



LEARN ABOUT

Types of Rocks

FIND OUT

- how rocks form
- how people use rocks

VOCABULARY

rock

igneous rock

sedimentary rock

metamorphic rock

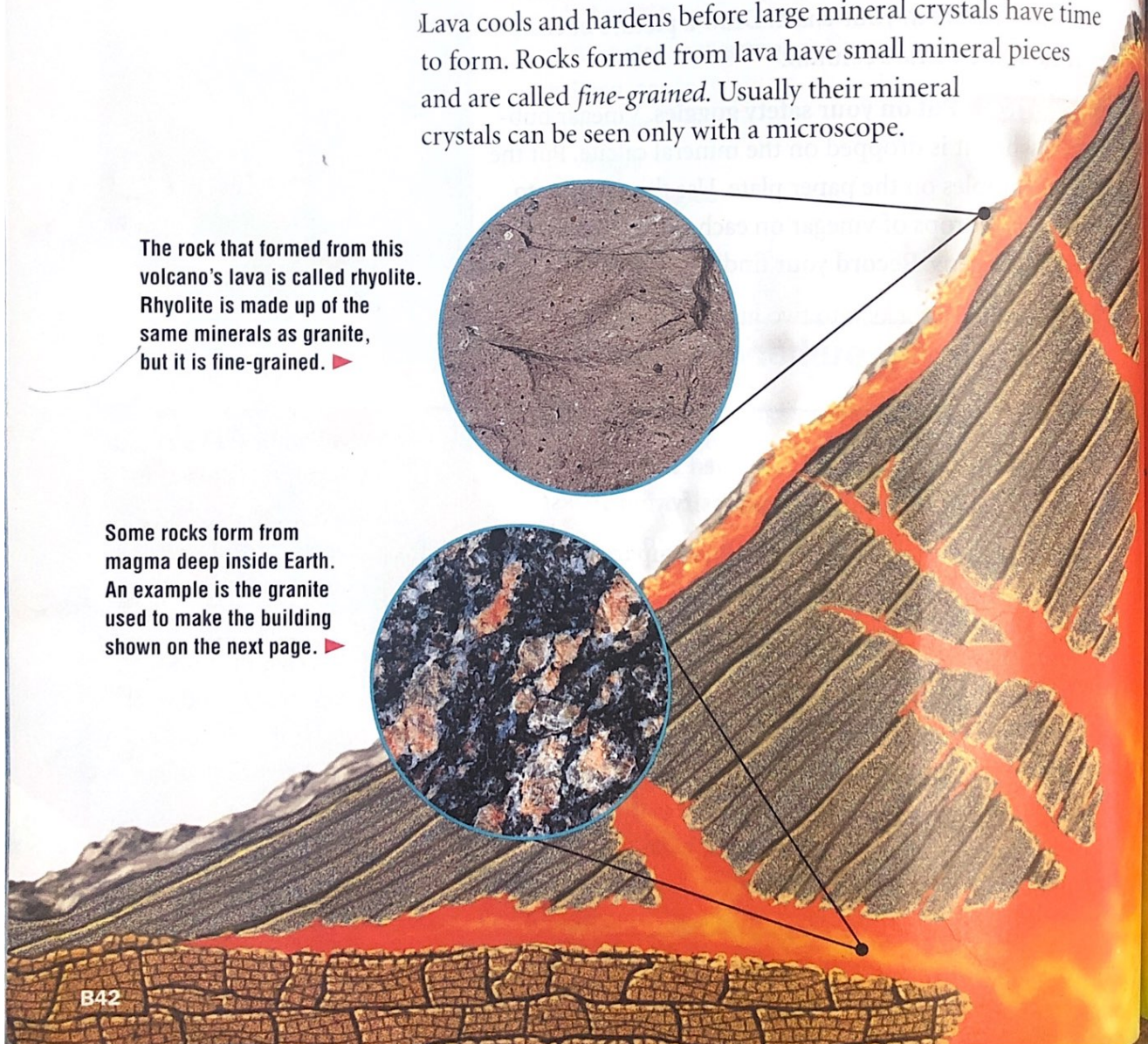
Igneous Rocks

Earth is made mostly of rocks. A **rock** is material made up of one or more minerals. But unlike minerals, rocks are not crystals. Like minerals, some rocks form at or near Earth's surface. Others form deep in the crust or in Earth's middle layer, the mantle. There are many different kinds of rocks. But they all can be classified into three groups based on how they formed.

Rocks that form when melted rock hardens are called **igneous** (IG•nee•uhs) **rocks**. In Chapter 1 you learned that lava is melted rock that reaches Earth's surface through a volcano. Lava cools and hardens before large mineral crystals have time to form. Rocks formed from lava have small mineral pieces and are called *fine-grained*. Usually their mineral crystals can be seen only with a microscope.

The rock that formed from this volcano's lava is called rhyolite. Rhyolite is made up of the same minerals as granite, but it is fine-grained. ►

Some rocks form from magma deep inside Earth. An example is the granite used to make the building shown on the next page. ►





▲ Basalt



▲ Gabbro



▲ Pumice



▲ Obsidian

Melted rock that stays below Earth's surface is called magma (MAG•muh). Magma cools and hardens slowly. Its minerals can form large grains that are easy to see. Igneous rocks formed from slowly cooling magma are called *coarse-grained*.

Basalt (buh•SALT) is the most common igneous rock that forms from lava at Earth's surface. Basalt is a dark, greenish-black rock made up mostly of the minerals feldspar (FELD•spar) and pyroxene (py•RAHKS•een). Gabbro (GAB•roh) is an igneous rock that is also made up mostly of these two minerals. But gabbro has larger mineral grains

than basalt. That's because gabbro forms inside Earth instead of at Earth's surface.

Pumice (PUHM•ihs) is another igneous rock. The tiny holes in pumice are caused by gases escaping from the lava as it cools. Pumice feels rough and scratchy. Obsidian (uhb•SID•ee•uhn) also forms from lava. The lava cools so quickly that the rock looks like black glass. When obsidian breaks, sharp edges form.

Granite is a common igneous rock that forms when magma cools slowly beneath Earth's surface. Most granite is made up of large grains of feldspar, quartz, and mica (MY•kuh). These mineral grains are joined together tightly, making granite a strong rock that lasts for a long time.

✓ What are igneous rocks?

◀ Granite is an igneous rock often used for building. Brookings Hall at Washington University in St. Louis is made of unpolished pink granite blocks.



Sedimentary Rocks

Rocks are broken down into smaller pieces by weathering. Weathering is caused by many things. At Earth's surface the actions of wind, water, ice, and plant roots cause weathering.

After rocks are weathered into small pieces, blowing winds, flowing water, gravity, or slow-moving glaciers often move the pieces to other places. The movement of weathered rock pieces from one place to another is erosion.

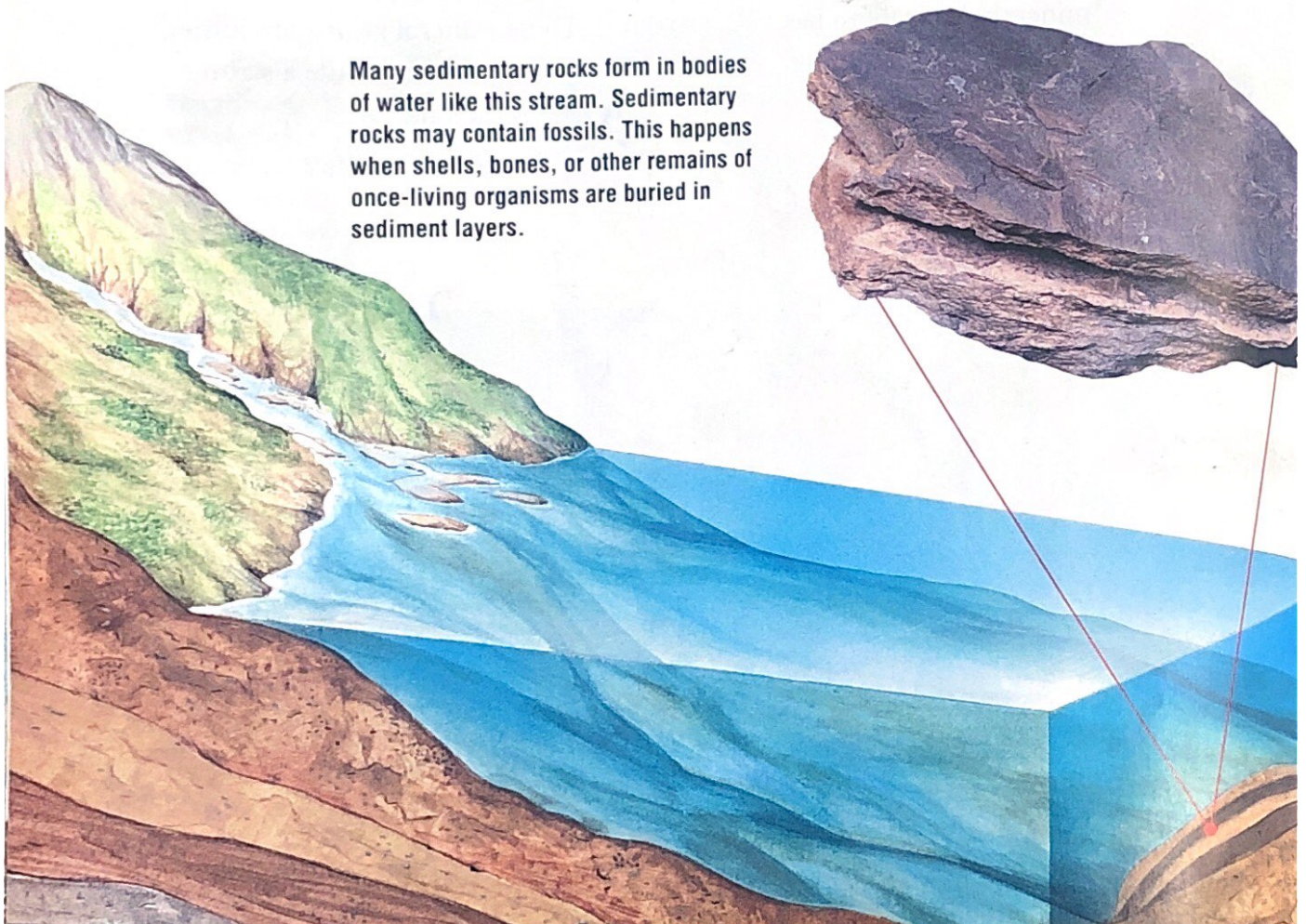
When erosion is caused by water, over time the rock pieces drop to the bottoms of streams, rivers, or lakes. The material that is dropped is called *sediment*. Over a long time, layers of sediments can form **sedimentary** (sed•uh•MEN•ter•ee) **rock** as they are squeezed and stuck together.

Most sediments are dropped by moving water when it slows down, such as when a river or stream enters a lake. The largest pieces of weathered rock are dropped first. Conglomerate (kuhn•GLAHM•er•it) is a type of sedimentary rock that can form from these larger pieces. The pieces in a conglomerate can be as big as boulders or as small as peas. In a conglomerate, the pieces are round and smooth. Most conglomerates form in shallow water.

Smaller sediments are carried farther by the water and dropped later. Siltstone is one type of rock made up of smaller sediments.

Limestone is a fine-grained sedimentary rock. It is made up mostly of the mineral calcite. Most limestone forms in oceans, sometimes from seashells. A few kinds of limestone form in lakes.

Many sedimentary rocks form in bodies of water like this stream. Sedimentary rocks may contain fossils. This happens when shells, bones, or other remains of once-living organisms are buried in sediment layers.





▲ Conglomerate



▲ Limestone



▲ Sandstone



▲ Shale

Sandstone is another kind of sedimentary rock. Sandstones, as you might guess from their name, are made up of bits of rocks and minerals the size of sand grains. Nearly all sandstones are made up mostly of the mineral quartz.

Some sandstones are fine-grained. They feel smooth when you touch them. Other sandstones are coarse-grained. They feel

rough against your skin. Sandstones can form in water or on land.

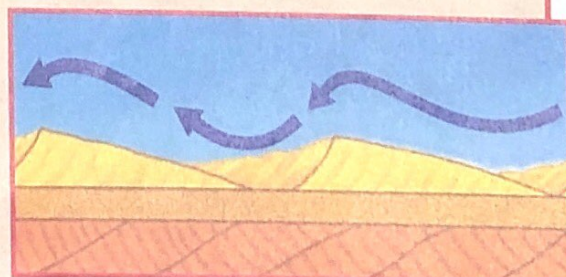
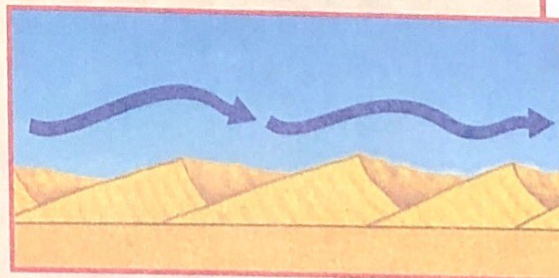
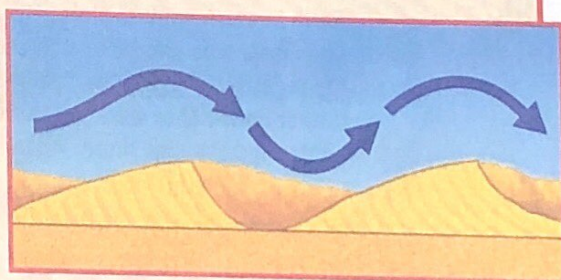
Shale is a fine-grained sedimentary rock made of very small sediments. The sediments in most shales are so small that you can see them only with a strong hand lens. Some shale sediments are so small that you can see them only with a microscope.

✓ **What processes help form sedimentary rocks?**

THE INSIDE STORY

Crossbedding

1. Many sandstones are *crossbedded*. Crossbeds begin to form when wind blows sand grains in one direction for a long time. The grains pile up until the piles become so steep that sand begins to drop off the top edge. These sand piles, or dunes, will become the first rock layer.
2. Over time, more sand covers the first layer. This new sand keeps the first layer from moving. Sand blown by the wind keeps filling the gaps between dunes.
3. When the wind changes direction, the next sand layer is put down at a different angle. As the wind keeps changing direction, new layers are put down at different angles. The rock layers that form from the sand layers will show these changes in wind direction.



Metamorphic Rocks

High heat and great pressure can change the texture of rock—the way it looks and feels. They can also change the form of the minerals that make up the rock. These changed rocks are called **metamorphic** (met•uh•MAWR•fik) **rocks**. Metamorphic rocks can form from any kind of rock—sedimentary, igneous, or even other metamorphic rocks.

Some metamorphic rocks form when mountains are built up. Schist (SHIST) and gneiss (NYS) are two examples. Schist has wavy lines. It splits easily into layers. Gneiss forms when schist is heated and squeezed more. Gneiss often has bands of light and dark minerals.

Marble is another metamorphic rock. Marble forms when limestone is squeezed and heated. Artists often use marble to make statues. It also is used in buildings.

Slate is a metamorphic rock that forms when shale is under great pressure. Like shale, slate has layers. In the past, people used slate to make chalkboards for schools. Slate tiles are sometimes used to cover roofs.

Quartzite forms from sandstone when heat melts the sand grains together. Quartzite usually has a milky color. Other minerals in the sandstone can give quartzite a gray or pink color.

✓ How do metamorphic rocks form?

▼ This exposed hillside is part of a plate that was forced deep into Earth beneath another plate. The very great pressure there changed the rock. The rocks to the right were farther down. They were squeezed harder and changed more.

Schist is a metamorphic rock that has wavy layers of minerals. ▼

Gneiss is a metamorphic rock that forms when schist is changed even more. ▼



Slate is a metamorphic rock that can be split into thin sheets. Slate pieces are used to cover roofs on houses.

Summary

Rocks are made up of one or more minerals. Rocks are classified by the way they form. Igneous rocks form when magma or lava cools and hardens. Sedimentary rocks are usually made of pieces of rock that have been squeezed and stuck together. Metamorphic rocks form when heat and pressure change rocks.

Review

1. What are rocks?
2. How are rocks classified?
3. In which type of rock are fossils found?
4. **Critical Thinking** You find a rock that is made of small grains. How can you tell whether it is igneous or sedimentary?
5. **Test Prep** Which kind of rock is granite?
 - A igneous
 - B metamorphic
 - C layered
 - D sedimentary



LINKS



MATH LINK

Make a Graph A lake has three rivers flowing into it. Each river deposits 1 centimeter of sediment in one year. How deep will the sediments be after 10 years? If the lake is a meter deep, when will it be completely filled by sediment?



WRITING LINK

Informative Writing—Narration Use library reference materials to find out about the Navajo Sandstone crossbeds. Then write a story for your teacher describing the area while the crossbeds were forming.



PHYSICAL EDUCATION LINK

Rock Climbing Use library reference materials to find out the equipment needed for safe rock climbing. Make a list of safety rules for the sport of rock climbing. Tell how rock types affect climbing rules.



TECHNOLOGY LINK

Learn more about rock types by visiting this Internet site.
www.scilinks.org/harcourt