

Continents and Currents

Background

During World War II, an American attack transport captain, named Harry Hess, noticed that the size of submarine volcanoes became smaller as his ship moved away from the underwater mountain chain called the mid-ocean ridge. This observation grew into the seafloor spreading theory of plate tectonics. In a series of cruises beginning in 1968, scientific ocean drilling aboard the Glomar Challenger and the current drillship, the *JOIDES Resolution*, confirmed that oceanic crust is manufactured at mid-ocean ridges and then moves outward to either side. Later expeditions of the Ocean Drilling Program proved that the movement of continents caused by sea floor spreading changes the circulation of oceanic currents.

Summary

Students will be able to visualize how the movement of continents affects oceanic circulation.

Learning Objectives

Students will be able to:

- describe how the movement of continents affects oceanic circulation

National Science Education Standards

Standard D: Earth and Space Science

Ocean Literacy Principles

1. The Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of the Earth.

Materials (for each individual lab group)

1. Pie plate
2. 1/2 cup whole milk (1/2 an inch deep)
3. 2 contrasting food coloring options
4. Dish soap (preferably clear or light colored)
5. Several small stones (1- 2 inches in diameter)

Methods

1. Pour the milk onto the plate.
2. Place 5-6 drops (closely grouped) of one food coloring near the edge of the plate. Place 5-6 drops (closely grouped) of the second food coloring on the opposite side of the pie plate, near the rim as well.
4. Put a couple squirts of dish soap on opposite sides of the pie plate, near the two groupings of food coloring.

Activities and Questions

1. What happened when you added the dish soap? Did the colors mix across the two sides of the pie plate or did they stay close to their original locations?
2. If the pie plate represents the Earth what does the milk represent? What does the food coloring represent? What is missing from this model?
3. Empty the pie plate and start again. This time after adding the milk, place the small stones on the plate in a configuration similar to the continents. Now add the food coloring and dish soap.
4. What do you notice? What do the stones represent? How is the movement of the food coloring changed by placement of the stones?
5. Start over again and experiment with different configurations of continents. Try placing the continents together in only one half of the pie plate or spread them far apart in different corners of the pie plate. How do the different configurations affect the currents?
6. How might the circulation of the ocean affect your life?

Explanation

The currents in the pie plate are produced by interactions between the food coloring, milk, and dish soap. The food coloring is not soluble in the milk because of the milk's fat content. A few drops of dish soap breaks the surface tension of the milk. As the tension breaks up, colored currents begin to flow. The placement of the stones diverts these colored currents, just as the continents do on Earth.

Extensions

1. For more educational activities involving plate tectonics, visit www.deepearthacademy.org.
2. For more about the history and accomplishments of the *JOIDES Resolution* and scientific ocean drilling, visit <http://iodp.tamu.edu/publicinfo/drillship.html>.
3. To find information about the *JOIDES Resolution*'s current location and activities, visit www.joidesresolution.org.

References

1. Activity adapted from "Swirled World," Barbara Z. Tharp, Baylor College of Medicine, Division of School-Based programs
2. See <http://pubs.usgs.gov/gip/dynamic/HHH.html> for more information on Harry Hesso.