Reading 4.2 – Formation of Metamorphic Rocks

Getting Ready

Previously, you learned about different types of rocks, including metamorphic rocks. What do you already know about how rocks are formed?

As you put together what you have learned in the past, what you did in class today, and this reading, you will know a lot about metamorphic rocks and changes in the earth.

Metamorphic Rocks

Metamorphic rocks are formed from other previously formed rocks. In other words, a metamorphic rock is a rock that has been changed. The most common ways that rocks are changed is through pressure and heat. In class, you designed an experiment to determine how temperature affects the behavior of Silly Putty®. In this activity, the Silly Putty® was supposed to represent rock material that makes up the mantle of the earth (immediately beneath the surface). This is very similar to how rocks deform in the earth. Real rocks need much higher temperatures to deform than your Silly Putty® rock required.

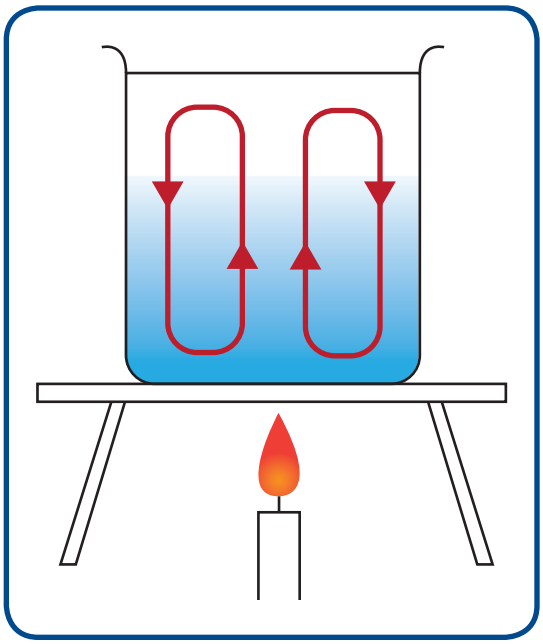
At places where Earth's plates meet, and deep places within the Earth's rock layers, the conditions are very hot. Where do you think the heat comes from?

Metamorphic rocks can be identified because they have been compressed, squished, folded, and deformed. It is easy to see that this metamorphic rock, called *gneiss*, has been intensely folded. It had to have been under very high temperatures to allow it to fold like this without breaking.

Even though rocks can get very hot, they do not always melt. If a rock melts, it becomes magma. That rock can then crystallize, harden, and become an igneous rock, which you learned about previously.

How Are Metamorphic Rocks Related to Plate Tectonics?

How does all of this relate to plate tectonics and the demonstrations of convection from class? In class, you did an activity with hot water and cardboard. The cardboard pieces were similar to Earth's plates. You saw that they moved horizontally on the water when the water was heated. On the earth, the plates ride on the surface of the earth on top of very hot rock material of the mantle. This rock material is solid, but nonetheless it can flow very slowly.



The rock beneath the earth's plates is solid, but it is very hot. This makes the rock a bit like Silly Putty®. This hot rock is able to move and deform (like your Silly Putty®), but it happens very slowly over many, many years. The result is that the slabs of rock at the surface (plates) ride on this slowly moving layer of hot, solid rock material.

Explain why plates move around on Earth's surface. (Use the diagram to help you.)