

# Fossils

What are Fossils? What is the process of Fossilization - Describe the different types of Fossils with their uses and scope.

Palaeobotany is the study of the plant life of living being the geological part and the organic remains of the living beings including plants and animals existed in the scumote part are called Fossils. In other words the plant remains that are found in rocks are known as Fossils. The word fossil came from the Latin word "Fodere" means "to dig". In correct sense fossil include not only the remains of the organism or plant of it but also any thing connected with an organism proving its existance.

The actual nature of fossilization depends on the environmental condition in which it takes place. The softer part disintegrate early so that chances of fossilization are better than harder parts, so it cannot be expected that a large plant or a tree would get fossilized entirely. Usually fossils of any bits of plants are found and these bits are than placed in form genera, without indicating to what plant it belongs. *Stigmaria* (Rhizomes of *Lepidodendron*), *Lepidostrobus* (Strobilus of *Lepidodendron*) etc. are such form genera.

The debris settled down and consolidated to form sedimentary rocks that was about 100 km deep. The nature of sedimentation also changed from time to time which changes the constitution of the sediment in the topography of the area, in the water flow etc. This caused stratification of the sedimentary rocks. (The strata may be irregular due to similar regions. This are local names for the different strata in different parts of the world and some Indian names of the strata is like Gondwana groups are described.)

Process of Fossilization → The process of fossil formation is called fossilization. Burial is the best method for fossilization. The process of fossilization is going on in nature in European coal forest plant parts may be deposited in situ when they grow. Usually such fossilization in situ takes place in swamps and small lakes where the low oxygen content and the presence of toxic substances in water containing decayed plant parts stopped growth of microbes and helped preservation of the plant parts.

The best place for fossilization is the ocean because the saline water prevents the decay of dead organism. These parts brought to the ocean with the help of rivers water and preserved there as fossil. Their hard parts settled to the bottom and covered by the sediments, so the older fossils are preserved deeper and recent one in upper strata occurs the fossils are exposed.

The plant parts are carried down by rivers etc. and deposition takes place like in Indian Gondwana coal deposits. The parts can not decay by fungi or microbes, so they lastly form fossils.

Sometime insects are trapped in Amber which is yellowish fossil resin. As the amber dries and solidifies than insect becomes well preserved as fossils.

In case of mould formation the impression left in mud or sand by the soft or hard part of plants or animals and are solidified into stone and a permanent impression of fossils left behind. During fossilization the protoplasmic contents disappear first than softer parenchymatous tissue and lastly harder parts by the micro-organisms and pressure of sedimentary rocks of the above parts. The pressure first reduces the vacant space of the cell & forces watery and organic substance out.

So above all fossils only compressed in the good fossilization method.

According to the nature of fossilization, there are altogether 5 different types of fossils are recognized. They are —

**1. Pterification** → Here the original portions of some organism have been replaced by minerals which dissolved in water. As for example — sedimentary rocks. This means transformation of the organic tissue into stone. So Pterification is the best method of fossilization, but it is rare. Here organic molecule changed into mineral molecules. The buried plant materials absorb mineral salts like silicates, carbonates, sulphates etc and precipitation takes place so that silica, calcium carbonate, & magnesium carbonate etc. get impregnated within tissue. In this process most of the organic material get destroyed, at last some cell wall survive and at last the whole structure becomes stone like.



### Pterified stems

Anatomically structures of ancient plants are beautifully obtained from such Pterification. Pterification are usually parts of stem, twigs, roots, seeds, sporangia etc. silicified and calcified fossils (bits of wood) are often found. The examples are, the coal balls, ranging in diameter from few mm to 1 meter. Each coal ball is mass of calcium magnesium carbonate with iron sulphide. Plant parts and even delicate parts of plants remain intact in the coal balls, so pterified part shows clearly.

2. Cast (Incrustation) → In this type of fossil the cavities of the impression may be filled by some hard minerals, as for example stem of calamites, stigmaria of Lepidodendron etc. But in course of time the inside as well as the outside solidifies into stone from which the exact cast of the plant peeled off having an appearance as correct as one may obtain from clay or plaster of paris moulds today. The casts of fossils does not actually contain any parts of the original plant and its internal anatomy.

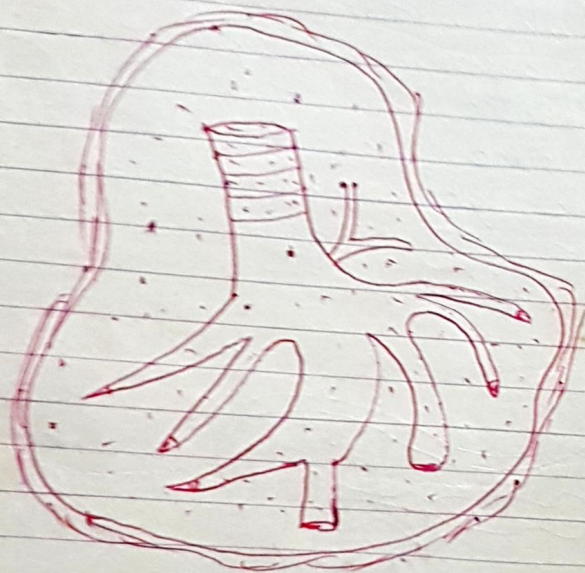


Fig - Cast of Stigmarian (Lepidodendron)

3. Impression (Mould) → The plant or animal parts just after decay on clay have left their impression in mud and sand. Such impression become harder into stone, as for example - leaf prints of Neuropteris, venation of leaf etc. The impression are very close or darker colour than the surface of the stone or below the rocks because it retains some of the organic material. In some well preserved material at the epidermis remains intact, so the stomata are clearly seen.

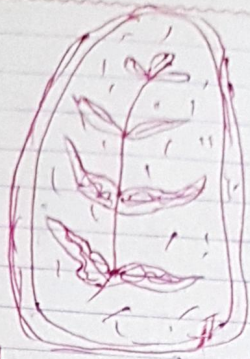


Fig - Impression of Neuropteris leaf

4. Compression → It is one type of impression when the organic remain of the plant part, which is found in the fossils is highly compressed. In a good compression it has possible to swell out the organs by some chemical treatment, so that some details became visible. A good type of compression fossils in the clad nodule of the *Lepidostrobus* species.

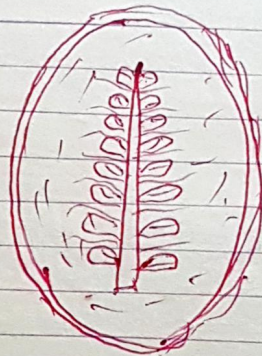


Fig - A Clay nodule showing *Lepidostrobus* cone compression inside

5. Rocks, minerals etc. or Organic origin → Different parts of plant or animal might have connection with any object is considered as a fossil. A stone showing foot print or leaf print is term as fossil. Gums of coniferous trees are found in fossilized form known as Amber, which is of great value in fossilization. Sometimes amber incloses beautiful fossils of flowers or insects. Coal is nothing but a highly compressed fossil. Graphite used in leaf pencils is a fossil because this type of carbon is suppose to be

considered as fossils. With the help of certain minerals, some pseudofossils also formed which resembles plants or animals.

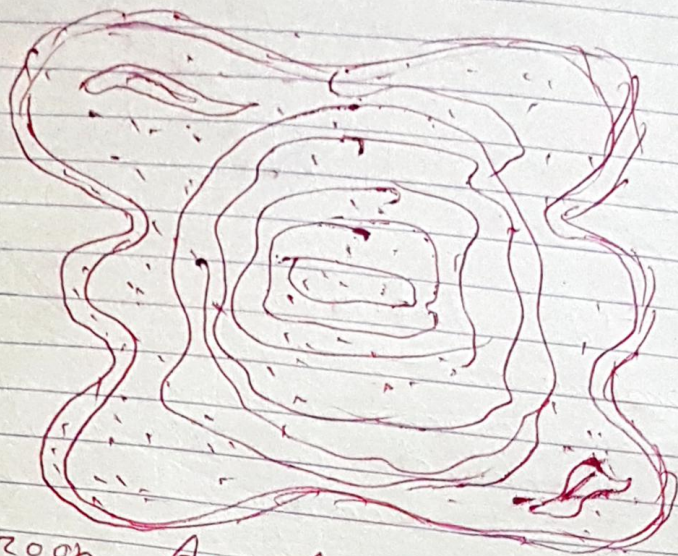


Fig - Cryptozoon An algal lime stone (Organic)

**Uses & Scope** → The study of fossils may furnish the past history of earth with regard to the determination of the age of the rocks and the environmental condition in which the plants and animals might have existed.

Study of fossil plants at the different ages is the most direct evidence of the evolution of plant kingdom. So the evolution and the flora of different ages we can recognize with the help of fossils.

Palaeontology is the study of fossil pollens only. These pollens are found in peats. They are found in stratified layers so their age may be calculated so study of pollen fossil is useful in tracing the history of plant communities. Fossil pollens also used in dating the deposits. A very important use of fossil pollen is that the presence of oil and other minerals bearing is indicated by certain deposits.