

What Is This?



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Solid as a Rock

🔊 You've seen rocks before. After all, there are lots of rocks on Earth. But do you really know what a rock is? A **rock** is a naturally formed solid made of one or more minerals.

🔊 A **mineral** is a solid formed in nature. Minerals are the building blocks of rocks. Minerals and rocks are not alive.

🔊 There are many kinds of minerals.

When you put salt on your food, you are using a mineral. When you use a pencil, the part you write with is a mineral.

Have you seen a diamond ring?

Diamonds are minerals. Many minerals are made into jewelry.

🔊 Minerals such as rubies, diamonds, and sapphires don't naturally look like this. These have been cut and polished into gems.



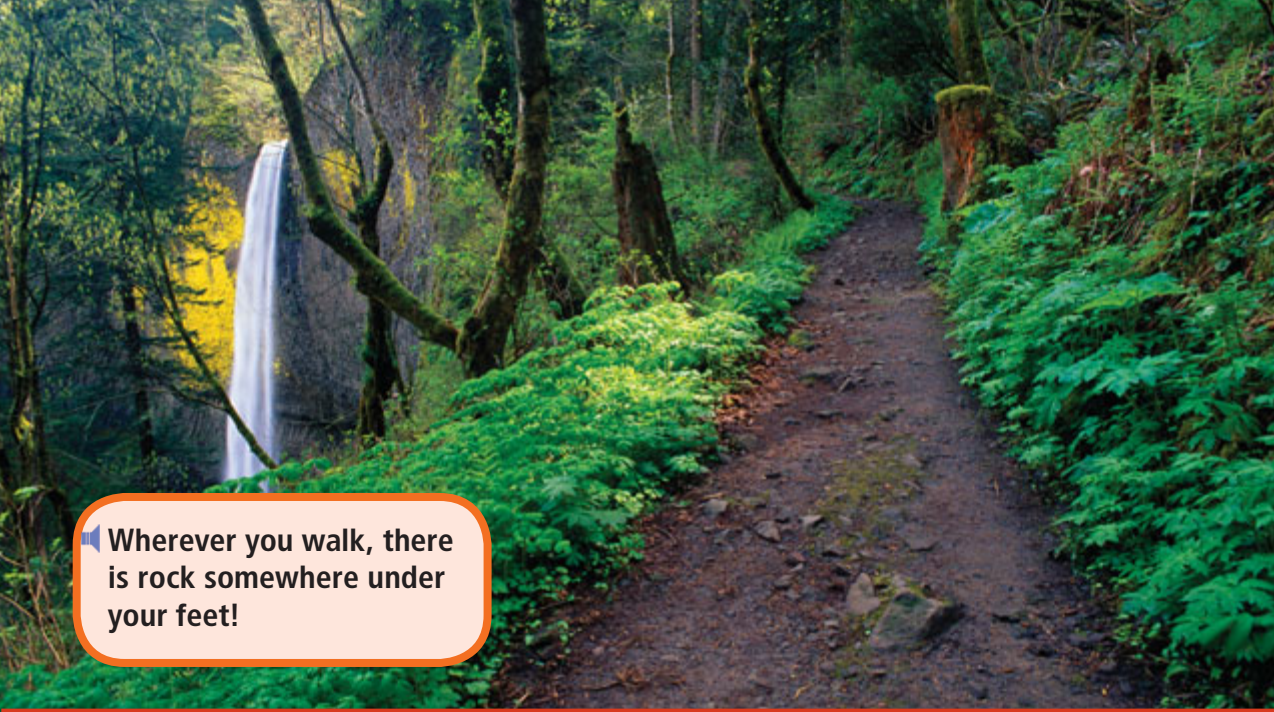
🔊 ruby



🔊 sapphire



🔊 diamond



Wherever you walk, there is rock somewhere under your feet!

Earth is made mostly of rock. There are three main layers of Earth. The outside layer is the crust. The crust is the layer we live on.

The layer beneath the crust is the mantle. It is so hot that the rock is soft.

The layer beneath the mantle is the core. The core is the center of Earth. It has two parts. The inner core is hard. The outer core is liquid rock that has been melted by the great heat.

Fast Fact

Out of this world! The largest diamond is the heart of a burned-out star called BPM 37093. It is about 482,800 trillion kilometers (300 trillion miles) away from Earth.



MAIN IDEA AND DETAILS What is a mineral? Name some ways minerals are used.

Igneous Rock

🔊 Rocks can look many different ways, but there are only three kinds of rocks. They are grouped by the way they are made.

🔊 **Igneous rock** is formed when melted rock cools and hardens. How does a rock melt?

🔊 Remember that the mantle is very hot. Rocks in the mantle can get so hot that they melt.

🔊 When parts of the mantle cool, igneous rock is formed. Granite is igneous rock that formed inside Earth. The large grains in it tell you that it cooled slowly.

🔊 Melted rock explodes from this volcano. When it cools and hardens, it will form igneous rock.



■ Not all igneous rock forms inside Earth. Igneous rock can also form on the surface of Earth. For this to happen, melted rock must reach Earth's surface.

■ How does melted rock get to Earth's surface?
When a volcano erupts, melted rock pours out. When that melted rock cools and hardens, it forms igneous rock.

■ Igneous rock that forms outside the Earth cools fast. It looks very smooth, almost like glass. When you look at it, you will not see many grains.



COMPARE AND CONTRAST

How is igneous rock that forms on Earth's surface different from igneous rock that forms inside Earth?

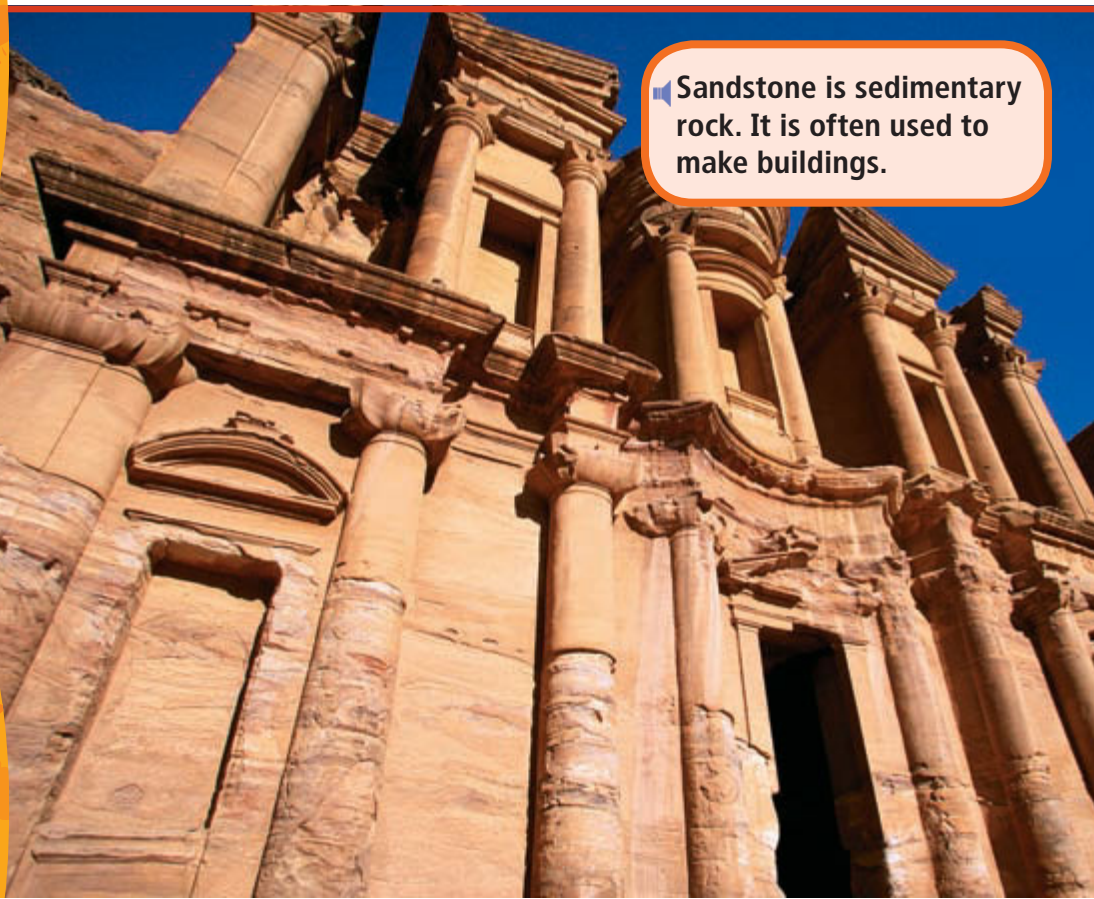


■ This igneous rock is called obsidian. It forms on Earth's surface.

Sedimentary Rock

🔊 The second kind of rock is called sedimentary rock. **Sedimentary rock** forms from sediment that has settled into layers and has been squeezed until it hardened into rock.

🔊 A river carries sediment—little pieces of rock, sand, and soil. When the river slows down, it drops the little pieces. They form a layer of sediment. The river keeps adding new layers, which press down on the layers below. The layers get squeezed together. Years and years go by, and the layers keep getting squeezed together. Finally, after thousands of years, sedimentary rock is formed.



🔊 Sandstone is sedimentary rock. It is often used to make buildings.

Fast Fact

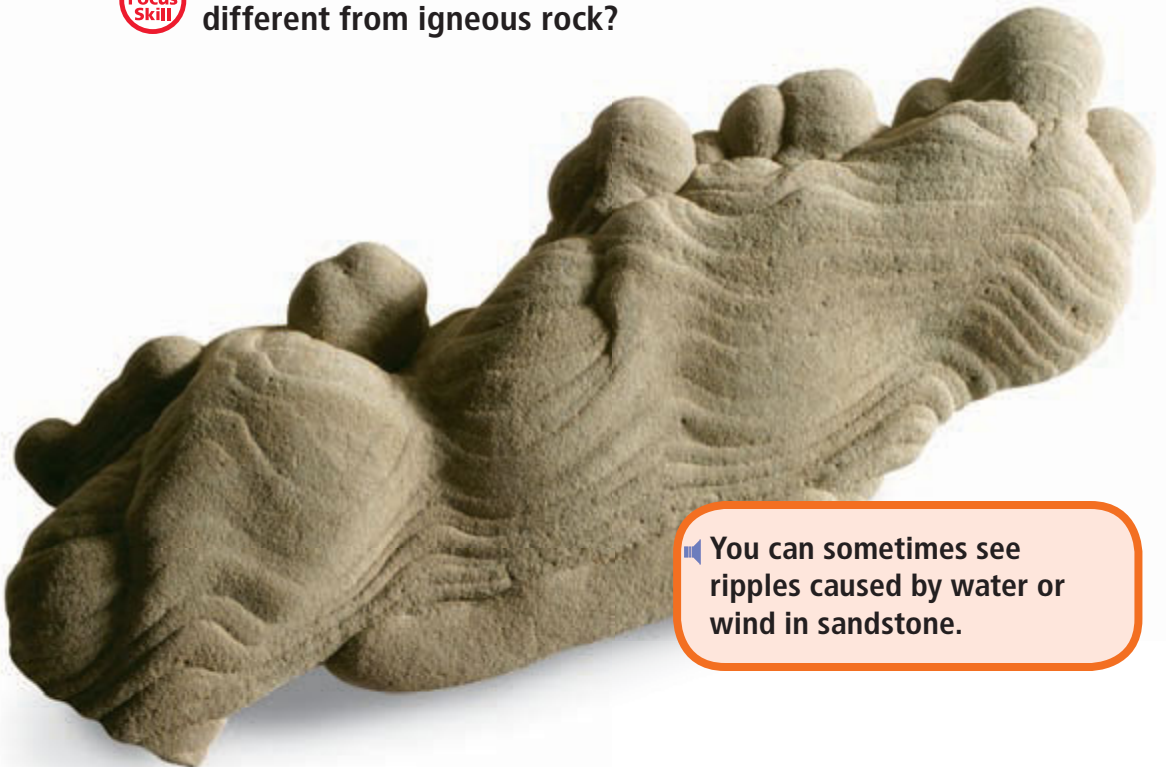
- ▶ A muddy river carries sand, soil, and pieces of rock. These materials settle to the bottom. Over time, they become sedimentary rock.

▶ Sandstone is sedimentary rock that is made from small grains of sand. That is how it got its name. Most of the grains in sandstone are the same size. If you touch sandstone, you will feel the grains. In fact, sandstone feels a little like sandpaper.

▶ Conglomerate rock is sedimentary rock that is made from pebbles and pieces of rock. If you look at a conglomerate rock, you will see the different materials that formed it.



COMPARE AND CONTRAST How is sedimentary rock different from igneous rock?



- ▶ You can sometimes see ripples caused by water or wind in sandstone.

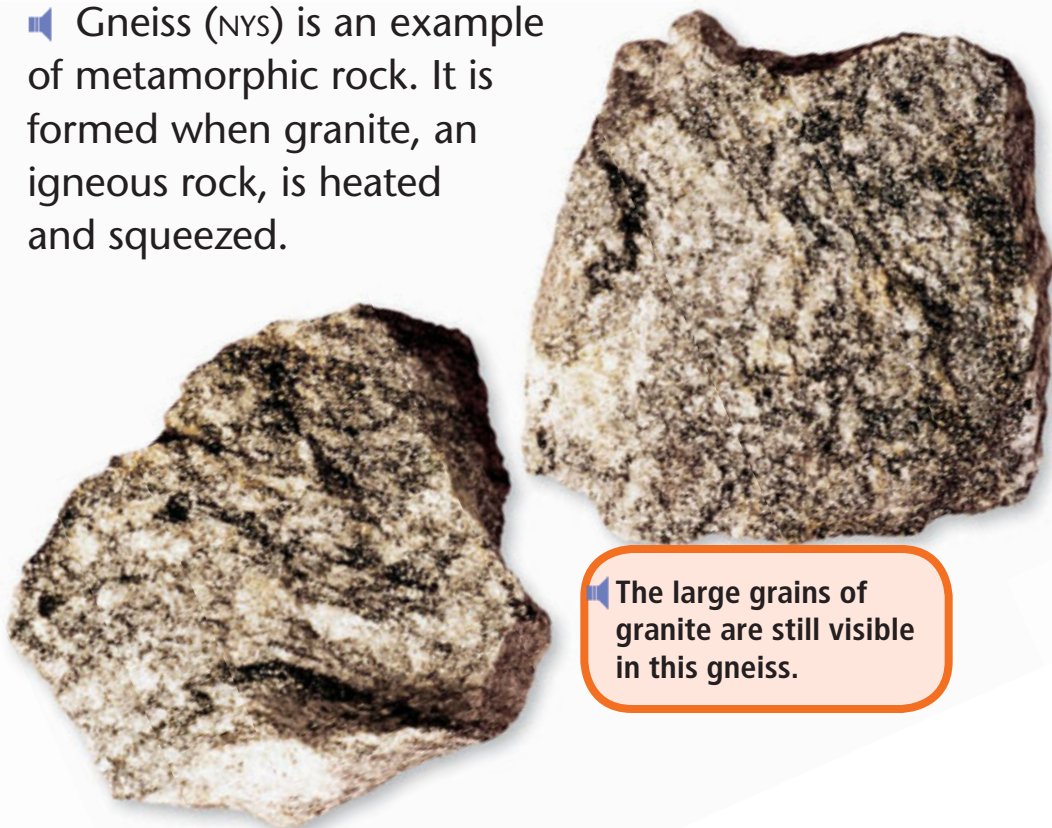
Metamorphic Rock

■ The third kind of rock is metamorphic rock.

Metamorphic rock is rock that has been changed by heat and pressure. Sometimes sedimentary or igneous rock gets heated and squeezed. When this happens, it becomes metamorphic rock.

■ A river carries a sedimentary rock. The rock drops to the bottom of the river and gets covered by layers of rock, sand, and soil. These layers press down on the rock and push it below the surface of Earth. It gets heated and squeezed until it is not a sedimentary rock any more. Now it is a metamorphic rock.

■ Gneiss (NYS) is an example of metamorphic rock. It is formed when granite, an igneous rock, is heated and squeezed.



■ The large grains of granite are still visible in this gneiss.



▶ The Taj Mahal, in India, is made entirely of white marble. Visitors say the marble changes color to match the sky.

▶ Any sedimentary or igneous rock can become metamorphic rock. The old rock doesn't disappear. It just changes into a different kind of rock.

▶ Marble is a metamorphic rock formed from limestone, a sedimentary rock. When limestone gets buried inside Earth, it is heated and squeezed. As time passes, the limestone is changed to a different kind of rock. It becomes marble.

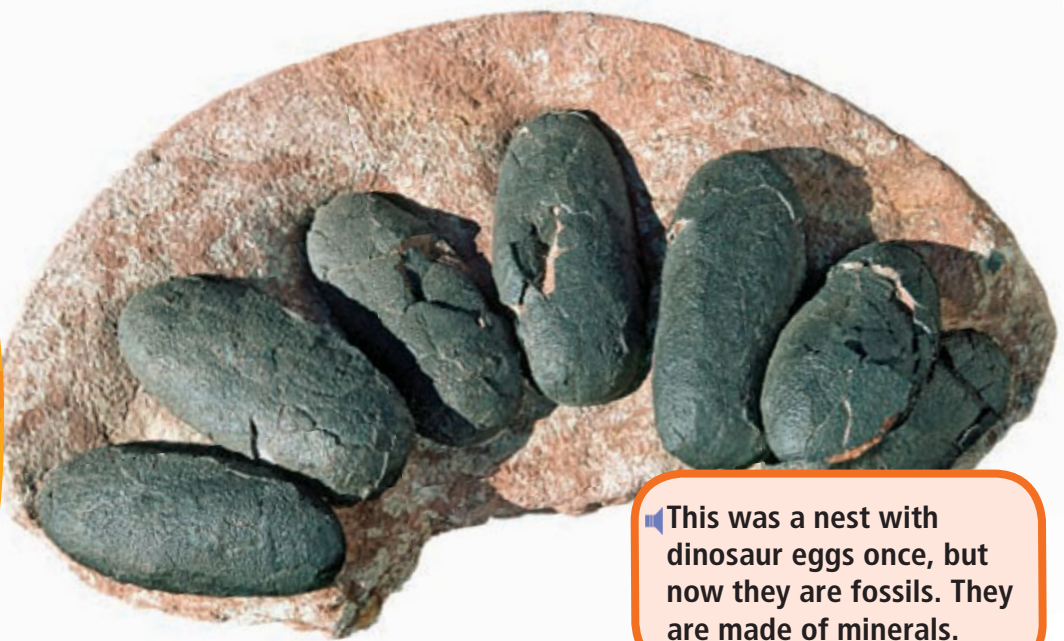
▶ Marble is used to make beautiful buildings. Artists also use it to make sculptures.



COMPARE AND CONTRAST Compare and contrast the ways in which sedimentary rock and metamorphic rock are formed.

Fossils

Have you ever seen a fossil? A **fossil** is a trace of the remains of an organism that died a long time ago. There are different kinds of fossils. Some look like the body parts animals had when they were alive. Some are just marks animals left behind.



This was a nest with dinosaur eggs once, but now they are fossils. They are made of minerals.

Maybe you have seen dinosaur fossils in a museum. They look like bones, but they are not. Over time, minerals replaced the bones.

A footprint can become a fossil. When dinosaurs walked, they left their footprints in the mud. The mud hardened into rock. This kind of fossil is called an imprint. Feathers and leaves can also leave imprints.



These brachiopod fossils were found in Michigan. Some are molds, and some are casts.

Another kind of fossil is a mold. A mold is the shape of an organism that lived a long time ago. The organism was pressed into rock as the rock was being formed. Then the organism dissolved, leaving a hole shaped exactly like it.

A cast fossil forms when a mold gets filled with mud or minerals. The materials in the mold harden to form the same shape of the organism.



MAIN IDEA AND DETAILS What are fossils? Name some kinds of fossils.

Secrets Revealed!

🔊 Fossils can't keep secrets. In fact, they tell us a lot.

🔊 It's hard to imagine what Earth looked like millions of years ago. Fossils help. Plant fossils can tell us what kinds of plants grew in a place. Animal fossils tell us what kinds of animals lived there.

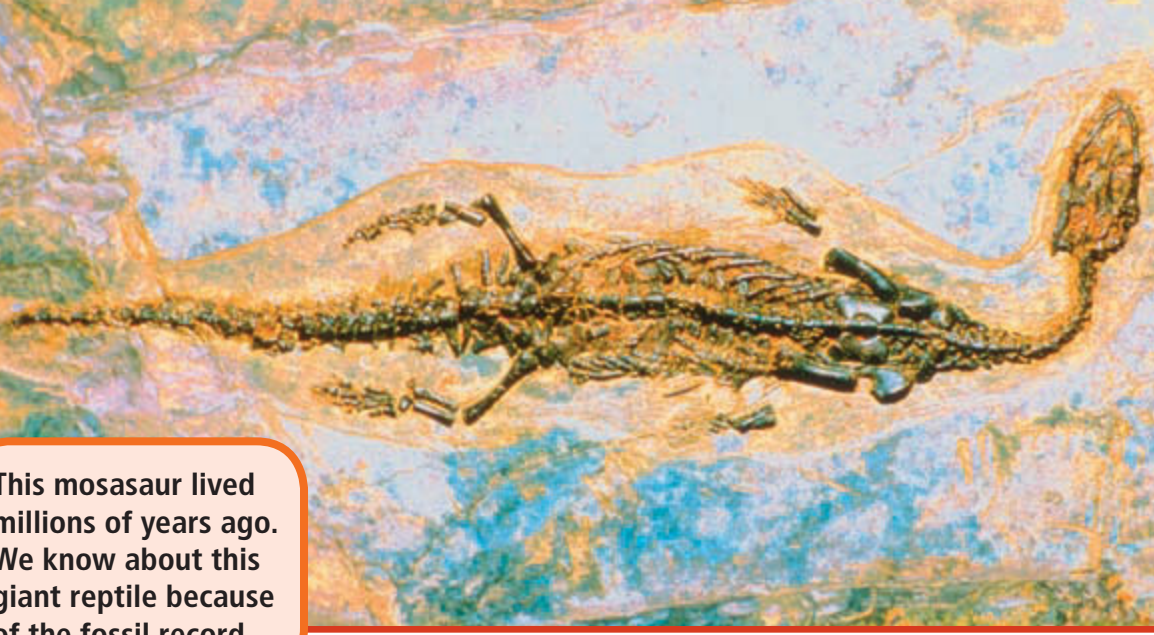
🔊 Fossils help us understand how the world has changed. Suppose you found a fossil of a shark's tooth—in the middle of the woods. You would know that millions of years ago, that area was a sea!

Fast Fact

🔊 In 1974, scientists found a human-like fossil in Africa. They named it Lucy. When they examined the fossil, they realized that Lucy had lived three million years ago!

🔊 This fern fossil was found in a coal mine.





■ This mosasaur lived millions of years ago. We know about this giant reptile because of the fossil record.

■ Fossils teach us about plants and animals, too. No human being has ever seen a dinosaur. We have learned about them from fossils. Fossil bones can tell scientists how big different kinds of dinosaurs were and how they moved. Fossil teeth can tell scientists what different dinosaurs ate.

■ Fossils also teach us when different organisms lived. Suppose scientists find a fossil of a bird. They keep digging. They find a fossil of a fish. The fish is buried deeper than the bird. This tells scientists that the fish lived before the bird did.

■ Many animals and plants that lived a long time ago no longer exist. Without fossils, we would not know about them.



MAIN IDEA AND DETAILS Name one way we learn from fossils.

Finding Fossils

Where do scientists look for fossils? They look in places with a lot of sedimentary rocks. The remains of living things are sometimes found in the layers that form sedimentary rock.

Not very many fossils form in igneous and metamorphic rock. Can you guess why? The pressure and heat needed to form these rocks destroy plant and animal parts before they can become fossils.

There are more animal fossils than plant fossils. Plants are softer than animals. They are more easily destroyed when rocks form around them.



CAUSE AND EFFECT Why do we find few fossils in igneous and metamorphic rock?



This sea animal was an ammonite. Ammonites had hard shells. Scientists have found many ammonite fossils.

Summary







There are three kinds of rock. Igneous rock forms when melted rock cools and hardens. Sedimentary rock forms when layers of sediment press down on one another. Metamorphic rock is formed from other rock. An existing rock that is pressed into Earth's mantle and heated changes into a metamorphic rock.

When an organism dies, its remains can become a fossil. Minerals replace the bones. Even a footprint in mud can form a fossil. This kind of fossil is called an imprint. Other fossils are molds and casts. Fossils help us understand what Earth was like millions of years ago.






Don't judge a rock by its cover! This rock is gray on the outside but colorful inside.



Glossary

-  **fossil** (FAHS•uhl) A trace of the remains of an organism that died a long time ago (10, 11, 12, 13, 14, 15)
-  **igneous rock** (IG•nee•uhs RAHK) Rock that formed when melted rock cooled and hardened (4, 5, 7, 8, 9, 14, 15)
-  **metamorphic rock** (met•uh•MAWR•fik RAHK) Rock that has been changed by heat and pressure (8, 9, 14, 15)
-  **mineral** (MIN•er•uhl) A solid formed in nature (2, 7, 10, 11, 15)
-  **rock** (RAHK) A naturally formed solid made of one or more minerals (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15)
-  **sedimentary rock** (sed•uh•MEN•ter•ee RAHK) Rock made when sediment settled into layers and got squeezed until it hardened into rock (6, 7, 8, 9, 14, 15)

Think and Write

-  **1.** How does a fossil tell us about the past?
-  **2. MAIN IDEA AND DETAILS** Can a sedimentary rock become a metamorphic rock? Explain.
-  **3. COMPARE AND CONTRAST** Compare and contrast a fossil of an animal's bone to a fossil of an animal's footprint.
-   **4. Narrative Writing** Write a journal entry about a day when you found a fossil of a fish where there is no water now.

Hands-On Activity

Find a picture of a fossil of an animal or plant you have never seen. Write a description of how you think the plant or animal looked. Draw a picture to go with your description.

School-Home Connection

Go on a walk with a family member and look for rocks. Tell your family member what you know about different kinds of rocks.

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