10-4 What are ocean currents?

INVESTIGATE

Comparing Densities of Cold and Warm Water

HANDS-ON ACTIVITY

1. Fill a plastic container half full with warm water. Wait for the water to stop moving.
2. Add several drops of food coloring to a cup of ice water and stir.
3. Using an eyedropper, gently dribble the colored water down the inside of the plastic container.


STEP 3

THINK ABOUT IT: What happened? Why? What does this tell you about the density of cold and warm water?

Objectives

Define current. Describe how surface currents and density currents are formed.

Key Terms

current: stream of water flowing in the oceans

Coriolis effect: bending of Earth's winds and ocean currents by Earth's rotation

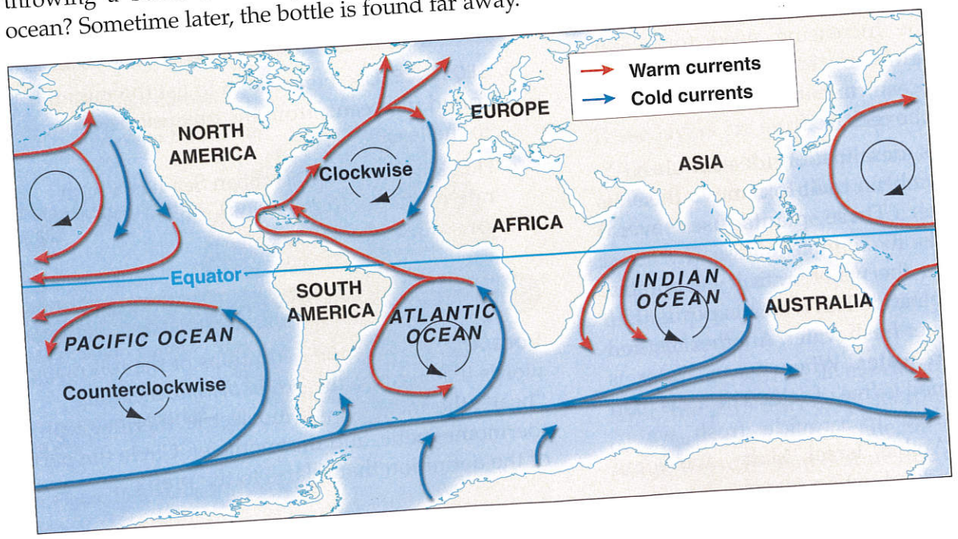
density current: stream of water that moves up and down in ocean depths

On the Move The water in Earth's oceans is always moving. Have you ever heard of someone throwing a bottle containing a message into the ocean? Sometime later, the bottle is found far away. How did it get there? It was carried by ocean currents. These **currents** are streams of water in the oceans. Some currents move along the ocean bottom. Some move up and down within the ocean depths. Currents can also flow along the surface.

1 **DEFINE:** What is a current?

Density Currents Differences in density can cause currents to move up and down in the ocean depths. This movement of water causes **density currents.**

Ocean currents can be warm or cold. Currents flowing from areas near the equator are warm. They bring warm water into cooler regions. These warm currents tend to warm the air over nearby land areas.



◀ **Figure 10-11** Different densities in ocean water cause density currents.

Currents coming from areas near the poles are cold. They bring cold water into warmer regions and cool these areas. Cold water is denser than warm water. Cold water around the poles sinks to the ocean bottom. Water around the equator is warm. Warm water rises up toward the ocean surface.

Different amounts of salt in ocean water also cause density currents. Water with a lot of salt is denser than water with only a little salt. Dense, salty water sinks. Less salty water rises.

2 **DESCRIBE:** What conditions cause density currents in the ocean?

Surface Currents Winds cause most surface currents. Winds near the equator blow mainly from east to west. In the Northern Hemisphere, these winds blow from the northeast. In the Southern Hemisphere, these winds blow from the southeast. Earth's rotation causes the winds in the Northern Hemisphere to curve toward the west and the winds in the Southern Hemisphere to curve toward the east. This is called the **Coriolis effect.** Continents and large islands also influence ocean currents. As a result, surface currents move in huge circles. They move clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere.

3 **STATE:** What causes most surface currents?

CHECKING CONCEPTS

1. Ocean currents are streams of _____ in the oceans.
2. Most surface currents are caused by _____.
3. Surface currents from the _____ are cold currents.
4. Surface currents from the _____ are warm currents.

THINKING CRITICALLY

5. **HYPOTHESIZE:** Why do large land areas cause surface currents to change direction?
6. **COMPARE:** Which is probably denser, the water in the Arctic Ocean or the water in the Caribbean Sea? Explain your answer.

HEALTH AND SAFETY TIP

An undertow is a current that moves beneath and in a different direction from the surface current. Undertows can be very dangerous. This is one reason you should never swim alone. Interview a lifeguard to find out about other safety guidelines for swimming. Make a chart that outlines some of these guidelines.

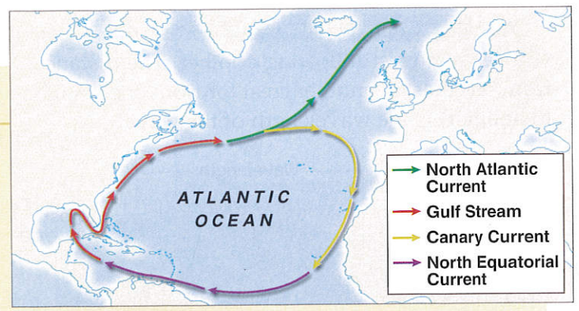
Real-Life Science

TRAVELING ON CURRENTS

Knowing the direction and the strength of ocean currents is important to the shipping industry. Any good sailor knows that traveling with a current saves time.

In 1768, King George III asked Benjamin Franklin why it took mail ships longer to go from England to the colonies than to return to England. Franklin asked the captain of a whaling ship. He was told of a strong current of warm, salty water that flowed along the eastern coast of North America, then across the North Atlantic. Whaling ships rode the current going out but stayed outside of it when returning home. That ocean current is the Gulf Stream.

Thinking Critically How do you think ships today shorten their trip to Europe?



▲ **Figure 10-12** Currents can help ships cross the Atlantic Ocean faster.