known as **Taphonomy** and includes three stages of fossilization process which are **Mortality**, **Biostratinomy** and **Diagenesis**.

- i. Mortality concerns with causes and consequences of death.
- ii. Biostratinomy deals with the fate of an organism body from the time of death until it is finally buried by the sediments.
- iii. Diagenesis covers the fate of organic contains after they are buried in sediments. It is controlled mainly by condition of sedimentation and by the petrography of the sediments.

Basic prerequisites for the process of fossilization are:-

- a. Presence of hard part in the organisms (in rare case soft bodied organisms have also been found preserved as fossils.
- b. Quick burial after death
- c. Anaerobic condition of burial
- d. High temperature and pressure condition of burial.

Modes of Fossilization:

- i. **Unaltered remains:** In rare cases even the soft body tissues may be preserved into with life or no alteration for example: The extinct Woolly mammoth in Siberia.

ii. Altered remains:

- a. Carbonization:** It is a chemical reaction, water transfers into organic material of plant and animal to a thin film of carbon. Nitrogen, Oxygen and Hydrogen are given off as gases, leaving only an outline of organisms. Example: Carbonized fish remains, leaves and woody trunks of plants. This process is also known as Natural Distillation.



Figure 1 Carbonized Fish

- b. Petrification:** Under certain condition ground water completely dissolved the organism shell and deposited some other substance in its place. This is very slow process, the replacement is from particle to particle, or from volume to volume. During this process of replacement the internal structure of organisms get preserved. Example: Petrified wood or bone of vertebrate.



Figure 2 Petrified Wood

- c. Permineralization or Imprignation:** In this process the pore spaces of the bones get filled by running ground water. Example: Fossilized bone.
- d. Recrystallization:** It occurs when a solution or precipitate change the internal physical structure of original mineral the often reforms as larger

crystal. For example aragonite Shells converted into more stable calcite shell.

- e. **Mould and Cast:** This fossilization process begins when the whole organism or hard parts trapped in coarse porous sediments such as sandstone. The porous nature of sediments or rock enables the carbonate groundwater to infiltrate and dissolved the original organisms. Subsequently this mould gets filled by secondary mineral matter, thus produce the Cast or replica of original organisms.
- f. **Tracks, Trails, Footprints or Imprints:** Such features on the surface of sediments are characterized as Trace fossils. Many organisms during their movement over soft mud or sandy bottom leave impressions of body parts, after solidification of sediments they get preserved as trails, tracks or footprints on the rock surfaces.
- g. **Burrows, Borings or Tubes:** Certain animals excavate burrows in sand, bore holes into solid rocks for example: Fossil burrows, Bores are very common.
- h. **Coprolites or Dung Stone:** It is fossilized feces of organisms.
- i. **Gastroliths:** These are also called Gizzard Stone. They are in the form of rounded polished stone pieces formed in association with fossilized bone, where the stomach once was.

Importance or Use of fossils: Remains in organisms present in rocks of earth crust have significant value as:

- 1) **Chronological Significance:** Stratigraphic indices with the help of **index fossils** – are those fossils that have short geological (vertical) range and wide geographical distribution and rapid evolutionary trends.
- 2) In determination of palaeoenvironment and palaeoclimate.
- 3) Fossils are used as biostratigraphical zonation and correlation of strata.
- 4) To establish palaeogeography.
- 5) Fossils are evidence of organic evolution.
- 6) They are very good tool in petroleum exploration.