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ARTICLE-A-DAY

All About Rocks

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Making Tools from Obsidian

This text is excerpted from an original work of the Core Knowledge Foundation.

Many prehistoric cultures made tools out of rock. Scientists working in East Africa have found obsidian stone tools that are nearly two million years old. Obsidian was especially prized by ancient tool makers. Obsidian is an igneous rock that forms from lava that cools quickly. Obsidian breaks into pieces with sharp edges that are good for cutting and piercing.

To make a very sharp cutting tool, ancient tool makers struck a block of obsidian with another, harder rock. This caused a long, thin blade of obsidian to flake off. Although the blade was fragile, it had incredibly sharp edges. In fact, the edges of obsidian blades are much sharper than metal scalpels used by surgeons today.

Making a spear tip or arrowhead was more time consuming. The tool makers started with a relatively flat piece of obsidian. They shaped it by striking off tiny flakes of rock, one after another, from the edges. They gradually shaped it into a sharp, durable-and often beautiful-pointed tool.

Spear tip

Arrowheads

Changing Form: Metamorphic Rock

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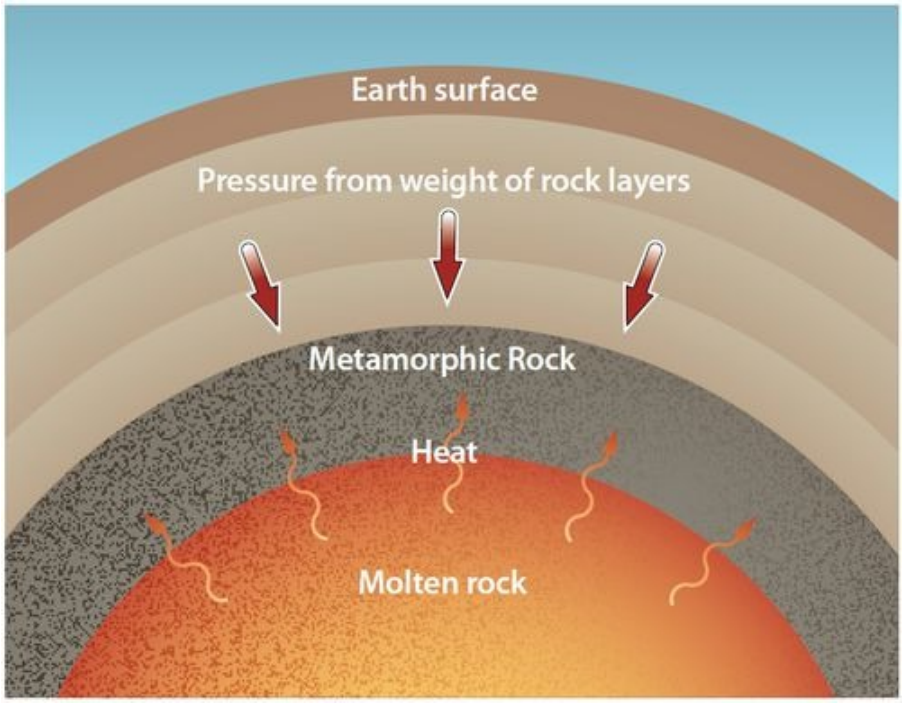


One of the three major classes of rocks is metamorphic rock. Metamorphic rocks form when igneous or sedimentary rocks are exposed to extreme heat and pressure. They can even form from older metamorphic rocks. High temperatures and crushing pressure alter the minerals in the rocks. Mineral grains may be flattened or rearranged into layers, swirls, or stripes. They may also be changed into completely different minerals!

For example, take granite, an igneous rock. When granite is subjected to intense heat and pressure, it becomes a metamorphic rock called gneiss. When the sedimentary rock limestone is squeezed and heated deep below ground, it becomes a metamorphic rock called marble.

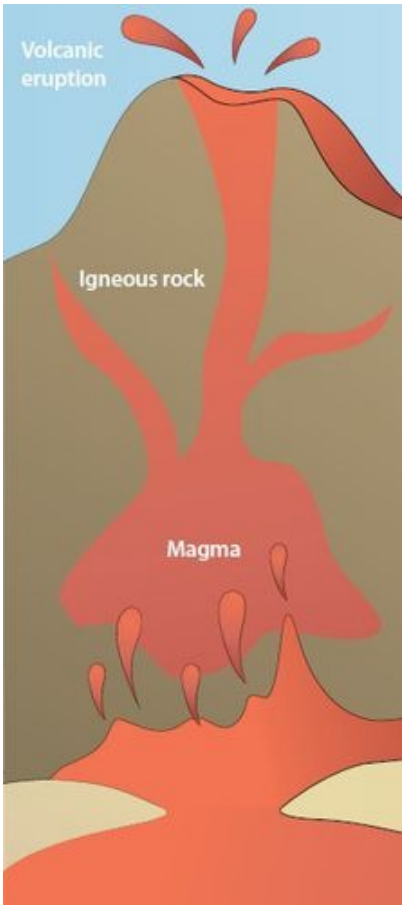
Metamorphic rocks tend to form deep within Earth's crust. The pressure from countless tons of overlying rock is tremendous. Equally powerful is the heat rising from hot magma in the mantle beneath the crust. Metamorphic rocks often form where tectonic plates are slowly colliding. They can also form as magma travels up through cracks in Earth's crust and heats the rocks around the cracks. If the heat of the magma completely melts the rock again, then it becomes igneous rock. If the rock is heated just enough to be changed, however, it instead becomes metamorphic rock.

The Rock Cycle

This text is excerpted from an original work of the Core Knowledge Foundation.

Rocks you see in the world around you might seem like permanent fixtures. Given enough time, however, all rocks change. They are created, destroyed, and recreated in a continuous cycle. Geologists call this ongoing process the rock cycle.

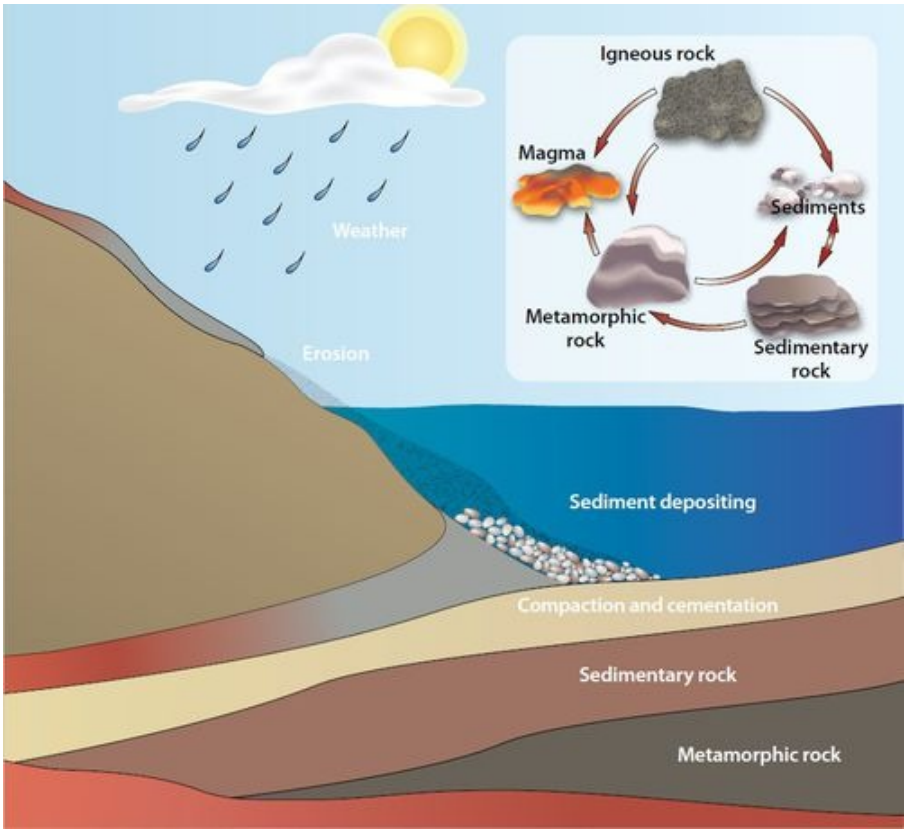
The rock cycle has no starting or ending point. You can jump in anywhere to see how it works. Let's begin with magma erupting from a towering volcano. The magma (now lava) cools and hardens into igneous rock. Over the course of thousands of years, sun, wind, rain, and freezing temperatures cause the rock to weather, or break down into smaller pieces. The pieces continue to weather, slowly breaking down into sediments. Howling winds, flowing water, and gravity gradually move the sediments down the sides of the volcano and beyond. Movement of sediments from place to place is called erosion.



Imagine that the sediments end up in a lake, where they settle to the bottom. Over long periods of time,

more layers of sediments are deposited on top of them. Compacting and cementing processes eventually turn the deeply buried sediments into sedimentary rock.

Now imagine that the sedimentary rock is near the edge of a tectonic plate. The plate collides with another plate-very slowly, of course. Tremendous heat and pressure generated by the collision gradually turn the sedimentary rock into metamorphic rock. As the plates continue colliding, their rocky edges crumple. The metamorphic rock is slowly pushed up higher onto Earth's surface. Think mountains! Exposed to air, rain, and snow, the rock begins to weather and erode.



Alternatively, one tectonic plate might be sliding beneath another. The metamorphic rock along the edge of the descending plate gets hotter and hotter as it nears the mantle. At some point it melts into magma-magma that someday might erupt from a volcano again.

Understanding how rocks change helps geologists understand how Earth has changed over time.

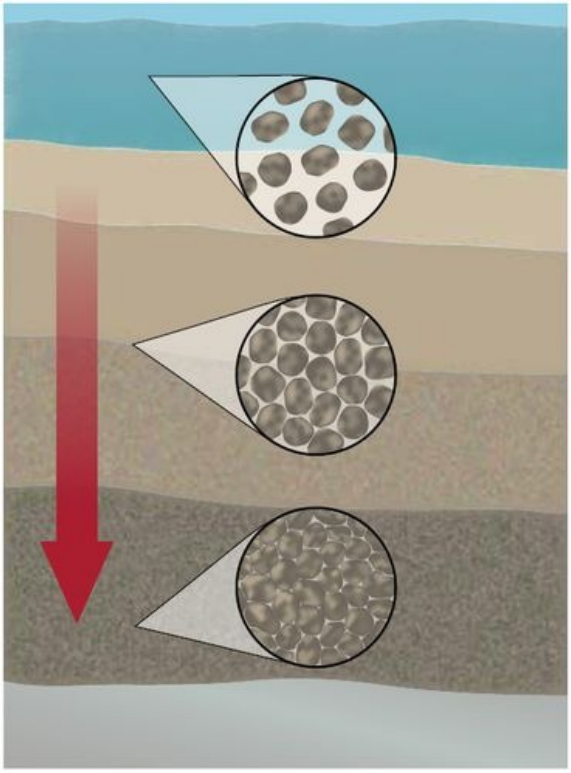
Layer After Layer: Sedimentary Rock

This text is excerpted from an original work of the Core Knowledge Foundation.

Sedimentary rock is a major class of rocks. Sedimentary rocks are made of sediments. Sediments are tiny bits of rock and sand combined with fragments of once-living things. Sediments collect in low-lying areas both on land and in bodies of water. They form layers, one on top of another. Over long periods of time, the weight of overlying layers compacts the sediments in deeper layers, squeezing them closer together. Sediments also become cemented, or glued, together as dissolved minerals fill the spaces between the sediments. As the sediments dry, the dissolved minerals turn into solids, binding the sediments together. Over time, compacting and cementing processes transform sediments into sedimentary rock.

Most sedimentary rocks are more easily broken than most igneous rocks. Hit a sedimentary rock with a hammer, and it will crumble or break apart. Some sedimentary rocks contain fossils. Limestone is a sedimentary rock often packed with the fossilized skeletons and shells of tiny ocean creatures.

Some sedimentary rocks get their name from their sediments. Sandstone started as grains of sand, whereas mudstone formed from ancient mud.



The weight of overlying layers compacts the sediments, squeezing them closer together.

What Exactly Are Rocks?

This text is excerpted from an original work of the Core Knowledge Foundation.

You don't have to look hard to find rocks. They are all around you-and under you, too! Earth's crust is made almost entirely of rocks. Mountains, hills, and cliffs are huge masses of rock that form landscape features. Pebbles in a streambed are smooth, rounded rocks. Chunky bits of broken rock form the gravel on a country road. Rocks go into making sidewalks and streets. Slabs of rock cover the outside of many buildings. Indoors, pieces of rock often make up floors, walls, stairs, and countertops. Museums are good places to see rocks that artists have carved into sculptures. The polished stones in some types of jewelry are rocks that people wear.

Rocks are all around. Some are carved into sculptures, others are used for jewelry.

All the varieties of rocks can be organized into three classes.

Just what are rocks, exactly? Rocks are naturally occurring materials made of solid, nonliving substances called minerals. Think of minerals as the building blocks of rocks. Some rocks are formed from just one mineral. Most rocks, however, are combinations of two or more

minerals. Minerals appear as different-sized pieces, or grains, in rocks. Some rocks have very tiny mineral grains, giving the rocks a smooth, even texture. Other rocks have larger mineral grains and a rougher texture.

Imagine hiking up a mountain and picking up rocks along the way. When you reach the top, you'll probably have quite a collection. Your rocks may have different colors and textures. Some may have stripes or layers. Some might be hard and others crumbly. Some have tiny grains whereas others have large grains that glitter when they catch the light. All this variety might seem confusing. Yet geologists organize all rocks into just three classes, or basic types: igneous, sedimentary, and metamorphic.

Born from Magma: Igneous Rock

This text is excerpted from an original work of the Core Knowledge Foundation.

Igneous rocks

Igneous rocks are the most abundant class of rocks on the earth. Igneous rocks form when magma cools and solidifies. When you think of igneous rocks, think of volcanoes.

There are two basic types of igneous rock. One type forms from magma that erupts onto Earth's surface as lava. The lava cools and hardens into rock. The faster it cools, the smaller the mineral grains will be in the resulting rock. Obsidian is an igneous rock formed from lava that cooled very quickly, so quickly, there wasn't time for the minerals to form grains. As a result, obsidian is as smooth and shiny as glass. In fact, it is often called volcanic glass. Basalt is an igneous rock formed from lava that took longer to cool. Basalt is typically a dark-colored rock. It has fairly small mineral grains that give it a fine-grained texture.

The second type of igneous rock forms from magma that solidifies below Earth's surface. Magma cools very slowly when it's deep beneath the surface. Slow cooling leads to igneous rocks with relatively large mineral grains. The slower the cooling is, the larger the grains are. Granite is a common igneous rock that forms from magma that cooled within Earth's crust. Granite usually contains mineral grains that are large enough to see with the naked eye.