

Modes of Fossilization

By

Dr. Purnima Srivastava

(For Students of M.Sc Sem II Elective Geology)

DISCLAIMER: Many figures, charts, tables and other content may have been borrowed from Internet, books and other e-resources for teaching purposes only. No reproduction is allowed as the copyright remains with the original producers of these contents. The author of this lecture presentation would not be responsible for any such copyrite violation.

Modes of Fossilization

A **fossil** is any preserved remain, impression, or trace of any once-living thing from a past geological age.

Examples include bones, shells, exoskeletons

Modes of Fossilization

There are two main types of fossil preservations:

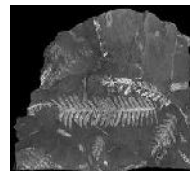
- Preservation with alteration and
- Direct preservation

Most common is fossil preservation with **Alteration**.

In this, the original organic material is partially to fully changed into new material.

There are several types of preservation with **Alteration**:

- **Carbonization**, a chemical reaction where water transforms the organic material of plant or animal to a thin film of carbon. Nitrogen, hydrogen, and oxygen are driven off as gases, leaving an outline of the organism. Organisms often preserved by carbonization include fish, leaves and the woody tissues of plants.



Carbonized Fossil plant

- **Permineralization** or **petrifaction** takes place in porous materials such as bones, plants and shells. The material is buried; later, groundwater percolates through its pore spaces. A solution, commonly supersaturated in either calcium carbonate or silica, precipitates minerals in the spaces.



A cephalopod shell

Recrystallization occurs when a solution or precipitate changes the internal physical structure of a fossil. Recrystallization changes the microstructure of the original minerals; they often change into larger crystals. The composition of the mineral does not change, only the crystal structure changes. For example, many shells originally composed of calcium carbonate in the form of the mineral Aragonite recrystallize into the more stable form of calcium carbonate called Calcite.



Recrystallization



- **Replacement** involves the complete removal of original hard parts by solution and deposition of a new mineral in its place. The Petrified Forest in Arizona is an excellent example of this type of preservation. Here the original organic material (wood) has been wholly replaced by silica.



Fossil wood

What are the modes of fossil preservation for body fossils?

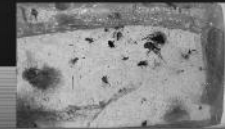
Unaltered

Original Material - original, unaltered material from the living organism
unaltered bone or shell



Encrustations or entombments -

material is trapped inside coating such as amber



When an organism is preserved without any change in morphology and composition, the fossil is known as **Fossil in toto**.

AMBER WITH SMALL SNAKE INCLUSION



What are the modes of fossil preservation for body fossils?

Unaltered

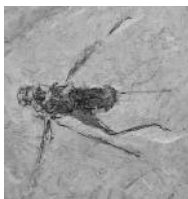
Mummification - quickly dried material

Refrigeration - material is trapped inside ice and tissue is preserved

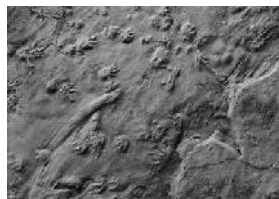


Types of Fossils

Body fossil



Trace fossil



When part of any organism, whether plant or an animal is preserved, it is known as the **Body fossil**

Body fossils



Trace Fossils

- When traces of any biological activity of an organism are preserved, it is known as Trace fossil. They can be resting traces, walking traces, grazing traces, crawling traces etc.

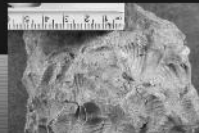


A fossil may be:

- an original skeleton or shell;
- a mold or cast;
- material that has replaced the once living thing;
- traces such as footprints or worm tubes

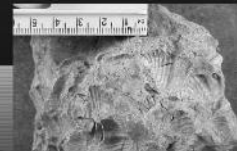


Trace Fossils



More on trace fossils

- Mold - reproduction of the inside or outside surface of a living thing
- Cast - duplicate of the original organism; usually formed by replacement of inside of living thing



Cast & Mold

A mold is always in negative relief, it depicts outer surface features of an object.

A cast is a cavity filling structure which is also known as an internal mold. It always preserves as positive relief.

