

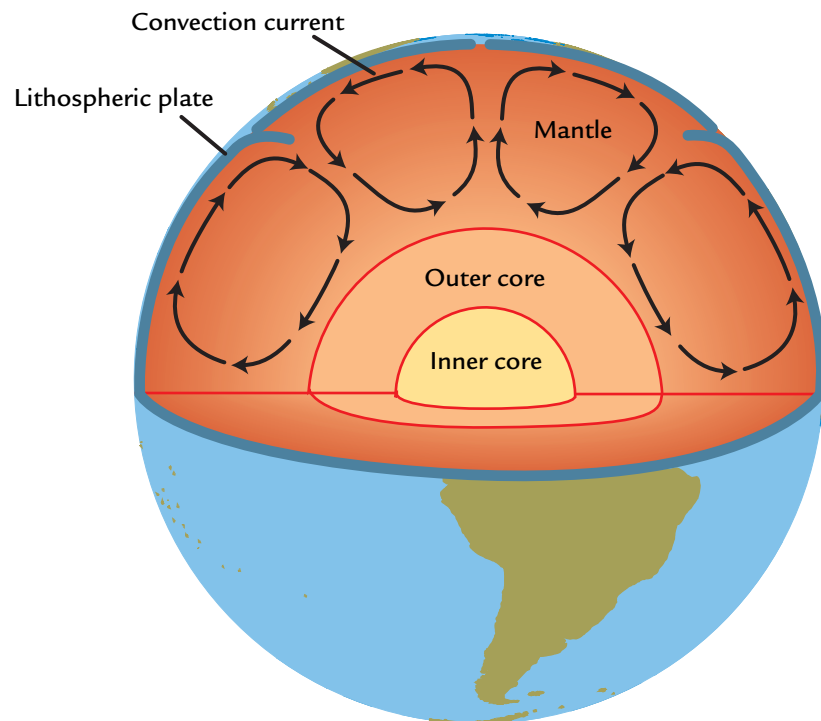
46 Convection Currents



Scientists don't know exactly what drives plate motion. One theory is that there are convection currents within the earth's mantle. **Convection** occurs when there is a temperature difference within a substance like magma, causing it to move in a circular pattern (Figure 1, below). This convection of the magma within the mantle is believed to cause plate movement. In this activity, you will investigate how differences in temperature can cause substances like magma to move.

CHALLENGE

How do differences in temperature cause a convection current?



Mantle Convection

MATERIALS



For the class

supply of warm water

supply of cold water



For each group of four students

2 plastic cups

1 plastic syringe

1 plastic cup with circular depression

1 small vial with 2-holed cap

1 bottle of red food coloring

paper towels and/or a sponge

PROCEDURE



Capped Vial in Cup

1. Fill two plastic cups, one with warm water and the other with cold water.
2. Snap the small vial (cap-side up) into the base of the plastic cup, as shown at left.
3. Gently remove the cap and place 1 drop of food coloring into the bottom of the vial. Carefully and firmly re-cap the vial with the 2-holed cap.
4. Use the syringe to carefully fill the vial with about 5 mL of warm water. Gently tap the vial to remove any air bubbles.
5. Cover both of the holes in the 2-holed cap with two fingers and have one person in your group slowly add cold water to the set-up until it is almost full.
6. Remove your fingers and observe what happens from both the side and the top.
7. Record your observations as Trial 1 in your science notebook. Use arrows to sketch the movement of the colored water.
8. After a few minutes, carefully remove the vial from the cup. Describe the contents of the vial in your science notebook.
9. Empty and rinse the vial, the cap, and the cup.
10. Repeat Steps 3–9, but this time use *cold* water in Step 4 and *warm* water in Step 5. Record your observations as Trial 2.

ANALYSIS



1. **a.** Did both trials result in the movement of water? Why or why not? Discuss your ideas with your group.
b. What do you think is necessary for a convection current to form?



2. Compare the results of your two trials. When warm and cold water are mixed, what happens:
 - a. to the warm water?
 - b. to the cold water?



3. Imagine that hotter magma is lying beneath an area of cooler magma deep in the mantle. What do you predict will happen? Be as specific as you can and explain your reasoning.
4. What do scientists believe causes plates to move?