**OVERVIEW**

Ocean *currents* arise in several ways. For example, wind pushes the water along the surface to form wind-driven currents. Over larger areas, circular wind patterns create hills and valleys on the ocean sur- face. In these areas, the balance between gravity and Earth’s spin causes *geostrophic* currents to flow.

Deep ocean currents are caused by differences in water *temperature* and *salinity (density).* In this experiment, the students will *hypothesize* the cause of ocean currents and then develop a *model* to help explain the role that temperature plays in deep ocean currents.

**CONCEPTS**

* Cold water is more dense than warm water, and is therefore heavier.
* In some regions of the ocean, circulation is based upon the sinking of cold water and the subsequent *displacement* of warm water.

**MATERIALS**

* Approximately 9 x 13 x 3 inch glass dish
* Tap water
* Hot tap water
* Small waterproof ziplock bags
* 2 Clothes pins (or small clamps)
* 2 Different colors of food coloring
* 2 Eye droppers
* Rock
* Ice cubes, or a chemical cold pack
* Map of deep ocean currents
* Map of sea surface temperature

**ACTIVITY**

1. Fill the glass pan with tap water. Let the pan rest for a few minutes while the water settles.
2. While water is resting create a hypothesis explaining how you believe temperature affects ocean currents? *(1 point)*
3. Place a rock in a plastic bag and fill the bag with hot water. Seal the bag, and use the clothes pin to clip it to one corner of the glass pan.
4. Fill another bag with ice cubes or the chemical cold pack, and clip the bag to the opposite corner of the pan.
5. Use one of the droppers to add four drops of food coloring to the water next to the ice cube. Use the other dropper to add four drops of a different color of food coloring next to the bag of hot water. Observe the food coloring for several minutes.

Where did the water sink? *(1 point)*

In what direction did the current flow along the bottom? *(1 point)*

Where did the water rise? *(1 point)*

Make drawing of what you observed. (*3 points)*

1. Make a conclusion about what happened. How does this conclusion compare your earlier hypothesis about ocean circulation? (*2 points)*
2. Discuss and answer these questions with your group. Be prepared to discuss your answers with the entire class.

Do you think that the direction of deep-water currents could be reversed? *(2 points)*

Compare your model to Earth’s oceans by looking at an image of global sea surface temperature. *(2 points)*

Where are the oceans coldest? Where are they the warmest? *(2 points)*