Wave Size and Depth

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Objectives

1. To investigate how deep the energy of a wave goes.
2. To investigate the relationship between the size of a wave and depth of wave energy.

Materials (per group)

- Aquarium
- String
- 5 corks (of equal size and weight)
- Water
- Permanent and erasable markers
- 2 rulers (one must fit inside the aquarium)
- Modeling clay (to secure the ruler to the bottom of the aquarium)
- Straight pins

Background Information

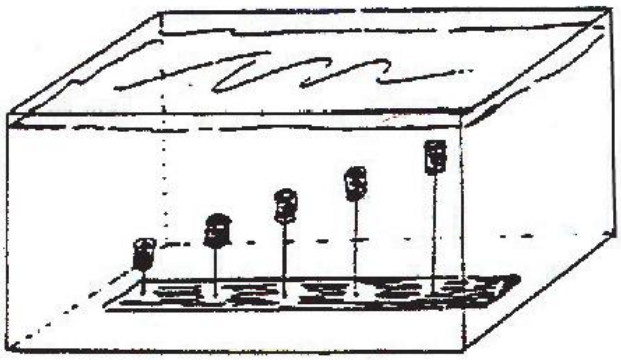
Most waves are generated by wind. Such a wave's size depends on how long the wind blows, the strength of the wind, and the *fetch* (the distance over which the wind blows). The water in a wave moves in a circular orbital pattern downward to a depth of one-half the wavelength.

Also see the Waves Fact Sheet (on the SECOORA website).

Procedure

1. Label each cork using the permanent marker.
2. Cut five lengths of string (at least seven inches in length)
3. Tie one end of each string to one of the rulers. Secure this ruler to the bottom of the aquarium using the modeling clay (see the illustration on the next page).

4. Attach the corks to the strings with straight pins. The first should one inch from the bottom, the second two inches from the bottom, and so on.



5. Add water to the aquarium until it is about one inch above the cork with the longest string.

6. Record the depth of each cork *as measured from the surface*.

7. Make small waves by moving your hand or a block of wood back and forth in the water. Record your observations of the motion of each cork.

8. Increase the size of the waves by moving your hand or block of wood faster. Observe and record how the increased wave size affects the motion of each cork.

9. Let the water settle. With an erasable marker, mark the water level on the outside of the aquarium. This line represents "sea level."

10. Hold a ruler vertically beside the aquarium and make small waves with your hand again. Measure the heights of the crests and troughs of these small waves and determine the wave height (*Hint: the wave height is the difference between the heights of the crests and the troughs. You can also think of it as the distance from the height of the crests to the height of the troughs*).

11. Repeat Step 10 for larger waves.

Observations

Table 1: The effect of waves on submerged corks

	Cork 1	**Cork 2**	**Cork 3**	**Cork 4**	**Cork 5**
Depth (inches)					
Effect of smaller waves					
Effect of larger waves					

Table 2: Wave heights

	Wave height (inches)
Smaller waves	
Larger waves	

Analysis

1. When waves were small, which corks moved?

2. When waves were larger, which corks moved?

3. How deep did the effect of the small waves go? The larger waves?

4. Is there a relationship between wave height and the depth to which the effects of the waves' energy can be observed? Explain.

Conclusions

In your own words, explain how deep the effect of the energy of a wave can be felt and the relationship between wavelength and height to wave depth.