

Objectives

After reading this lesson, you should be able to

- ◆ define geologic time.
- ◆ explain what a fossil is.
- ◆ describe three ways fossils form.

Geologic time

All the time that has passed since the earth formed

Does a year seem like a long time to you? Your idea of time depends on what you compare it to. Compared to events in your life, a year probably is a long time. Compared to the history of most nations, a year is not very long at all. Scientists who study the earth describe a long time in terms of millions or billions of years. For example, the carving of the Grand Canyon took about 6 million years. Compared to that amount of time, a year is not even noticeable.

Geologic Time

Most events in earth science are compared to **geologic time**—all the time that has passed since the earth formed. Scientists estimate that the earth is about 4.6 billion years old. Compared to this amount of time, even the Grand Canyon is fairly young.

When an event, such as a hurricane, happens today, it is recorded. Newspaper reports, videotapes, and photographs record the event. No such records exist for most of the earth's events. Yet much has happened in the earth's long history. Mountains have built up, continents have moved, living things have come and gone. These events left records in the rock of the earth's crust. As you will see, scientists study rock layers to learn what happened in the past and the order in which events took place.



The Colorado River has carved the Grand Canyon over millions of years.

Fossil

Trace or remains of an organism preserved in the earth's crust

Petrification

Replacement of the original parts of a buried organism with minerals

Fossils are evidence that living things on the earth have changed over time. Fossils also show that the earth's climates haven't always been the same.

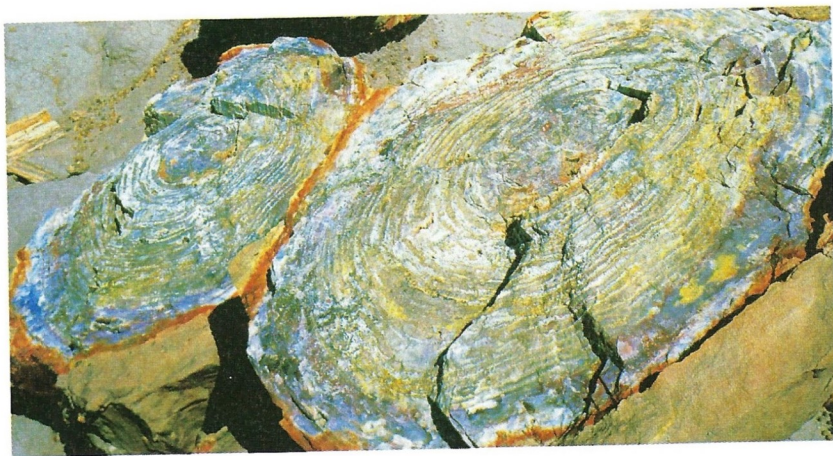
Fossils

Among the most important records of the earth's history are **fossils**. Fossils, like the one shown on page 332, are the traces or remains of organisms preserved in the earth's crust. Organisms are living things and include plants and animals. Fossils are evidence that certain kinds of life existed. Other living things may have been present on the earth in the past. However, unless these living things left fossils, scientists have no evidence of their existence.

It's not easy to become a fossil. When an organism dies, its soft parts usually decay. They might also be eaten by other creatures. The parts most likely to become fossils are the hard parts, such as wood, teeth, bones, and shells. Usually, these parts must be buried quickly in some way in order to become fossils. Most organisms that become fossils are buried by sediment on the ocean floor. Burial might also occur during sandstorms, volcanic eruptions, floods, or avalanches.

Types of Fossils

Most fossils preserve the shape of the organism but not the actual body matter. For example, some fossils form when minerals replace the original parts of a buried organism. This process is called **petrification**. The photo shows petrified wood. Over thousands of years, the wood was dissolved by groundwater and replaced by the minerals in the water.



What details can you see preserved in this petrified wood?

Mold

Type of fossil that forms when the shape of a plant or an animal is left in a rock

Cast

Type of fossil that forms when minerals fill a mold; a model of an organism

Another type of fossil forms when an organism leaves an imprint behind. For example, a plant or an animal may become buried in sediment that later forms rock. Eventually, the organism decays or dissolves. The space left in the rock, called a **mold**, has the shape of the plant or animal. If minerals fill the mold, a **cast** forms. The cast becomes a model of the original plant or animal. In the photo below, find both a mold and a cast of a trilobite. This sea animal lived 500 million years ago.



Many buried trilobites created the molds and casts in this rock.



Fossils, such as this amber, offer a glimpse of life from the past.

Sometimes, the actual body matter of an organism is preserved as a fossil. For example, remains of woolly mammoths, ancient ancestors of elephants, have been found preserved in ice and frozen soil. The remains of saber-toothed tigers have been discovered trapped in petroleum deposits called tar pits. The insects in the photo on the left were trapped in tree sap. The sap hardened into a material called amber, preserving the actual body of each insect.

The Rock Record

Directions Find the lettered phrase that best completes each sentence. Write the letter of the correct phrase on the line.

- | | |
|--|---|
| _____ 1. To find out about the earth's past, scientists ____. | A certain organisms once existed |
| _____ 2. Because of fossils, we know that ____. | B space left in a rock |
| _____ 3. Organisms that are buried quickly after death ____. | C study rock layers and fossils |
| _____ 4. When animals become trapped in tree sap, their ____. | D can become fossils |
| _____ 5. Hard ____ do not decay easily and may become fossils. | E a cast forms |
| _____ 6. All of the time since the earth's formation is ____. | F geologic time |
| _____ 7. Petrification occurs when minerals replace ____. | G a buried organism |
| _____ 8. A fossil is the remains of an organism ____. | H preserved in the earth's crust |
| _____ 9. A mold is the ____ where an organism was buried. | I teeth, bones, and shells |
| _____ 10. If minerals fill a mold, ____. | J actual bodies can be preserved |

Directions Match each fossil description with one of the three terms below. Write *P*, *I*, or *T* on the line.

P petrification**I** imprint (mold or cast)**T** trapped and preserved

- _____ 11. A mosquito is caught in amber.
- _____ 12. A trilobite decays, leaving an imprint.
- _____ 13. A saber-toothed tiger falls in a tar pit.
- _____ 14. The wood in a tree branch is replaced by minerals.
- _____ 15. Minerals fill the mold of a seashell.
- _____ 16. A log turns into minerals.
- _____ 17. A leaf decays and leaves its shape in the sediment.
- _____ 18. A seed is covered with sap.
- _____ 19. A woolly mammoth freezes in a snowstorm.
- _____ 20. An imprint of fish bones is seen in a rock.

