TYPES OF FOSSILS

By: Scott Marlowe

Paleontology science essentially studies two principle fossil types:

Body Fossils are preserved remains where an organism's body tissue, or parts thereof, become fossilized in an altered or actual state.

Trace Fossils constitute any evidence of left behind by an organism that is not tissue remains. Examples of trace fossils are animal tracks, trails, burrows borings, impressions, molds, casts, and steinkerns.

Body Fossils include remains like this peccary mandible which includes teeth and bone.

Trace Fossils are evidence of the presence of an organism in its environment like this therapod track

METHOD OF PRESERVATION

An vital observation about any fossil find is the way in which the remains are preserved. The method of preservation indicates what happened to the organism's remains subsequent to death, and the conditions under which the fossil was originally created.

Most remains do not become fossilized after death. All life begins to decay after it dies and will decompose over time. Animal remains are often subjected to predation.

To become fossilized, tissue has to be subjected to particular environmental conditions that are conducive to preservation.

The more important circumstances are rapid burial and the existence of hard part in the remains. If an organism is not quickly buried, microbes and other animals will devour the remains and the material will be lost to the fossil record. Even if remains become fossilized, erosional processes can destroy them.

Unless an organism happens to die in anaerobic environment, its soft parts will not be preserved. For this reason, fossilization of soft tissue is highly unusual.

BODY FOSSILS

Unaltered Preservation refers to fossils that have undergone little or no change in structure and composition. A fossil of an organism that lived recently is more likely to be unaltered than a more aged one.

Original Skeletal Material refers to the hard tissues that are preserved as the original material. This includes many invertebrate molluska that have shells composed of calcium carbonate, silica, or chitin and vertebrate species with bones of calcium phosphate.

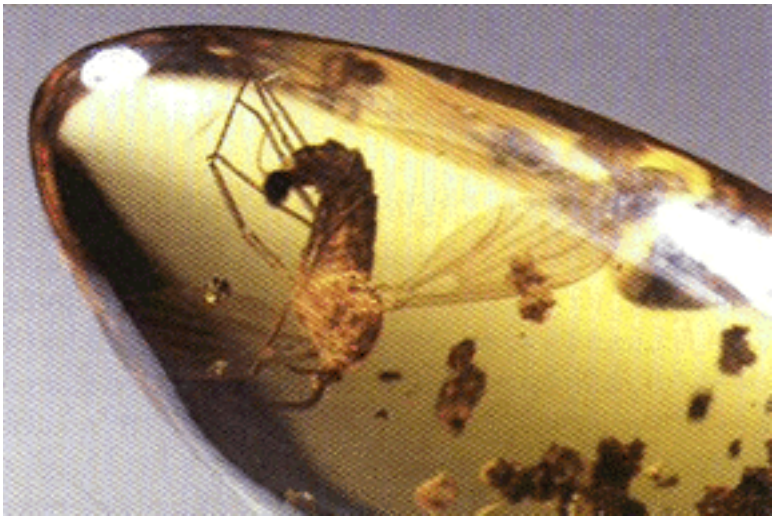
Encrustations occur in caves where ground water with a high concentration of dissolved minerals seeps or drips constantly. As the water evaporates, the minerals are remain. These chemicals then form a thin coating on the interior surface of the cave and remains that lie in it thereby preserving organisms that die there.

Tar Impregnation is excellent for fossilization. The La Brea tar pits of California yield particularly fine collections of vertebrate bones, wood, and so forth. Smaller tar pits frequently yield perfectly preserved insects their larvae.

In *Amber Entombment* coniferous trees, like spruce, pine and fir, that have a sticky resinous pitch that seeps from damage to the tree's bark. Many small insects and other small organisms occasionally become trapped in the resin. After burial the sap hardens into amber. Particular areas of the Baltic Sea coastline and a few islands in the West Indies are well known for insects preserved in amber.

Refrigeration occurred primarily during the Pleistocene, when ice sheets covered much of the Northern Hemisphere. Some animals fell into crevasses or became trapped in permanently frozen soil. Although infrequent, some have been discovered perfectly preserved in this manner.

Mummification occurs in very arid environments. The animal's remains dehydrate or desiccate quickly and become preserved -- usually including its soft tissues.



Unaltered preservation (like insects or plant parts trapped in amber, a hardened form of tree sap)

Altered Remains

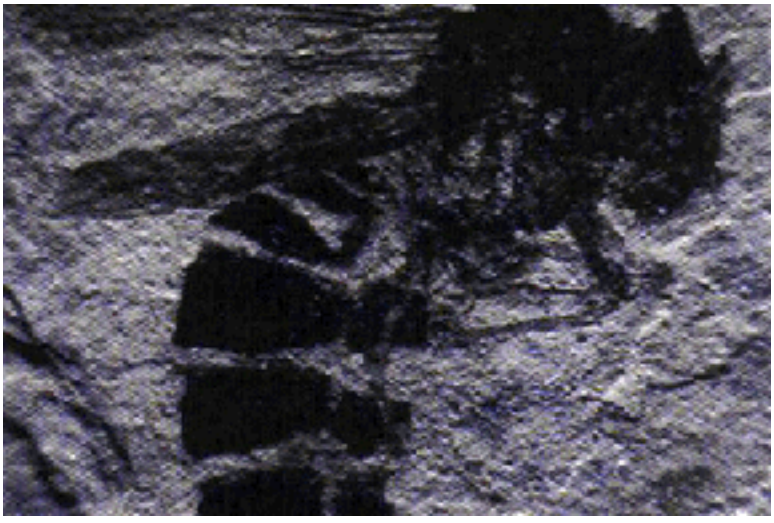
As sediment layers become compressed by the weight of overlying material, they slowly undergo the process of lithification. It is common for cementing materials in the groundwater like carbonate, silica, and iron oxides, to bond the sediment together and harden. Often the groundwater, and the minerals contained in it, impacts the fossilization process.

In *Permineralization*, bones, teeth, shells, and plant stems have porous internal structures. These pores can become filled with mineral deposits in the soil and groundwater. In the process of permineralization, the actual chemical composition of the original hard parts of the organism may not change but it generally will be altered in some way.

Permineralization or petrification in which rock-like minerals seep in slowly and replace the original organic tissues with silica, calcite or pyrite, forming a rock-like fossil - can preserve hard and soft parts - most bone and wood fossils are permineralized.

Carbonization occurs when an organism becomes pressed into sediment and its volatile, liquid or gaseous contents are forced out leaving a thin film of carbon. When other organic material remains, as when plants are entombed, coal is formed. Thus, coal mines are typically a good source for carbonized fossils.

In *Recrystallization* the hard tissues are converted, usually in a solid state, into a new mineral or to coarser crystals of than those of the original mineral.



Carbonization or coalification in which only the carbon remains in the specimen - other elements, like hydrogen, oxygen, and nitrogen are removed.

Dissolution or *Replacement* refers to fossils formed when groundwater, particularly if it is acidic, acts upon the remains to dissolve the hard and soft tissue structures of an organism trapped in sediments. The hard tissues are often simultaneously replaced by minerals contained in the water -- molecule by molecule. Petrified wood is a classic example of this type of fossilization where even the internal microscopic cellular structure of the plant is replaced by silica in the process of fossilization.

Replacement where an organism's hard tissues dissolve and are replaced by other more stable minerals, like calcite, silica, pyrite, or iron.

Authingenic Preservation occurs when a mold or form of an organism is made after it decomposes in sediment and is replaced by material that hardens into casting of the original animal's likeness. Animals with exoskeletons or shells are often fossilized in this way. Fossils of animals with shells, particularly molluska, are sometimes called *Steinkerns*.

Authigenic preservation molds and casts of organism itself occur where the animal becomes destroyed or dissolved leaving a replica of the creature incased in matrix.

TRACE FOSSILS

As in Authingenic Preservation, a *Mold* refers to any reproduction of an organism's past presence in the environment that has been preserved by leaving an impression, but not necessarily filled with hardened material such as an animal's track or footprint. Generally speaking, a *Cast* is any copy of the original form when the "positive" item is removed or dissolved away and the remaining "negative" impression becomes filled with sediment or mineral material that subsequently hardens into a replica of the original.

Compression refers to fossils that form as a result of pressure from sediments that cover an organism or its trace fossils of it. Compression usually is used to describe the casts and/or molds of plant leaves.

Borings and Burrows from when worms, clams and other burrowing invertebrates "drill" into rocks, wood, shells, and all types of sediment. These cavities are frequently preserved, especially in fine-grained rocks and may also appear in the bones of vertebrate animals.

Coprolite is the fossilized excrement from a animal and is sometimes very useful in providing knowledge about specific diet of the animal concerned.

Gastroliths are smooth, polished stones that are typically found in the abdominal cavities of skeletal fossils of dinosaurs and large mammals. These "grinding stones" are thought to have been essential for the animal's digestion of plant material by grinding up vegetable matter in their stomach.

Gnawings are the result of rodent, marsupial and other animals that chewed on bones or trees.

These Gastroliths were found in the abdonimal area of a dinosaur fossil and may have helped the animal digest plant material. Similar small gastroliths are often found associated with certain fish and mammal species.

Coprolite, like this preserved dung from an alligator, can be useful in determining the type of foods that the animal ingested for nurishment or may reveal digestive disorders and allomentary parasites.