What Drives Ocean Currents?
A Hands-On Activity for Children Ages 10-14

Objective: Students will gain an understanding of how water density and salinity affect ocean currents in the northeastern Gulf of Mexico by modeling a layered ocean.

Time: One 50-minute class period

Background: An ocean current is literally the movement of water in the ocean. Oceanic currents are driven by tides, winds, and differences in water density. Density is defined as the number of things, in this instance, molecules, in a certain area. Water density is affected by the number of salt molecules it contains, as well as by other substances such as sediments, oil, etc. The higher the salinity (salt content) of the water, the greater the density of the water, thus it stands to reason that freshwater will have a lower density than saltwater. Temperature also affects the density of water as molecules become more densely packed in colder environments. All of these variables have the potential to affect ocean currents by changing the composition of the ocean and can even reverse the direction of currents. For more information see the following NOAA tutorial: http://oceanservice.noaa.gov/education/tutorial_currents/

Materials:

- Table salt
- Yellow, blue, and red food coloring
- Room temperature, ice-cold, and hot water
- 1 clear rectangular container (such as a clear plastic shoe box) for each group
- 1 book or block of wood for each group to prop up the container
- 1 measuring cup for each group
- 1 mixing spoon for each group

Procedure:

1. Provide students with background information on ocean currents, density, and salinity. Ask students to hypothesize how salinity affects the density of water. (See supplemental materials for more information.)
2. Break students into groups of three and pass out materials.
3. Instruct the students to place the wood block or book under one side of the container to elevate it.
4. Instruct them to mix 1 spoonful of salt with 1 cup of room temperature water in the measuring cup. Tell them to stir for 30 seconds, add 3 drops of yellow food coloring, and add the colored water to the container.
5. Next, instruct them to add 3 drops of blue food coloring to ½ cup of ice-cold water and slowly pour the colored water into the elevated side of the container.
6. Finally, instruct them to add 3 drops of red food coloring to ½ cup of hot water and slowly pour the colored water into the elevated side of the container.
7. Ask students to observe the results after step 5 and after step 6.

Discussion:

1. Which type (temperature or salinity) of water had the highest density? Which had the least density? How could you tell?
2. What happens to the high salinity water and why?
3. Where would you expect to find the saltiest waters in the ocean and why?