

## Details



**Completion Time:** About 1 Period

**Permission:** Download and Share

## Geologists in Training

### Overview

The study of rock and sediment layers, or stratigraphy, can be used to introduce students to the fundamental principles of geology and to lead into the idea of geologic time. In this lesson, students are introduced to Nicolas Steno's 3 major laws of stratigraphy: the law of original horizontality, the law of superposition and the law of lateral continuity, while they model the activities of real geologists.

### Objectives

Students can identify and explain Steno's 3 Laws of Stratigraphy. Students can apply the Laws of Stratigraphy to determine the relative ages of sediment layers. Students can describe the grain size, texture, color and thickness of sediments and then use these descriptions to draw a geologic cross-section. Students will use their understanding of tsunamis to identify a sediment deposit as a tsunami deposit and support their decision with evidence.

### Preparation

Students should have an understanding of geology as the study of the Earth encompassing its substances, shapes, processes and history; understanding of sediments, sedimentation, and stratigraphy; introduction to Nicolas Steno and his three major laws of stratigraphy; familiarity with tsunamis.

### Procedure

1. Describe how today students will create a model of how layers of sediments are deposited.

### Materials

- Student Journals
- About 1-2 quarts each of 6 samples of different soils, sediments and sand with varying grain size, texture and color – one should be representative of a tsunami deposit, i.e., a clean beach sand, perhaps with bits of shell
- Plastic spoons – one per group of 2 students
- Baby food jars – one per group of 2 students



2. Tell students that they will be gradually creating several layers of sediment in their cups. There are 2 important keys to this activity. First, it takes time for each layer to form, so listen to directions and don't rush. Second, sediment should be slowly sprinkled into the cup in a nice even layer, so don't dump spoonfuls in all at once or the layers on the bottom will be ruined by the sediment coming in from the top.
3. Ask students to pick one of the sediments and carefully, gently, and slowly sprinkle about 2 spoonfuls of sediment into the baby food jar.
4. Have students describe the first layer of sediment in their journals – focusing on grain size, texture and color.
5. Students should pick a new sediment type and add a second layer of about 2 spoonfuls on top of the first. Remind students to add the sediment slowly by sprinkling and to try and distribute it over the entire lower layer.
6. After students have described the second layer's grain size, texture and color in their journals, ask them to describe the surface of each layer. Answers should resemble: "It's flat." "It's even." "Even though the gravel layer is bumpier than the other surfaces, all the layers are flat." Probe a little deeper and ask why the layers are flat. Answers might include: "Because of gravity." "Because the sediment drifts down through the water and collects on the bottom."
7. Summarize these ideas and formalize it as the law of original horizontality. "Law of Original Horizontality – When layers are deposited, they settle in flat, horizontal layers."
8. Students should then add a third layer to their cup. Spend a moment making observations and writing descriptions.
9. Ask students about what happens at the sides of the cup. Are there walls or sides on a lake or in the ocean or in a delta? How far would the layer continue if there were no walls? Discuss the spread of sediments in the real world. If it seems appropriate, suggest a mini-experiment that students can try in their cups, such as adding just a pinch of sediment or sprinkling sediment just in one place as the sediment flowing from a river might be dumped into a lake just in one place.
10. Summarize these ideas as the law of lateral continuity. "Law of Lateral Continuity - when a sediment layer is laid down, it will extend in all directions until it runs out of material or hits a wall."
11. Students should then add another layer to their cup and again spend a moment making observations and writing descriptions.
12. Ask the students about the order of the layers. Where is the first, the oldest, layer? Where is the most recent layer? Discuss the ordering of layers.
13. Summarize these ideas as the law of superposition. "Law of Superposition - in an undisturbed series of sediment layers, the youngest layers are on the top and the oldest layers are on the bottom."
14. Discuss what "undisturbed" means and what they could do to the cups to mess up that order. Answers might include: "Stir it up." "Turn it upside down." "Tilt it sideways." "Crush the cup."
15. Ask the students what might happen in the real world to disturb sediment layers that



form. Answers might include: "Erosion." "Bulldozers." "Earthquakes." "Scientists." Discuss how each of these disruptions might affect the sediment layers.

16. Instruct the students to measure the thicknesses of their layers and add this to their descriptions. Then they should identify which of the layers they think is the tsunami deposit and justify their decision.

### **Extension**

Student could use their written descriptions to draw a cross-section (side-view picture) of their sediment layers, with a label for each layer with its description. They could also write a paragraph below the picture describing the sequence of events that created the layers in their cup. Students could use the Laws of Stratigraphy to determine the order of geologic events in another group's baby food jar or in example cross-section drawings.

### **Resources**

As I developed this lesson I came across an online activity authored by Irene Salter at the "My Science Box – hands-on curriculum for the adventurous teacher" website that incorporates instruction on the Laws of Stratigraphy with the building of stratigraphic sediment layers. I borrowed some of her lesson structure and modified it for my purposes – to address sediments instead of rocks and to include the idea of tsunami hunting. The original "Layers Upon Layers" lesson plan can be found at:  
<http://www.mysciencebox.org/rocklayers>

### **Assessment**

Students will be able to describe sedimentation, identify and explain Steno's Three Laws of Stratigraphy, and apply the Laws of Stratigraphy to describe sediment layers.

### **Credits**

Misty Nikula, [mnikula@whatcomday.org](mailto:mnikula@whatcomday.org)



**National Science Education Standards (NSES):**

**Content Standards, Grades 5-8**

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard D: Earth and Space Science

- a. Structure of the earth system
- b. Earth's history

**Other Standards:**