

Core Sampling

Adapted from “ODP: From Mountains to Monsoons”
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Key Concepts:

1. Conditions on the Earth have changed over time.
2. Sediments on the ocean floor contain evidence of the earth’s history.
3. Core samples taken from the ocean floor can be used to help reconstruct what has happened in the Earth’s past.

Summary of the activity

Students take core samples from a sediment sample prepared by the teacher. Using information provided by the teacher, students hypothesize possible conditions on the Earth’s surface that would have resulted in the series of sediments.

Materials:

For the teacher:

- overhead transparency drawing of the earth
- fine sand
- water
- food coloring: red, blue and yellow
- coffee can or similar opaque container

For each team:

- sediment sample (prepared by the teacher in advance)
- clear soda straws

Teacher Preparation

Preparing the sand

- A day or two before class, prepare sediment samples where the students will take their core samples.
- Dampen the fine sand enough so that it holds together in your hand.
- Place half of the sand in one container. You will color this sand blue.
- Divide the remaining sand evenly between two other containers. One of these samples will be colored red and the other will be colored yellow.
- Add enough food coloring to the samples so that they are well-colored. Mix well.

Making the sediment samples

- The samples will have 4 layers, one layer of red, one of yellow and two layers of blue sand.
- Put a layer of red sand in the bottom of the container.
- Pour in a layer of blue sand.
- Add a layer of yellow sand.
- Finish off with a second layer of blue sand.
- Make a sediment key that shows the following:
 - Blue Sand = Shallow Water
 - Red Sand = Deep Water
 - Yellow Sand = Beach Sand

Procedure

1. Share the following information about sediments with the students.
 - By studying the sediments on the ocean floor, we can gather clues about what surface conditions were like at various times in the Earth's past when the sediments were deposited. Using those clues, we can try to reconstruct what might have happened during the Earth's past. What was living at the time? What was the climate like? Where were the sediments in relation to the magnetic north pole?
 - The ocean basins are a receptacle for weathering products of rock and minerals on lands.
 - Particles from the atmosphere, such as pollen and volcanic ash eventually settle out and fall into the ocean.
 - Particles from the land are transported to the ocean by rivers and streams.
 - Eventually these particles settle out of the water and fall to the ocean floor.
 - Different particles have different characteristics, such as color, hardness, chemical composition and such.
 - As the particles pile up on the ocean floor, they begin to exert pressure on the sediments below. Over time, the deposits become sedimentary rock.
 - By studying the mineral composition, structures and textures of ancient rocks, we can learn a lot about the physical environment when the sediments were deposited.
 - Changes in sea level can also affect sediment composition. When sea level is lower, light penetration is closer to the ocean bottom. Plant material has a better chance of making it to the ocean floor before it is consumed.
 - In low sea level conditions, areas that were previously quite far from the coast may now be very close. As a result, the sediments would contain more rocks, gravel, sand and particles from the land.
 - Each layer of sediment represents a finite period of time and the kinds of sediment tell us what the conditions were at the time of deposition.
 - Terrigenous sediments, those derived from the land, include both organic (shell) and inorganic (rock) components. Generally found in shallow water and containing some coarse materials such as gravel, sand, silt, mud, terrigenous sediments provide us with information about the land, how steep it was, the rates of erosion. Deposits off mountainous coasts differ from those off coastal plains and sediments derived from glacial terrains have distinct properties that indicate their origin. About 90% of the terrigenous sediments settle out on the continental margins within a few hundred kilometers of their sources. Very fine-grained terrigenous sediments that have settled grain by grain in the deeper parts of the ocean cover about 74% of the ocean floor.
 - Biogenous material, material derived from living things, tells about water temperature and presence of radioactive materials. In some cases, parts of living things may be fossilized in the sediments.
 - Scientists use core samples to investigate the various layers of sediments that have collected on the ocean floor over time.

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Student Materials

1. Your teacher will provide you with a “sample seabed” from which you will take a series of core samples.
2. Using a clear soda straw, hold the straw by one end, orient it vertically over the seabed and gently push it into the sediment. Twist the straw, seal the top end with your finger and pull it out of the sediment.
3. Lay the straw down on a piece of white paper. Do not try to remove the sediment from the straw.
4. Draw a picture of the sediments in their original orientation. Which sediment was the deepest? Which was the oldest? Which was the youngest? How do you know?
5. Your teacher will provide you with some information to help you “identify” the sediments in your core.
6. Using that information, describe the changes in water depth over time where the core was taken. What are some possible explanations for this change in water depth over time?
7. These possible explanations are hypotheses. How could you test the hypotheses? What other information would you need? What would support your hypothesis? How could you determine which was the best explanation for the change? What would we expect to find in real sediments that demonstrated this change?
8. With your group, create a simple but reasonable geologic history story that would involve change in sea level, location and/or climate over time. Decide what types of sediments you would need and what order they would be found. Later you will have an opportunity to prepare this sample to be analyzed by your classmates.