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Rocks and Rock Formation

Reading and Discussion

We walk over rocks every day, build cities and roads from rocks, and even wear rocks! But what about the millions of rocks we don't notice? If you don't look too closely, all rocks look the same, so it's easy to overlook most of them. But the Earth is covered with rocks of every shape and size, and each one is unique! Scientists who study the Earth and its rocks are called geologists. Today, you will become a geologist yourself as we explore the three different types of rocks and how they are formed.

Because rocks have been here as long as we have, we may assume that they have existed just as they are since the beginning of time. In fact, it takes millions of years and many changes for rocks to form. There are three basic types of rocks: **sedimentary**, **igneous**, and **metamorphic**. Each type forms in a very different way.

Sedimentary Rocks

Look closely at the word, "sedimentary." You will see the word, "sediment." **Sediment** is made of small particles of matter that are left over from something larger. When a large rock is crushed or ground up, the tiny specks are called "sediment." Sand is a kind of sediment, because it is made up of very small particles of rock and shell.

Sedimentary rock gets its name because it is made up of sediment. It is formed on the outer layer of the Earth. This layer is called the crust, and it is where all forms of life exist. Sedimentary rock is formed when sediment compresses, which most often takes place near the mouths of streams and rivers, and on beaches.

Imagine a stream running through a mountain. As the water flows, it picks up sediment, carries it downstream, and deposits it at the end of the stream. Many kinds of sediment get picked up, including particles from large rocks, animal bones, and shells. This process goes on for millions of years, and the sediment is piled up in layer upon layer. Soon, all of that weight begins to put pressure on the lowest layers of sediment. They compact and become sedimentary rock. Sandstone and limestone are two examples of sedimentary rock.

Igneous Rock

Igneous rock is unique because it comes from deep inside the Earth. It is the only kind of rock that begins as a liquid. This liquid is actually rock matter that is so hot, it is molten. It is called **magma**, and it can only be found close to the Earth's center and flowing from volcanoes. When magma cools, it hardens and becomes rock.

Sometimes this cooling process occurs on the Earth's surface. For example, when lava flows from a volcano, it cools and becomes igneous rock. Igneous rocks that are formed on the surface are called "**extrusive**." They cool very quickly, so they are made up of very fine crystals. Volcanic glass is an example of an extrusive igneous rock. When igneous rocks form beneath the Earth's surface, they cool much more slowly. They are

coarser, because they are made up of larger crystals. These igneous rocks are called "**intrusive**." Granite is an example of this kind of igneous rock.

Metamorphic Rock

The third type of rock actually begins as igneous or sedimentary rock! With plenty of time, heat, or pressure, igneous and sedimentary rock can be transformed into metamorphic rock. The word, "**metamorphosis**" means transformation or change. This kind if rock is usually found beneath the surface of the Earth. Transforming a rock requires an amount of heat or pressure that can only be found deep in the Earth.

Metamorphic rock can also change again, into a *new* kind of metamorphic rock. Sometimes these rocks are under so much pressure that their molecules can be rearranged to create new minerals! These rocks often have stripes or bands of color that help scientists understand what kind of changes took place when they were being formed. Examples of metamorphic rock include: **slate**, **jade**, and **marble**.

Summing Up

Some rocks, like sedimentary and extrusive igneous rocks, are right on the surface of the Earth. We can pick them up and study them anytime. But how do we learn about rock that is formed deep in the Earth? Miners and scientists often dig to find large deposits of these rocks, but you can find them in almost any park or forest. It takes millions of years, but pressure and shifts in the Earth's deep layers bring metamorphic and intrusive igneous rocks to the surface. Take a very close look at the next rock you pick up, and remember that it was being formed millions of years before you arrived on Earth!

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Activities

Activity A: Test Your Knowledge! Circle the letter of the correct answer below.

1. Which of the following is NOT a type of rock?
    a. Igneous;
    b. Metamorphic;
    c. Mineral;
    d. Sedimentary.

2. Which of the following begins as molten, or liquid, rock matter?
    a. Igneous rock;
    b. Metamorphic rock;
    c. Sediments;
    d. Sedimentary rock.

3. What is sedimentary rock made of?
    a. Igneous rock that has cooled and hardened;
    b. Particles of ground up rock, shell, and bone;
    c. Beach sand;
    d. Lava.

4. What do scientists call igneous rock that cools quickly and is found on the surface of the Earth?
    a. Extrusive;
    b. Exterior;
    c. Intrusive;
    d. None of the above.

5. What is needed to form metamorphic rock?
    a. A stream or river
    b. Fire
    c. Sediment
    d. High pressure or heat

Activity B: Read the description of each rock below. Use the lines provided to answer these questions: What kind of rock is it? How might it have formed?

1. This rock was found near a volcano in Hawaii. It is black, hard, and smooth. At one time it was a liquid.

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_____

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2. This rock was found on a beach. It is very hard, but has been broken, and we can see it has layers. It is very rough, and contains sand.

_____

_____

3. This rock is very smooth and very hard. It was found on a mountain, and has white and gray stripes.

_____

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Activity C: Draw a line connecting the rock name with its description.

Metamorphic	**Particles of rock, shell, and bone are deposited in layers and compressed.**
Igneous	**Molten rock cools and hardens.**
Sedimentary	**High heat or pressure transforms existing rock.**

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Answer Key

Activity A

1. C
2. A
3. B
4. A
5. D

Activity B

1. This rock is an igneous rock. It was formed when molten rock that reached the surface of the Earth cooled and hardened.

2. This rock is sedimentary. It was formed when layers of sand and other sediment became compressed under high pressure.

3. This rock is a metamorphic rock. It was formed deep in the Earth when another kind of rock was exposed to extreme heat or pressure.

Activity C

Metamorphic — **High heat or pressure transforms existing rock.**

Particles of rock, shell, and bone are deposited in layers and compressed. — **Sedimentary**

Igneous — **Molten rock cools and hardens.**