

Getting to Know: Rock Cycle

The English language abounds with images that imply the permanence and steadfastness of rocks. The third president of the United States, Thomas Jefferson, is credited with the quote, "In matters of style, swim with the current; in matters of principle, stand like a rock." We refer to tough and strong people with rock imagery: "He's built like a rock." Some companies use rocks in their logos to imply strength and stability. You can probably think of other instances of rock imagery. It might seem from these examples that rocks are constant and never changing, but did you know that rocks can change and transform? All of the rocks on Earth are part of the rock cycle. You've probably learned about the water cycle and how all of the water on Earth can move and change form. The same is true of rocks, although it's usually on a much slower scale.



We think of rocks as solid and unmoving, but they are constantly changing in the rock cycle.



Misconception 1: *I thought that rocks never change.*

That's incorrect. Rocks do change! Sometimes, rocks can exist in one form for billions of years, but all of the rocks on Earth eventually change. It's called the rock cycle, and you're about to learn a great deal more about it.

What is the rock cycle?

The *rock cycle* is the process by which rocks are created, transformed, and recycled to form new rock. There are many processes involved in the rock cycle, which you'll explore in greater depth in this concept. Overall, three fundamental forces drive the rock cycle. Those forces are: the Sun, Earth's gravity, and the internal heat of the Earth; all three forces affect the rock cycle.

What are the different processes involved in the rock cycle?

There are several processes in the rock cycle; each process plays a different role in breaking down rocks and forming new rocks. Weathering and erosion are two processes involved in the rock cycle; both are ultimately caused by the Sun and gravity. The Sun, along with Earth's gravity, provides energy for the water cycle and Earth's weather. Together, these forces can slowly break down rocks until they become small particles, called *sediment*. Weathering and erosion both work to break down rocks, but they're not the same process. *Weathering* is the breaking down of rocks (from wind, water, or chemicals), whereas *erosion* is the movement of rock particles. Often the two processes function together (rocks that are weathered are more likely to erode and move to a new location as sediment).

Another process in the rock cycle is *deposition*, which is the process by which small particles of rocks settle in one place. Rock particles are usually carried by something, like water or wind, and once deposited, particles of rocks can slowly build up over time and eventually be cemented together to become layers of new rock. Rocks that are created from the process of deposition are called *sedimentary rocks* because they're made of sediments from other rocks. Sedimentary rocks can have particles from many different rock types and various locations.

Other processes involved in the rock cycle include tectonic plate movement, metamorphism, and volcanism.



Water can weather and erode rock, causing it to be deposited elsewhere.



Misconception 2: *Is it correct that Earth's mantle is made entirely of magma?*

Earth's mantle is not made of magma. There are spots where magma exists in the mantle, but the mantle is mostly solid rock. However, the rock in the mantle does slowly flow in a process called *convection*.

How do tectonic plate movement, metamorphism, and volcanism contribute to the rock cycle?

Tectonic plate movements push deep rocks up to Earth's surface and can also move rocks at Earth's surface down to great depths. As rocks move, they are often exposed to Earth's internal heat and pressure, which can cause them to change. When rocks are exposed to heat and pressure, they can change into *metamorphic rocks*. (This is the process called *metamorphism*.) If they are exposed to high enough temperatures, rocks can melt completely, forming *magma* (or, when it's at Earth's surface, it's called *lava*). When magma cools, it becomes *igneous rock*. Magma and lava are associated with volcanoes; volcanoes are a source of igneous rocks. *Volcanism* is the process of volcanic activity and the formation of igneous rocks.

You'll learn much more about the processes involved in the rock cycle, but for now, you should know that all rocks are slowly changing. All three rock types (igneous, metamorphic, and sedimentary) can transform and become any other rock type. It's a process that's often occurring too slowly for us to notice, but the rock cycle is constantly changing and shaping Earth as we know it.



Misconception 3: *I hear people use the terms crust and lithosphere interchangeably. Are they the same?*

The crust and the lithosphere are not the same. Earth's crust is actually part of the lithosphere. The lithosphere also includes the uppermost part of the mantle.