FOSSIL AND TYPES

Srimanta Kanji

Fossil is **the trace of passed life form found in rocks of Earth**. Actually, fossil refers **to organic remains dig out from Earth**. The word fossil derived from a Latin verb "*fodere*" (=to dig up). According to Arnold (1947) fossil maybe defined as "the relic of some former living things, plants or animals embedded in or dug out of the superficial deposits in past geological period". Fossil maybe defined "Any evidence of prehistoric life " (W.N. Stewart 1983). Under fossilization process the sedimented plant part which show prehistoric life evidence is called fossil.

Types of fossils:

The fossils may be categorised into following types:

A. MEGA FOSSIL: The type of fossil which are visible to naked eye and are **better source of morphological as well as anatomical studies**. During fossilization large plant part like leaf, stem, roots, flower etc get preserved in sedimentary rocks such type Fossil is called **Mega Fossil.** These fossils may be categorised into four types depending upon the basis of the nature of fossilization process.

1. **Compression:** In this type of fossil, fossilisation take place under great pressure. As a result, the solid organ became flattened. Due to vertical pressure of the sediment, the external forms undergo modification and the organic matter consists of the thin film of carbon. The compression fossil internal structure is not preserved. In rare cases cuticle, stomata etc retained in internal structure.

Palaeobotanist huge to study the compression fossil for external morphology of the plant.

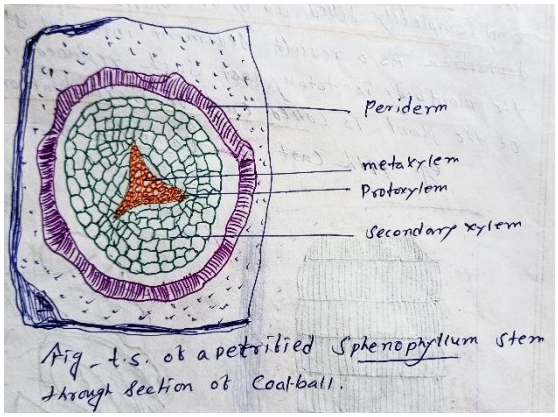
E.g.- *Ptilophyllum,* clay nodule of *Lepidostrobus*.

***CLAY NODULE:** A good type of compression fossil is called clay nodule. In this type plant material get enveloped in a ball of clay, became compressed. As a result, the clay ball trans into stone. Within the clay ball the plant material is to be found very much intact than the normal compression. E.g.- Clay nodule of Lepidostrobus.

2. Impression: The type of fossil where a leaves or any other organic part after falling on semi-rigid clay forms an imprint on its surface. During the course of the fossilization process the imprint became permanent, when the clay converted into stone. Such type of fossil is called **impression**. In impression Fossil the plant part does not contain any organic material as in compression. Thus, impression may be defined as **negative of compression**.

Impression fossil from in fine and soft material which shows better details. Impression is extremely useful in the study of external structure of various plant parts like stem leaf and flower. E.g.- *Neuropteris, Glossopteris*.

3. Petrification: The type of fossil **where both external as well as internal structure of plant body are preserved in original form.** During petrification process **the organic tissue of plant cell are replaced with silica (SiO2) and other mineralisation process**, like- lime carbonate (CaCO3), iron (FeS), MgCO3, sulphur etc. As a result, the internal structure of plant bodies protected in some way from rapid decay during mineralisation, through molecule-by-molecule replacement and plant specimen transformed into hard stone. E.g.- Petrified fossil is ' coal ball ', *Sphenophyllum.*



*****COAL BALL:** The petrified plant organ of roughly spherical shape or irregular rounded mass or sub-spherical, which shows get diversity in their size and ranging from few mm to a metre. Such fossil is/are formed by infiltration of calcium carbonate (CaCo3), magnesium carbonate, iron sulphide etc. And representing the plant of passed day. So, the anatomy as well as the morphology is retained, and this type of fossil is called coal ball. Frequently plant fragments of steam, root, seeds and sporangia or liberated spores are retained in coal ball. E.g.- Petrified coal ball *Sphenophyllum* stem.

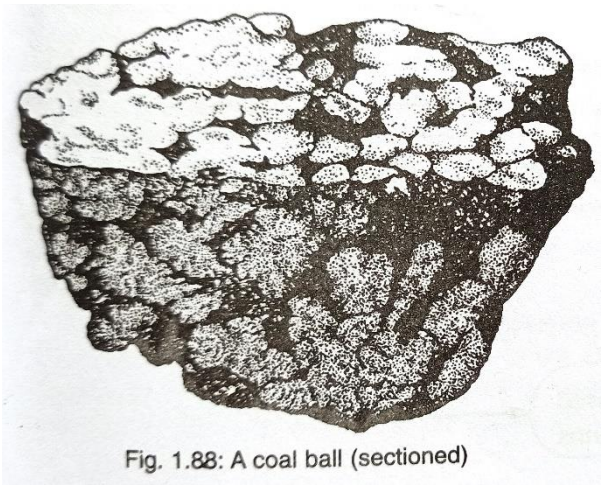
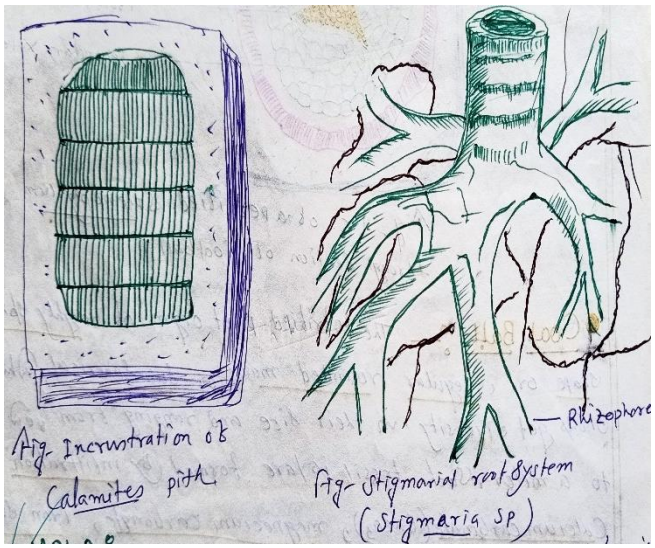


Fig. 1.88: A coal ball (sectioned)

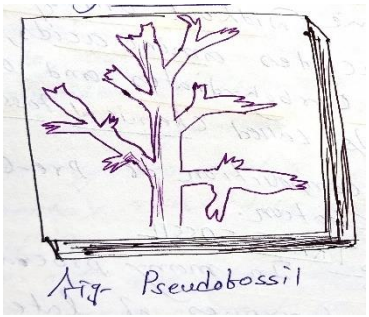
4. cast or incrustation and mold: In these types, the deposition of iron and carbonate minerals occurs in the form of a hard cast around the plant parts. The internal structure is degraded to form a cavity which is completely filled up by the surrounding sediments. Thus, the external preserved surface of the plant part is called a mold, while the replaced internal structure of the plant part is called a cast. Stigmarian root system is an example of mold, while the pith cast of a *Calamites* stem is a common example of incrustation. Usually, 3-dimensional plant part such as stem, seed, fruit etc. are ideal for this type of preservation. Eg. Stigmarial root system *Stigmaria sp.*, *Lepidostrobus sp*.



B. COMPACTION / MUMMIFIED: The type of fossil where plant or plant parts are compressed by the vertical pressure of one against another. As a result, in the fossil their inter veining matrix is not found. Such type of fossil is called compaction /mummified fossil. Eg- Some plants structure like- leathery leaf, hard food and seeds are preserved in mummified fossil. Siberian Mammoth *Lorix sp*.

C. SUB FOSSIL: The type of fossil where plant parts or animal parts required certain time of period for their fossilization. As a result, the fossil part excavated before they complete their fossilization process such type of fossil is called **Sub-fossil**. E.g.- Coal is compressed fossil while peat is referred to as sub fossil during early stage of coalification. **The fossil of recent deposit is called sab-fossil.**

D. PSEUDOFOSSIL: In nature apart from true fossils there are also pseudofossil. At a glance which look like plant fossil. However close examination reveals their structure is unlike that of plants. Usually, dark coloured minerals enter the rock in solution, get crystalizes and consolidate in the shape of the plant part. This type of fossil is called **Pseudofossil.** E.g.- *Botryoerines sp*.



E. DERIVED FOSSIL: The fossilised organisms that held in a stratum younger or older than the fossil themselves are called derived fossil. Actually, fossilized organism not of the age of the bed. These are results of tectonic movement of Earth or other geological upheaval.

F. INDEX FOSSIL / GUIDE FOSSIL: The type of fossil where relic of former organism (plant or animal) helps in dating other fossil found in the same sedimentary layer, which gives clear indication of the passed geological ages to which they belong are called **Index fossil / Guide Fossil.** E.g. - *Monograptus*—indicate lower Devonian while *Myrepollenites* is a marker of Eocene. *Glossopteris* in the index fossil of lower Gondwana. Foraminifera, pollen grains, spores etc. also used as index fossil.

G. AMBER: The resin of coniferous tree particularly *Pinus succinifera* is called Amber. Such resinous substances after falling on forest floor from injured plant parts, became hardened and stored over long period of times. During exudation of resin some insect, old flower parts, windblown pollen grains, fungal spores and others plant part and animal debris etc, eventually accumulated preserved in Amber. In these regard ambers is good preservative. Amber has high economic value and used in jewellery.

H. CHEMICAL FOSSIL: The type of fossil where remnants of organic compounds preserved in sediments or imparts of fossilised structure without undergoing any minimal change, which includes amino acid, hydrocarbon, fatty acid, lipid, carbohydrate and other derivatives of organic compounds called chemical fossil. E.g.- Chemical composition of **Pre-Cambrian** rocks, is an important criterion to establish the biogenicity of putative unicellular or multicellular organisms present in Pre Cambrian rocks. The existence of insoluble **kerogen** is used as proof of biogenicity. Similarly, the occurrence of **pristane** and **phytane**, degradable product of chlorophyll molecule, may be used as photosynthesis.

I. ICHNO FOSSIL/ TRACE FOSSIL: During fossilization, indication of prior existence of organism are traces in the sediments of Earth, maybe regarded as **trace fossil or Ichno fossil**. In many Pre-Cambrian strata various kinds of burrows of late Protozoic animal had been recognised. Indian Pre-Cambrian a large number of mycobionts belonging to the genera,

Kakabekia, Animekiea, Collenia, Conophyton. have also been described. Coprolites (fossil excretes), gastrolith (polished stones in the abdomen of dinosaurs), gnawed bones etc.

J. MICRO FOSSIL: During fossilization process the microscopic organism like bacteria, spores, pollen grains, algal and fungal spores, Diatoms etc. became preserve in sedimentary rock/ deposits. Micro fossils are visible only after maceration of sediments with the help of microscope. Such fossil is called Micro Fossil.