

## What Can We Learn From The Sediment Record?

Adapted from: COAS Suitcase Oceanography, Earth Materials  
<http://www.coas.oregonstate.edu/index.cfm?content.display&pageID=99>

### **Purpose:**

This activity introduces students to sediment stratigraphy and the sources and types of sediment and rocks in the oceans.

### **Materials:**

Opaque paper cups	Clear straws
Play dough	Small clear cups
3 colors of sand: white, black, brown/red	Sediment sources/Seafloor handouts
Example core worksheet	Core activity worksheet
Glossary	Interesting Facts
Instructions	

### **In Advance:**

- Prepare the cups with layered sediments using different colored sand. Add water to 12-oz paper cups, and then carefully add colored sand to form two or three layers at the bottom of the cup. Each layer should be about 2-cm thick. You would need about 6 cups for a class of 30.
- Cut the straws in half and prepare small cups with play dough at the bottom for the students to set their straws in.
- Set up stations for 2-3 kids to work as partners. Each station should have a cup with sediments, straws, small cups with play dough and colored pencils.

Review concepts. Ask students to name one thing they can find in the bottom of the oceans and how did it get there. If you recovered this material back from the seafloor, how would it look? Review the information in the NOAA Ocean Explorer packet for more background.

### **Collecting Sediment Samples**

How do oceanographers know what is in the bottom of the ocean? Sometimes they go to the seafloor in submarines, but more commonly they collect samples from ships by collecting sediment "cores." In this activity students will model collecting sediment cores.

Show them examples of cores recovered by oceanographers from various parts of the ocean (on the handout). Ask questions: What do these sediments mean? How are they different. Why are they different?

Distribute hand-outs and tell them we will explain where the rocks and sediments in the bottom of the ocean came from.

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**Undersea Volcanoes**

(You will need "Processes that contribute to seafloor deposits" handout and a map of the ocean floor)

What is the most common rock one finds in the bottom of the oceans, why? *A: Basalt, because it forms at sea floor spreading centers from volcanic activity. New ocean crust is made of basalt.*

Talk about different types of rock, which ones originated in the ocean (for example, limestone, basalt, and sandstone)? Calcite is also formed in the ocean by organisms such as plankton, coral, clams, and other bivalves in their shells that accumulate at the bottom of the ocean when the organisms die.

**A. Seafloor Eruptions**

Note undersea mountain chains on the bathymetric seafloor map. Explain that there are submarine volcanoes, which put out lava that forms oceanic crust (basalt). This is the longest continuous chain of volcanoes in the planet. If all the new rock formed every year along mid-ocean ridges were poured into the Grand Canyon, the entire Grand Canyon would be filled in 8 to 10 years. (~20 cubic kilometers of new oceanic crust are formed every year). The Hawaiian islands are made mostly of basalt.

**B. Hydrothermal Vents**

The areas around spreading centers have cracks. As seawater descends into the region of partly molten rock beneath the mid-ocean ridge, it heats up to 300-400°C and becomes extremely corrosive. This hot fluid is capable of dissolving the surrounding basaltic rock and leaching out metals and other elements. The most spectacular of these vents are called black smokers, the "smoke" that comes out of chimneys consist of metallic sulfide particles that precipitate out of the vent fluids as it mixes with seawater.

**Sedimentation**

Ask the students to name other ways materials can be put into the oceans (cover the ways they don't bring up – give local examples where possible). Refer to the chart with illustrations.

**Demonstration:**

1. Reiterate that lava forms rocks (basalt) at the seafloor and put the 'basalt' (any rocks you have on hand) samples in the bottom of a large beaker. Add some black sand to illustrate volcanic/hydrothermal deposits.

2. Add more colored sand to the dish to illustrate deposition. Explain that we are using colored sand to demonstrate these processes (White = Animal Shells; Black = Volcanic Ash; Brown = Clays from Rivers). In the ocean, there is sand, clay, and silt. Clay and silt have much smaller particles and settle more slowly. (If you have access to some, bring in some mud and put it in another beaker to show that this takes a long time to settle.)

3. Use a straw to "core" sediments from the beaker, and show students how to do it. Make three "cores." Seal them with playdough and pass them around.

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4. Show them the real cores in the handouts and explain that these get cut lengthwise for curation (saving and preserving) and study. (You saw these at the COAS Core Lab!)

5. The deeper sediments are older, so an individual core can tell us something about the history of a place in the ocean (e.g. volcanic eruptions shown by ash layers, periods of high productivity shown in layers of white calcium carbonate (animal shells), major inputs of sediment like red/brown river runoff.) Reading the layers of sediment is called stratigraphy. Note that, after the sediments get buried, they change with time, from shells to marble.

6. Ask the students to look at the "core" pictured on their worksheet. Help them answer the questions in the sheet.

### **Coring with Straws Activity**

The purpose of this study is to reinforce the concept of stratigraphy and sediment source. Each student will collect material from the bottom of the cup and reconstruct the "history of sedimentation" in their "model basin". You can ask the children before they begin whether they know what is at the bottom of their ocean, and how are they going to find out. Look at the worksheets, and ask them to "predict" what the sediments would look like. Remind them that because you have given them no information as to the location of this "ocean", it is not possible for them to guess, but they can take a sample to help them answer this question. Remind them that this is a model. Use white sand to represent animal shells, black sand to represent volcanic ash, and brown sand to represent clays delivered from rivers (refer them to the laminated chart on their trays). Tell the children that it is important not to move the cups, because this can disturb the sediments at the bottom. Demonstrate how to use the straw to sample, remind them to use their fingers at the top of the straw to avoid the sand spilling out after the sand is cored. Put the straw with the sand in the cups containing play dough, so that the sediments don't come out and they can make their observations. Ask them now to fill in the rest of the worksheet.

### **Optional Adaptation: Cupcake Coring!**

If you have the time and ambition, this activity can also be done with cupcakes. Use three different colors of batter to make cupcakes in opaque cups. Once frosted (with blue frosting to represent the ocean!) the students won't be able to see the layers in their cupcake. The cake can be cored with straws in the same manner as above.