Introduction to Speleology: Three Great Caves of Oregon

**Grades:** Activities adapted for K-9  
**Subjects:** Oregon History, Geography, Social Studies  
**Suggested Time Allotment:** 1-2 Class Periods

**Overview:**

Caves are a great way to engage young learners with the subject of geology and earth sciences. The study of caves is known as **speleology**, and those who explore caves are called **speleologists**. Oregon boasts a number of large and impressive caves. Furthermore, because our state is so geologically diverse, there are excellent examples of different types of caves, formed by different geological forces.

This lesson will concentrate on three major Oregon cave systems: the **Oregon Caves of Josephine County**, the **Lava River Cave of Deschutes County**, and the **Sea Lion Caves of Lane County**.

A) The Many Types of Caves

Begin the lesson by informing the class that there are many different types of caves, which differ because of the various ways that they are formed. Students should become familiar with a number of different types of caves. The teacher may either choose to share this information with the class, or assign students research exercises to find the information themselves and share back with the class. Questions to guide their research: What are the earth forces that form this type of cave? What kinds of rock are they usually formed in? What are some typical shapes and features of this type of cave? Where are some places in the world where major examples of this type of cave can be found?

**Cave Types:**

- **Eolian Caves**—Formed by the wind, usually in sandstone.  
- **Glacier Caves**—Formed by the action of glaciers.  
- **Volcanic Caves**—Formed by the flow of lava and volcanic gasses.  
- **Sea Caves**—Formed in seashore areas by the action of waves.  
- **Talus Caves**—Formed by the uneven piling-up of large boulders.  
- **Tectonic Caves**—Formed by deep movements of the earth’s crust.  
- **Solution Caves**—Formed when acid and water dissolve soluble rock such as limestone.
Once the class has reviewed the various types of caves, next direct them to the Internet to learn more about some of the distinctive caves of Oregon. Three of our state’s most famous caves are classic examples of three distinct cave types. Can the class match each Oregon cave with its cave type?

(These are impressive examples of solution caves, or caverns, in marble rock, a form of limestone).

Sea Lion Caves: http://sealioncaves.com/home/
(This coastal grotto outside Florence is one of the largest sea caves in the world!)

Lava River Cave: http://en.wikipedia.org/wiki/Lava_River_Cave
(As the name implies, this cave is volcanic in origin.)

B) The Genesis of Caverns

‘Cavern’ is a term used to refer to particularly large, underground solution caves. These types of caves are formed by the dissolving power of natural acids—most typically, sulfuric or carbonic acid—in solution with water. When the acidified water percolates through small cracks and fissures in limestone rock (i.e. limestone, dolomite, marble) it gradually dissolves the rock until large caverns are eventually formed. A full description of the process can be found online here, as well as in most classroom earth science textbooks. You may also read about the process in a historic Oregon newspaper article from 1875: “Origin And Philosophy of Limestone Caves,” from Salem Willamette Farmer, June 4, 1875

Note that the impressive caves of the Oregon Caves National Monument were formed this way!

C) The Discovery of Caves in Oregon

Historic Oregon Newspapers features a number of articles about the discovery and early exploration of caves in Oregon. These materials can be shared with the class in order to give a historical perspective to the science lessons.

“Oregon Caves,” from Portland Sunday Oregonian, August 24, 1902

“Mammoth Cave In Southern Oregon,” from Salem Willamette Farmer, June 13, 1879

“Another Cave,” from Jacksonville Oregon Sentinel, May 7, 1879

“Find A Great Cave: Two Boys Find Immense Cavern Near Grants Pass,” from Salem Daily Journal, April 11, 1903

“Great Oregon Caverns,” from Portland Morning Oregonian, August 10, 1901

“Ice Caves Are Unique,” from Bend Bulletin, July 3, 1912
Class Activity: Grades K-4

Materials

- 1 box sugar cubes
- toothpick
- fish tank or clear plastic tub
- 1 spray bottle with water
- approx. 2 lbs. modeling clay

Procedure

- Have students loosely stack the sugar cubes against the inside the tank or tub, up against one of the sides. Do not make an even “brick wall”—leave gaps and spaces between some of the columns, and stack some higher than others. Explain how the sugar cubes represent deposits of limestone, and the spaces between the cubes represent natural cracks and fissures.

- Completely cover the sugar structure—sides and top—with approximately 1/8-inch of clay. Enclose the sugar entirely with clay, except for the “window” side where it can be viewed through the container. Make sure there are no gaps. This clay represents the surface layer of soil and non-soluble rock.

- Using a toothpick and pencil, poke several holes of varying diameter through the clay and into the sugar. These represent holes and gaps in the surface layer.

- Using the spray bottle, repeatedly douse the structure with water. This represents rainfall. Have the class observe through the side of the tank as the water drip through the clay and down into the stacked sugar cubes. What effects are observed? Repeat the spraying several times, dissolving more and more of the sugar.

- ALTHOUGH VINEGAR IS A WEAK ACID, NOTE THAT APPROPRIATE LABORATORY SAFETY PROCEDURES SHOULD BE FOLLOWED.
Class Activity: Grades 5-9

Materials

- limestone rocks
- a few types of non-carbonate rocks
- water
- vinegar
- pipettes or eyedroppers

Procedure

- Review the science behind the process of limestone dissolution by which caverns are formed. The two most important acids in forming natural caverns are carbonic acid and sulfuric acid. Explain that vinegar is an acid stronger than carbonic acid, but weaker than sulfuric acid.

- Distribute rock samples to students. Using pipettes or droppers, put drops of water on each of the rocks. Observe and record results. Next, instruct class to place drops of vinegar on the rocks. Observe and record results. Which of the rocks is carbonate limestone? The answer should be obvious, based on this experiment! (The limestone rock will bubble on contact with vinegar; non-carbonate rocks will not.)

- In jars or beakers, make mixtures of vinegar and water. Make a 50%-50% mixture, also a mix of 25% water-75% vinegar, and one that is 75% water-25% vinegar. Leave plenty of room between the surface of the mixed liquid and the rim of each container. Take three samples of limestone rocks, find the mass of each sample on a laboratory scale and record these numbers. Immerse a limestone rock in each of the three mixtures. Observe and record your observations. After period of time (usually a few days will suffice—depends on the size and density of the rocks) the samples should have become noticeably smaller. When this is observed, they should be removed from the liquid and dried. When they are completely dry, they can be reweighed on the laboratory scale. How much mass has each rock lost due to the dissolving action? How does this correspond to the strength (acid-to-water ratio) of each liquid sample?

- ALTHOUGH VINEGAR IS A WEAK ACID, NOTE THAT APPROPRIATE LABORATORY SAFETY PROCEDURES SHOULD BE FOLLOWED.