Making WAVES

Adapted from "Making and Using a Wave Machine", Visit to an Ocean Planet, NASA
http://sealevel.jpl.nasa.gov/education/activities.html

Materials (per group of 4-5 students)

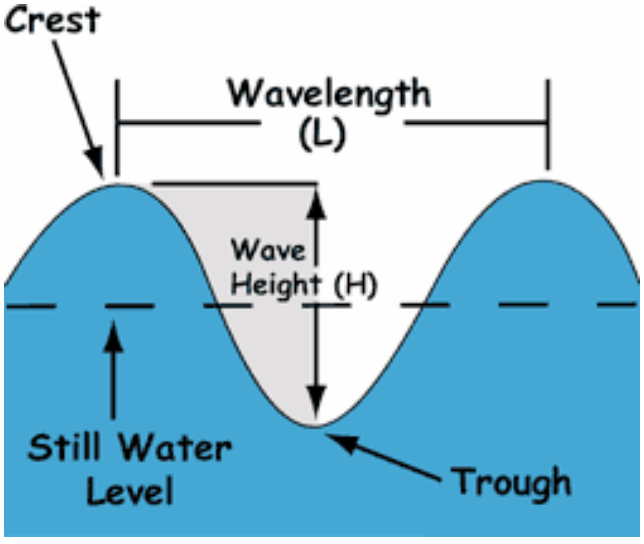
- 2 small aluminum baking pans or one large one
- Duct tape*
- Heavy scissors or tin snips*
- Silicon caulking*
- Water
- Sand and/or small gravel
- Stiff piece of plastic or wood to fit across short end of pan
- Small Styrofoam balls
- Ruler or meter stick
- Paper and pencil
- Computer with Internet (optional)

* Needed only if using two pans that will be glued together

Characteristics of Ocean Waves

Waves in the ocean are caused primarily by wind blowing across the surface. The wind transfers some of its energy to the water, through friction between the air molecules and the water molecules. Some important terms to know when studying waves are:

- **Crest** - The highest part of a wave
- **Trough** - The lowest part of a wave
- **Wave Height** - Vertical distance between a wave's trough and crest.
- **Wavelength** - The distance between two successive wave crests or troughs
- **Period** - The time taken for two successive wave crests to pass the same point
- **Frequency** – The number of wave crests that pass a point in a given amount of time divided by the amount of time (#/second).
- **Fetch** - The length of open sea surface across which the wind can generate waves



Virtual Waves (optional)

National Geographic has a great wave simulator on the web. It allows you to see the effect of changing wave characteristics. Check it out:
http://www.nationalgeographic.com/volvooceanrace/interactives/waves/index.html

Making a Wave Tank (if using 2 pans)

- Cut one end off each pan so that the two ends fit together.
- Connect pans using duct tape and calking to make them water tight.
- Add sand to one end to make a "beach."

Making and Measuring Waves

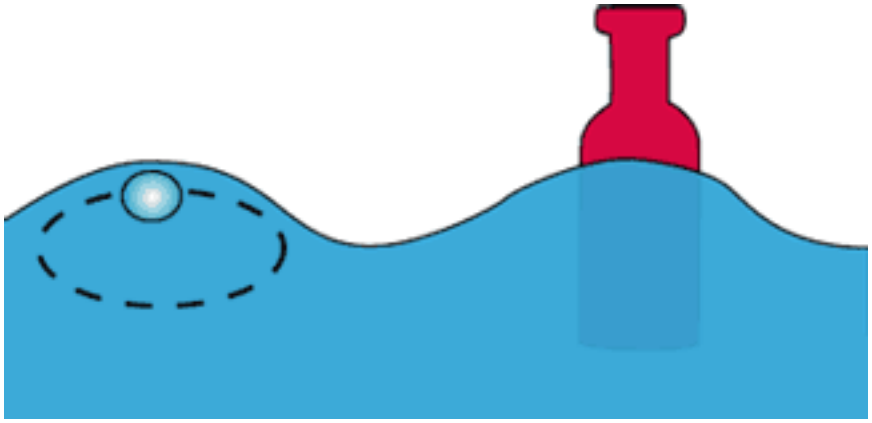
- Add about 2 inches of water to the bottom of your wave tank
- Use the wood piece to generate waves by moving it up and down at the non-beach end of the pan. Try different methods of generating waves. You might try a slight back and forth motion while you are moving it up and down. Try to generate even waves with a slow and consistent rhythm.
- When a consistent set of waves are being generated, use a ruler to estimate the *wavelength* and *wave height* of the waves, use a watch to estimate the *wave frequency*. Record your observations in the table below next to "Wave Set #1".
- Increase the frequency of your waves and repeat your measurements of frequency, height and wavelength. Record your measurements in the table next to "Wave Set #2"
- Increase the frequency of your waves and repeat the measurements. Record your results in the table next to "Wave Set #3".

	Frequency (#/sec)	Wave Height (cm)	Wavelength (cm)	Period (sec)	Speed (cm/sec)
Wave Set #1					
Wave Set #2					
Wave Set #3					

- The speed of a wave is equal to the wavelength/period. Calculate the wave speed for each of your sets of waves.
- What, if any, relationships do you notice between frequency and the other wave properties you measured?
- How does the wave motion affect the "beach?"

Investigating Wave Energy

- Scatter a few Styrofoam balls in the water in the middle of the pan.
- Generate waves in your wave tank. What do you notice about the Styrofoam? Does it move forward with the waves or stay in one place? What do you think explains your observations?
- Generate waves that break on the beach and place a few Styrofoam balls in the area where the waves are breaking. What happens to the Styrofoam where the waves are breaking? Why do you think this happens?
- Explain why surfers can surf near-shore but not in the middle of the ocean.



Explanation: Waves are not moving water, they are *energy moving through the water*. In the open ocean, objects travel in a circular motion as waves pass underneath them, as shown by the path of the ball in the Figure above. When waves break on shore, the energy is dissipated and the water rushes forward, moving the objects in its way.

Activity Group Discussion

- What are some results of waves?
- Why are waves important to people and to marine plants and animals?
- Why do scientists want to study waves?

Additional Activities:

Have students review the All About Waves background information sheet and try to find the answers to the Ocean World Wave Quiz. Discuss the answers as a group.

Distribute the Tsunami Word Find for fun.

Engineers and Scientists Studying Waves:
The OH Hinsdale Wave Research Lab at Oregon State University

Check out the live Wave Cam!
http://wave.oregonstate.edu/About_Us/webcam/