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## **Cavern Geology**

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### **Lesson 1: What is a Cavern?**

#### **OBJECTIVE**

Students will learn to identify the different types of caves.

#### **BACKGROUND INFORMATION**

##### **Cave or Cavern?**

Is there a difference between a cave and a cavern? This is a frequently asked question, and many people use the terms interchangeably. However, there is a difference. A cave is any cavity in the ground that is large enough that some portion of it will not receive direct sunlight. There are many types of caves (discussed in this lesson plan). A cavern is a specific type of cave, naturally formed in soluble rock with the ability to grow speleothems. So, although a cavern can accurately be called a cave (since it is a type of cave), all caves cannot be called caverns.

##### **Caves**

Caves can be classified into two main categories known as primary and secondary. This classification is based on their origin. Primary caves are developed as the host rock is solidifying. Examples of primary caves include lava tubes and coral caves (descriptions follow). Secondary caves are carved out of the host rock after it has been deposited or consolidated. Most caves fall in the secondary category. However, some primary caves may later be enlarged by the forces associated with secondary cave development.

Listed here are the main types of caves, and how they are formed:

##### **Coral Caves**

When colonies of coral in shallow water expand and unite, they form lacy or bulbous walls around an open area. When the shoreline is pushed up or the sea level falls, the cave is exposed. Waves and wind erode the coral, enlarging the cave, sometimes even destroying it.

##### **Eolian Caves**

Also known as wind caves. Wind erodes away the weak areas in sandstone cliffs.

##### **Glacier Caves**

Long tunnels form near the snouts of glaciers between glacial ice and the underlying bedrock. Water from the surface drains down through crevasses in the glacier. It enlarges the crevasses and melts away the ice at the base of the glacier.

### Ice Caves

There are two types of ice caves:

- The first is carved out of glaciers or snowfields by water and/or wind.
- The second is a rock cavity containing ice formations. As moisture in a cave is frozen it clings to the walls and continues to build up. When slight melting occurs or water enters the cave, it runs along the walls creating formations similar to calcite speleothems.

### Volcanic Caves

There are various forms of volcanic caves. They are all created from flowing lava and the effects of volcanic gases. Categories of volcanic caves include lava tubes, pressure-ridge caves, spatter cone chambers and blister caves.

### Sea Caves

Waves eroding away weak areas along sea cliffs create these caves which can be any size from crevices to large chambers.

### Talus Caves

Boulders pile up leaving passages underneath and between them.

### Tectonic Caves

A massive movement of bedrock separates rocks along joints or fractures. The cave created in this fashion is usually a small, high, narrow fissure consisting of a single passage. The ceiling is often a flat section of rock that did not move, or moved in a different direction. Massive, brittle rocks such as sandstone and granite are the best rocks for tectonic caves; however, they can also occur in basalt and limestone.

### Solution Caves

This is the category of caves that is classified as caverns. They are formed by the dissolution of soluble rocks such as limestone (calcium carbonate), dolomite (calcium magnesium carbonate), gypsum (calcium sulfate dihydrate) and salt (halite). When researching caves, the dissolution of limestone is usually the example given. For the purpose of this lesson we will also use limestone as our host rock. However, the conditions are basically the same for other soluble rocks.

## Cavern Genesis

Many people think that caverns are created by limestone bedrock being dissolved slowly by water. But limestone is not much more soluble than glass in water. So water alone could not form caverns. However, when ground-water contains an acid in solution it can and does make caverns.

Older traditional theories identified dissolved carbon dioxide as the probable cavern forming acid. When carbon dioxide dissolves into water it forms a weak acid known as carbonic acid. It is the same acid that gives carbonated beverages the bubbles and the pleasant "bite" on the tongue. It is however a very weak acid and would not normally be able to explain most of the world's caverns. Another gas, hydrogen sulfide, seems much better suited and is gaining wide spread acceptance as the probable primary source of the cavern development acid.

Hydrogen sulfide is available from many natural sources. It is generated by the anaerobic (oxygen free) decomposition of organic materials such as leaves, oil, coal and other natural deposits. It is also formed by the oxidation of sulfide deposits such as iron pyrite when it is exposed to weathering. It is produced in large quantities during volcanic actions and from geo-thermal springs and features.

When an underground source of hydrogen sulfide wells up and mixes with down-percolating oxygenated water from the surface the mixture of water, hydrogen sulfide and oxygen forms sulfuric acid.

Sulfuric acid has no trouble dissolving limestones, (common limestone, dolomite and marble), creating caverns. At first it slowly enlarges the cracks and joints of the bedrock and over time through a combination of dissolution and breakdown of weakened areas caverns are formed. The more hydrogen sulfide the larger the cavern. Some form very slowly over long periods of time with weak but long lasting sources of hydrogen sulfide while others form relatively quickly and sometimes gigantically with strong but short lived sources. Most, if not all, major cavern systems form this way. It may be possible that a few systems were formed by, or at least modified, over time by the action of weak carbonic acid while still others were formed by corrosive underground acidic brines but the large majority were formed by sulfuric acid

Carbonic acid does play a major part in how caverns look. It is mostly responsible for the "decorations," such as stalactites, stalagmites and flowstones that are formed which make caverns so delightful to look at. The solution of carbonic acid and limestone (calcium carbonate) forms calcium bicarbonate which when reaching the cavern interior can deposit calcite (calcium carbonate) that makes the formations within the cavern, and can even entirely fill the cavern.

## Cavern Geography

Because the dissolution of limestone takes place under the surface in the bedrock, a cavern may not have an entrance. Most entrances are formed after a cavern is formed. Entrances may be created by a valley enlarging and exposing a section of the cavern on the side of a hill, the collapse of a sinkhole, or the intrusion of man's developments into the surface.

Limestone caverns are commonly found in karst terrain. Karst comes from the Slav word krs meaning crag or stone. The word became a term to describe the rocky region along the Dalmatian coast of the Adriatic Sea. Karst terrain is generally characterized by bare rocky ground, sinkholes, underground rivers and the absence of surface streams and lakes. It should be noted that a karst area does not necessarily contain a lot of caves and at the same time an area with extensive caves may have little karst terrain.

## Experiments & Activities

### Grades K - 4 "Dissolution Experiment"

#### Materials

- 27 or more sugar cubes/toothpicks
- A clear fish tank with straight sides
- 1 spray bottle with water
- 2 lbs. modeling clay

#### Procedure

- Stack the sugar cubes against the inside of the fish tank. Make the structure at least four cubes high and wide, and three deep. For a more realistic look, a few columns may have one or two more cubes. Explain how the sugar cubes represent large areas of limestone and the spaces between the cubes represent the natural cracks and fissures in the limestone through which water travels.
- Cover the sugar structure with approximately 1/8-inch of clay. Make sure there are no gaps. The clay represents the surface dirt.
- Using the toothpick, poke several holes through the clay into the sugar. This will allow water to seep through.
- If needed, you can explain dissolvability by dissolving salt or sugar in a glass of warm water.

### Grades 5 – 8 "Dissolution Experiment"

#### Materials

- white vinegar
- shallow pan
- eye droppers
- samples of rocks, one of which is limestone.

#### Procedure

- Explain that it is sometimes possible to tell what minerals rocks are composed of by their physical properties such as appearance, grain size, hardness, texture, color, and whether they can be dissolved.
- Remind the students of the dissolution process of limestone explained in "Background Information." Explain that vinegar is an acid stronger than carbonic acid, but weaker than sulfuric acid.

- Place the rock samples in the shallow pan. Using the eye dropper, start coating the rocks with the vinegar. This is known as the "Bubble Test." The limestone piece will bubble as it dissolves while the other rock(s) will not. (This is a vivid demonstration, be prepared to allow each student enough time to try it).
- Ask the students to identify which rock is limestone.

### **Grades 9 – 12 "Dissolution Experiment"**

#### **Materials**

- two beakers
- 20% solution of hydrochloric acid (also known as muriatic acid)
- a sample of limestone
- a sample of non-carbonate rock

#### **Procedure**

- Partially fill two beakers with the acid.
- Weigh and measure each rock.
- Place them in separate beakers and watch what happens. The limestone will fizz and the non-carbonate rock will not react.
- Check the beakers every 15 minutes. (The dissolving action will stop if either the acid or the calcite is no longer available to react. If this happens, either add more acid or break the limestone to expose more calcite.) In about one hour the limestone sample will be noticeably smaller.
- After drying, the samples can be weighed and measured again to determine the changes.

Note: appropriate laboratory safety procedures should be followed when working with hydrochloric acid.

# Cavern Geology

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## Lesson 2: Speleothem Construction

### Objective

Students will learn to explain the process by which underground rock formations grow.

### Background Information

Geologists refer to cavern formations as speleothems, derived from the Greek words spelaion meaning cave and thema meaning deposit (in Europe they may be referred to as concretions). Speleothems are crystalline formations that grow by continual deposits. Since the definition of "cavern" is a cave formed in a soluble rock with the ability to grow speleothems, the composition of a speleothem will depend on which soluble rock the cavern is formed in. For instance, gypsum caverns will have gypsum formations and so on. For the purpose of this lesson plan, we will concentrate on the most common cavern type – limestone.

As cold rainwater falls it picks up oxygen and carbon dioxide in the air. Once it is on the ground and seeping through surface soils it may pick up additional carbon dioxide from decaying plants. This solution of water and carbon dioxide forms a weak acid called carbonic acid. As this acid continues to make its way into the earth, following small cracks in the rock, it erodes small amounts of limestone. The dissolved limestone (calcium carbonate) is added to the solution, now creating calcium bicarbonate (the mixing of two carbon compounds).

In the process of becoming calcium bicarbonate, the solution becomes somewhat pressurized and warms up. When it reaches the open air, the pressure is relieved by releasing the carbon dioxide. In doing so, it can no longer hold the calcium carbonate and must release it as well. (The release of the carbon dioxide is similar to what happens to a soda pop when it gets warm and goes flat. Notice the similarity in the names carbonation and carbonic acid) When the calcium carbonate leaves the solution, it crystallizes into a calcite circle around the water drop. There is often still some calcium carbonate left in the water. When it drops and hits the floor, the warmth created from the impact forces the rest of the calcite to leave the solution. Over many thousands of years, layers of calcite deposits build up on the ceilings, walls, and floors of the cavern forming a variety of formations. The shape of speleothems is determined by the different ways in which water drops into the cavern. Dripping water will form different shaped formations from splashing or seeping water. (Some of the most common speleothems and how they grow are discussed in Lesson 3.)

Several factors effect the rate of growth for cave formations. The temperature outside, which affects the rate in which plants decay in the soil (amount of carbon dioxide in the soil), and the amount of rainfall are the two most important factors. From year to year the growth rate may change, even from one formation to another in the same area of a cavern. Therefore, there is no definitive answer to the question "how fast do they grow?" However, a feasible growth rate for some formations might be 1 millimeter every 100 years.

Aragonite is a heavier and denser form of calcite. Some formations have been found to have alternating layers of calcite and aragonite. The purest form of calcite and aragonite deposits is clear to a translucent white. Most speleothems have a solid white appearance. When formations have hues of other colors such as red and green, it is due to other minerals and organic materials that were on the surface which dissolved and were brought in as part of the calcite solution.

Small, slightly separated areas of a larger cavern are referred to as grottos. The term grotto also refers to a highly decorated natural or artificial cave. In antiquity these natural caves were regarded as dwelling places of divinities. The crystalline structure of speleothems can be very porous. This can be a problem if people touch them. The natural oils in our skin will rub onto the formation leaving a light coating of oil. While one touch has minimal effect, many deposits of oil over time prevent any further growth. When calcium solution runs over the formation it normally leaves a layer of calcite behind. However, the human oils create a coating that the calcite cannot cling to. In a sense, the formation is now dead. We can see this same effect when washing a car that is waxed - the water beads up and runs off. Whereas, when washing a car that is not waxed, water tends to cling to the car. It is very important that people do not touch any surface in a cavern. (See the People & Caverns "Conservation" lesson plan for an activity related to this subject)

All of the Sierra Nevada Recreation Corporation caverns (Boyden, Moaning, California and Black Chasm) are profusely decorated with aragonite and calcite speleothems.

# Experiments & Activities

## Grades K - 4 "Crystal Growing Experiment"

A crystal growing experiment can be a great demonstration of how speleothems grow. Included in this lesson plan is an experiment that can be adapted for the K - 4 grade levels. In addition, students can do a simple sugar crystal growing experiment, or grow popcorn rock (kits are sold in our Nature Gift Shops).

- Explain how layer upon layer of the material continues to deposit in the same place, creating the "growing" effect.
- Growing two experiments simultaneously gives you the opportunity to use one as an example of how humans can destroy formations by a single touch. Allow a few students to handle the crystals and see what happens.

## Grades 5 - 8 "Crystal Growing Experiment"

### Materials

- 2 pieces of 12-inch cotton yarn or string (cotton yarn wicks liquid better than acrylic yarn)
- 4 jars of the same size
- 2 saucers
- washing soda (sodium carbonate) (substitute Epsom Salts if washing soda is unavailable)
- baking soda (sodium bicarbonate)
- warm water and mixing container
- student worksheets, included
- optional: magnifying glass, pictures of speleothems

### Procedure

Explain to the students that this experiment will show how water can deposit minerals to create cavern formations, also known as speleothems. Explain that this process in a cavern takes thousands of years. The students will be creating their formations by using a salt-based chemical compound. This will speed up the process by using concentrated solutions and the sun's help in evaporation.

Lead the students through the following demonstration or instructions:

- Dissolve as much of the washing soda/Epsom Salts as you can in very warm water. Arrange two jars on a windowsill with a saucer in between. Fill them about half way with the supersaturated solution.
- Tie a weight (such as a paperclip) to each end of a piece of yarn. Soak the yarn in the solution. Place the yarn so that each end is well inside the water solution in each jar and the middle is over the saucer. Make sure that the loop of the yarn is hanging lower than the water levels inside the jars. (See diagram on included worksheet).
- Put just a touch of dry washing soda on the saucer.
- Leave the jars for several days.
- The solution in the jars will wick along the yarn, then drip off at the low point in the middle onto the saucer. Deposits should build up on the saucer and hang from the yarn and may eventually connect to form a "column."
- Set up the second set of jars at the same time. Follow the same procedure except use the baking soda instead of the washing soda. Within 48 hours, students will notice the crystals look very different by comparison. (They will look like a delicate cavern flower.)
- Label the first set of jars A and the second set B. (A different drop of food coloring in each of the solutions, when mixing, will make it easier for younger students to discuss differences.) Have students check the experiment daily and record the results on the "Growing Cavern Crystals" worksheet included.

## Grades 9 - 12 "Crystal Growing Experiment"

Using the same experiment as described above, students can observe effects on the deposition process by manipulating some of the variables, such as varying solutions by concentration and by environment (light and dark locations, warm and cool, or sealed and open). Have students predict what might happen. After results are recorded and compared, ask the following questions:

- Which conditions were the most favorable for growth?
- What do these conditions have in common?

## Cavern Geology

### Lesson 3: Types of Speleothems

#### Objective

Students will learn to identify several types of speleothems that are commonly found in limestone caverns.

#### Background Information

Continuing with the limestone cavern example, the terminology used in this lesson will reflect this cavern type. However, the names of speleothems are defined by their shape regardless of the material they are created from.

As mentioned in Lesson 2, formations begin when calcium bicarbonate enters the cavern and the chemical balance of the solution alters, forcing the calcium carbonate to deposit on the surface of the cavern ceiling or wall it entered through. The path of the watery solution from there is what determines the shape of the eventual speleothem as it deposits calcite along the way.

Listed below are some of the most common forms of speleothems and a brief description of how each is created. There are several other speleothem formations found in caverns around the world. Some are very rare, found only in unusual conditions.

**Soda Straw** - Formed when the solution first enters the cave from the ceiling and the calcite crystallizes around the drop forming a ring before the drop falls. As drop after drop continues to enter the cave at the same point, the water will then travel through the rings deposited before them, building ring upon ring at the end of the last one. Over time, the result is a thin, hollow tube that resembles a straw.

**Stalactite** - When a soda straw is forming, the solution will also deposit calcite along the inside of the tube as it travels through it. Eventually, the straw will become solid. At that point, as the solution continues to want to enter the cave at the same point, it is forced to the side of the tube, then runs down the outside. Over time, the result looks like an icicle.

**Stalagmite** - As the watery solution falls from the ceiling, it lands on the floor or a ledge where it splashes or runs over an area, leaving the remaining calcite in its wake. The continued deposits build into a mound.

Note: while a stalactite and a stalagmite are formed from the same drops of water, the nature of their growth means that a stalactite may possibly grow in length faster than a stalagmite will grow in height. However, the stalagmite will most likely be wider than the stalactite. There are two easy ways to help your students remember the difference between a stalactite and stalagmite:

- Stalactite is spelled with a C for ceiling  
Stalagmite is spelled with a G for ground
- A stalactite holds "tite" to the ceiling  
A stalagmite "mite" reach the ceiling someday

**Column** - Usually a stalagmite is directly below a stalactite. Over much time they may finally meet. As calcite continues to run down the length of the stalactite, it now continues to run down the connected stalagmite smoothing the connection point. Some columns have been together for so long it is hard to tell where the two formations first joined.

**Flowstone** - Similar to the formation of a stalagmite. However, the area receiving the deposit has a slope to it, so the water runs down the slope in a wide spread. A flowstone can cover a large area.

**Drapery/ bacon strip** - When a water drop emerges on a vertical wall, gravity drags it down the side of the wall depositing calcite in a line. Each additional deposit builds up this fine line until it looks like hanging material. Draperies with red hues, caused by iron and other minerals in the calcite solution, look like bacon strips.

**Rimstone Dam** - (also known as Gours in Europe) Depressions in the cave floor may collect saturated water. The calcium in the solution will deposit around the edge of the pool. Eventually the deposits build up so high that more and more water can be held. The calcite deposits act as a dam.

**Cave Pearl** - (also known as Oolites) If a pebble is in a rimstone pool, the saturated water will coat it. As water drops continue to fall in the pool, they cause ripples which gently roll the pebble, giving it a smooth coating.

## Experiments & Activities

### Grades K - 4 "Create a Cavern"

Build a cavern bulletin board or diorama. Students can cut and paste, draw pictures, or create three dimensional artwork.

Students may also create a classroom cavern. (This is done by draping three sides of a table with a dark cloth or using a large box) Suggestions include: narrow tubes (paper towel holders) for soda straws, cones for stalactites and stalagmites, crumpled balls of paper to "build" flowstone. Glue or tape the formations into the display.

### Grades K - 4 "Memory Game"

Make two copies of the speleothem pictures form (included with the worksheets).

Paste onto construction paper or cardboard and cut into cards.

Play the memory game - lay the cards upside down on a table in no particular order.

Students take turns turning over two cards. When they match two identical cards, they remove them. The player with the most matches wins.

### Grades K - 4 "Flash Cards"

Make one copy of the speleothem pictures form (included with the worksheets).

Paste onto construction paper or cardboard and cut into cards.

Write name of formation on back of cards.

Use as flashcards.

### Grades 5 - 8 "Speleothem Identification Activity 1"

Match drawings of formations with their names using the "Speleothem Match" worksheet included.

Grades 5 - 8 "Speleothem Identification Activity 2"

Draw a cave using at least 5 of the formations using the "Draw a Cavern" worksheet included.

### Grades 9 - 12 "Speleothem Research"

Besides the speleothems covered in this lesson plan, there are several other varieties, including helictites, cave coral/popcorn, shields, aragonite flowers and false floors. Students can research these different types and how they grow.

# Cavern Geology

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## Glossary

**anaerobic soils:** soils without oxygen

**bedrock:** the solid rock beneath the looser soils of the earth's surface

**calcite:** a mineral composed of calcium carbonate

**calcium carbonate (CaCO<sub>3</sub>):** a mineral compound that is the main mineral in rocks such as limestone, marble, calcite, aragonite and chalk

**calcium bicarbonate (CaHCO<sub>3</sub>):** a combination of calcium carbonate and carbon dioxide (the "bi" represents the two elements of carbon)

**carbon dioxide (CO<sub>2</sub>):** a heavy, odorless, noncombustible gas that is in the air. People and animals expel it when breathing out, and plant life absorbs it

**carbonic acid (H<sub>2</sub>CO<sub>3</sub>):** an acid formed when water mixes with carbon dioxide

**consolidated:** the act of becoming solid. The joining of multiple elements into one

**crystalline:** made of, or similar to crystal

**crystallize:** to become crystalline

**dissolve:** to disintegrate

**dissolution:** the process of changing from a solid form into a fluid form

**erode:** to gradually wear away

**genesis:** the origin or beginning of something

**geography:** the study of the earth's natural features, weather and life

**geology:** the study of the origin and structure of the earth itself

**geothermal:** of or relating to the heat of the earth's interior

**grotto:** either a highly decorated cave, or a decorated cave-like area

**hydrogen sulfide (H<sub>2</sub>S):** formed when anaerobic (without oxygen) bacteria interacts with organic material

**karst:** area rock that has much dissolution

**pressurized:** subjected to high pressure

**saturated:** to thoroughly soak with water until it cannot hold any more

**sinkhole:** a depression in the surface caused by the dissolution of the rock beneath

**solidify:** to become solid

**soluble:** capable of being dissolved

**solution:** a fluid form of a dissolved substance

**speleothem:** the scientific term for a cavern formation. Comes from the Greek words "spelaion" meaning cave, and "therma" meaning deposit

speleological: referring to the science of caves

**sulfuric acid (H<sub>2</sub>SO<sub>3</sub>):** a colorless, oily, highly corrosive fluid solution that dissolves limestone

**translucent:** semi-transparent

**volcanic:** pertaining to volcanoes, being able to erupt

# Cavern Geology

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## Recommended Reading

### **Caves & Caverns – an activity book**

by Kate Coder, Audrey Taylor, and Ann Molosky  
Lincoln Caverns, Inc. ©1990  
pages 2-5, 29

### **Caves**

by Stephen Kramer  
Carolrhoda books, Inc. ©95  
pages 8-28

### **OurPlanet – Caves**

by Susan Rigby  
Troll Associates ©94  
pages 4-17

### **Looking Inside Caves & Caverns – X-Ray Vision series**

By Ron Schultz  
John Muir Publications, ©93  
pages 4-10, 20-38

### **Caves – The Wonders of our World series**

By Neil Morris  
Crabtree Publishing Co. ©96  
pages 4-15

### **Speleology - Caves and the Cave Environment**

by George W Moore and Nicholas Sullivan  
Cave Books, 64,78,97  
pages 7-78

Cavern Geology • Types of Speleothems • "Speleothem Identification" • Grades 5-8

# Cavern Geology

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## Speleothem Match

Draw a line from the name of the formation to the picture.

STALACTITES



STALAGMITE



COLUMN



SODA STRAW



DRAPERY



FLOWSTONE



HELICTITES



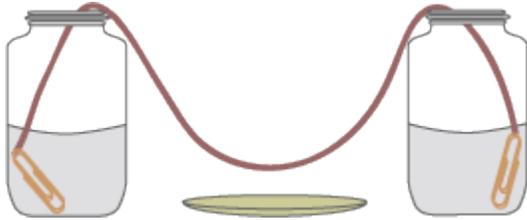
CAVE PEARLS



# Cavern Geology

## Growing Cavern Crystals

As you record your data, describe the size and shape of crystals. What differences do you see between A and B?



| RECORD DATA FOR A |  |
|-------------------|--|
| DAY 1             |  |
| DAY 2             |  |
| DAY 3             |  |
| DAY 4             |  |
| One week          |  |

| RECORD DATA FOR B |  |
|-------------------|--|
| DAY 1             |  |
| DAY 2             |  |
| DAY 3             |  |
| DAY 4             |  |
| One week          |  |

# Cavern Geology

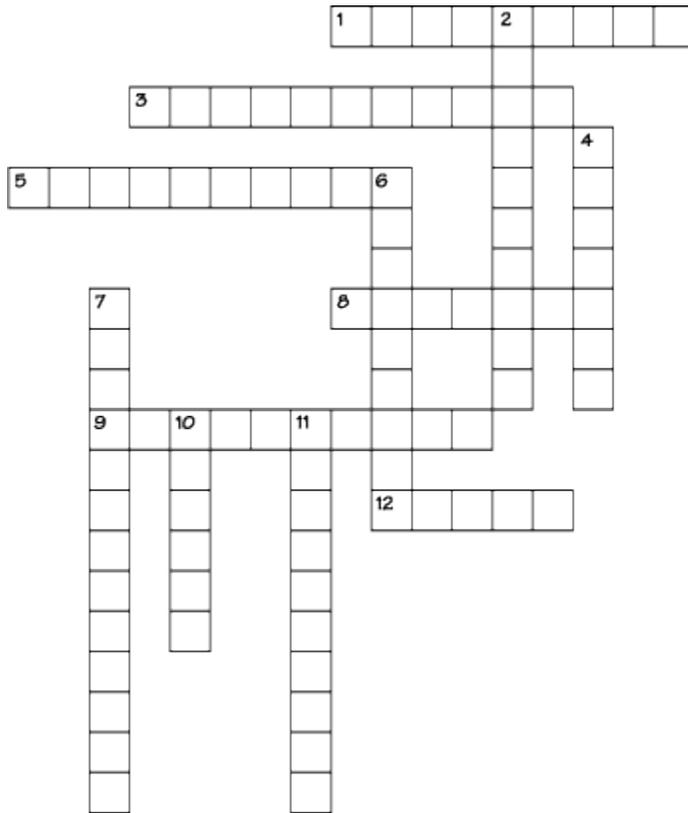
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## Types of Caves: Scrambled Words

|               |                         |
|---------------|-------------------------|
| NUTSOOLI      | — — — — — — — — — —     |
| CROLA         | — — — — — — — —         |
| ALIONE        | — — — — — — — —         |
| CRELIAG       | — — — — — — — — — —     |
| TROOGT        | — — — — — — — —         |
| CEI           | — — — —                 |
| VAAL BUTE     | — — — — — — — — — —     |
| EAS           | — — — —                 |
| SLAUT         | — — — — — — — —         |
| NECCITTO      | — — — — — — — — — —     |
| FAUT          | — — — — — —             |
| SKRAT         | — — — — — — — —         |
| CROK SLERTESH | — — — — — — — — — — — — |
| CLIAVOCN      | — — — — — — — — — —     |

# Cavern Geology

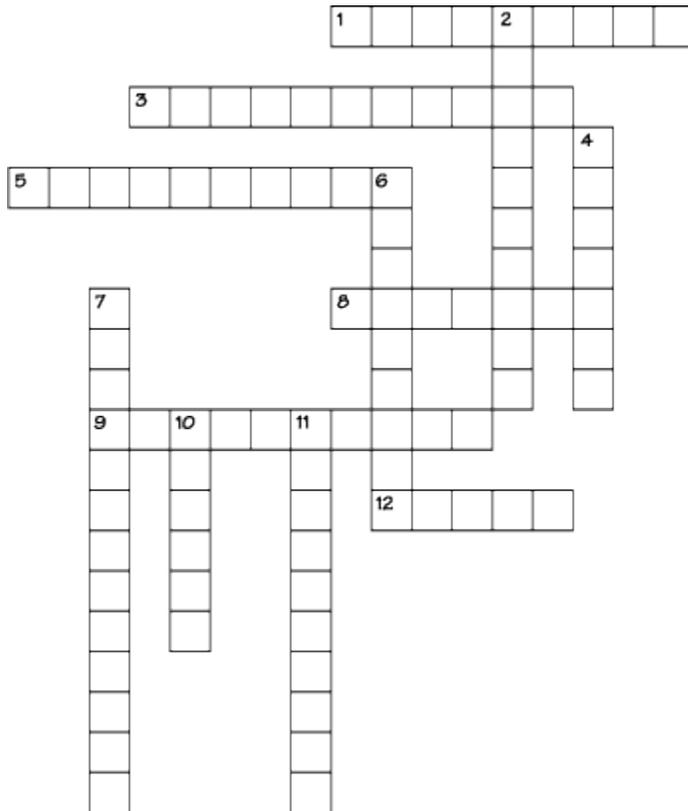
## Speleothem Crossword



| ACROSS   | DOWN   |
|--|--|
| 1. Looks like a frozen waterfall                                 | 2. Rises from the ground under a stalactite  |
| 3. One of nature's little pools                                  | 4. Looks like cloth hanging from the walls   |
| 5. These are not the kind used for jewelry                       | 6. A thin calcite tube that becomes a stalactite   |
| 8. The mineral that speleothems in limestone caverns are made of | 7. What leaves the calcium bicarbonate solution in order for the calcite to be deposited |
| 9. A drapery with reddish-brown coloring                         | 10. A connected stalactite and stalagmite  |
| 12. What brings calcite into the cave                            | 11. It starts out as a soda straw and hangs from the ceiling                             |

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| 12. What brings calcite into the cave                            | 11. It starts out as a soda straw and hangs from the ceiling                             |