

Original preservation Fossils with **original preservation** are the remains of plants and animals that have been altered very little since the organisms' deaths. Such fossils are uncommon because their preservation requires extraordinary circumstances, such as either freezing, arid, or oxygen-free environments. For example, soft parts of mammoths are preserved in the sticky ooze of California's La Brea Tar Pit. Original woody parts of plants are embedded in the permafrost of 10,000-year-old Alaskan bogs. Tree sap from prehistoric trees sometimes hardens into amber that contains insects, as illustrated in **Figure 21.21**. Soft parts are also preserved when plants or animals are dried and their remains are mummified.

Original preservation fossils can be surprisingly old. For example, in 2005, a scientist from North Carolina discovered soft tissue in a 70-million-year-old dinosaur bone excavated in Montana. Scientists have since found preserved tissue in other dinosaur bones.

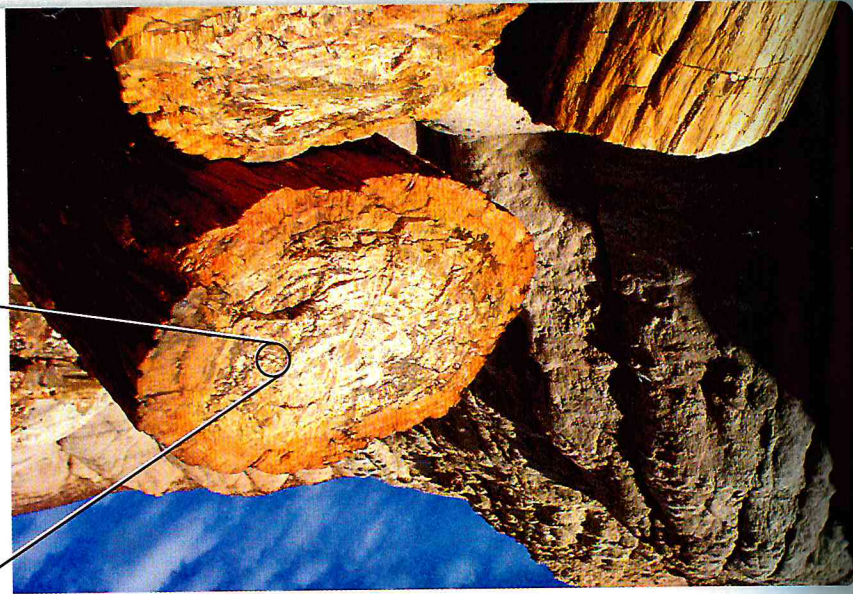
Reading Check Explain why fossils with original preservation are rare.

Altered hard parts Under most circumstances, the soft organic material of plants and animals decays quickly. However,

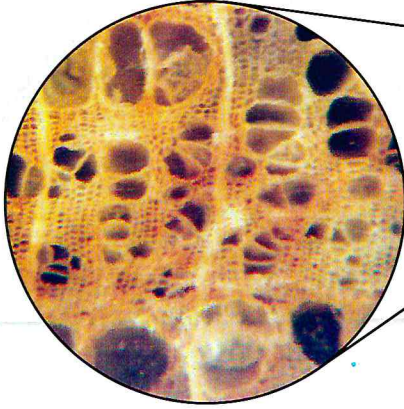
over time, the remaining hard parts, such as shells, bones, or cell walls, can become fossils with **altered hard parts**. These fossils are the most common type of fossil, and can form from two processes.

Mineral replacement In the process of **mineral replacement**,

the pore spaces of an organism's buried hard parts are filled in with minerals from groundwater. The groundwater comes in contact with the hard part and gradually replaces the hard part's original mineral material with a different mineral. A shell's calcite (CaCO_3), for example, might be replaced by silica (SiO_2). Mineral replacement can occur in trees that are buried by volcanic ash. Over time, minerals dissolved from the ash solidify into microscopic spaces within the wood. The result is a fossil called petrified wood, shown in **Figure 21.22**.



■ **Figure 21.22** Petrified wood is an example of mineral replacement in fossils. The blowout shows that tree rings and cell walls are still evident at $100\times$ magnification with a light microscope. **Describe** from where the minerals in the petrified wood came.



■ **Figure 21.21** This insect was trapped in tree sap millions of years ago.

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