Beaches

Introduction
According to some estimates, 50 percent of the population in the United States lives within 50 miles of a shoreline. Beaches provide a source of income for many residents. Coastal management has become a growing concern as beaches are increasingly used for resources and recreation. The supply of sand for many beaches has been cut off by dams built on rivers and streams that would otherwise carry sand to the sea. Waves generated by storms also continuously wear away beaches.

Most waves approach the beach at a slight angle. As these waves approach the beach at an angle, they set up a current called a longshore current. A longshore current moves parallel to the beach and in the same direction that the waves were moving in deep water.

In this investigation, you will examine a model showing how the forces generated by wave action build up, shape, and wear away beaches.

Prelab Preparation

2. One day before you begin the investigation, make two plaster blocks. Mix a small amount of water with the plaster of Paris until the mixture is smooth. Before you pour the plaster mixture into the milk cartons, add five or six small rocks to the mixture for added weight. Let the plaster harden overnight. Carefully peel off the milk carton.

Procedure
1. Prepare a stream table or other similar large, shallow container. Make a beach by placing a mixture of sand and small pebbles at one end of the container. The beach should occupy about one fourth of the length of the container.

2. In front of the sand, add water to a depth of 2 to 3 cm. What happened to the beach when water was first poured into the container?

3. Using the large wooden block, generate several waves by moving the block up and down in the water at the end of the container opposite the beach. See Figure A.
Continue this wave action until about half the beach has shown some movement. Describe the beach after this wave action has taken place. What happened to the particles of fine sand?

4. Predict what will happen to the beach if it has no source of additional sand.

5. Remove the sand and rebuild the beach.

6. In some places, breakwaters have been built offshore to protect beaches from washing away. Build a breakwater by placing two plaster blocks across the middle of the container. Leave a 4-cm space between the blocks. See Figure B.

7. Use a wooden block to generate waves as in Step 1. Record your observations.

8. Drain the water and make a new beach along one side of the container for about half its length. See Figure C. Predict what effect a longshore current would have on sand just offshore. How would this affect sand on the beach?

9. Using the wooden block, generate a series of waves from the same end of the container as the end of the beach. See Figure C. Record your observations. What happened to the beach? What happened to the shape of the waves along the beach?

10. Rebuild the beach along the same side of the container.

11. A jetty or dike can be built out into the ocean to intercept and break up a longshore current. Place one of the small plaster blocks in the sand to act as a jetty. See Figure D.

12. As you did before, use the wooden block to generate waves. Describe the results.

13. Remove the wet sand and place it in a container. Dispose of the water. **NOTE: Follow your teacher's instructions for disposal of the sand and water. Never pour water containing sand into a sink.**

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**Analysis and Conclusions**

1. How does wave action build up a beach? How does wave action wear away a beach?

2. How do longshore currents change the shape of a beach?

3. What effect would a series of jetties have on a beach?

**Extensions**

1. What can be done to preserve a recreational beach area from erosion as a result of excessive use by people?

2. What can be done to preserve a recreational beach area from being washed away as a result of wave action and longshore currents?