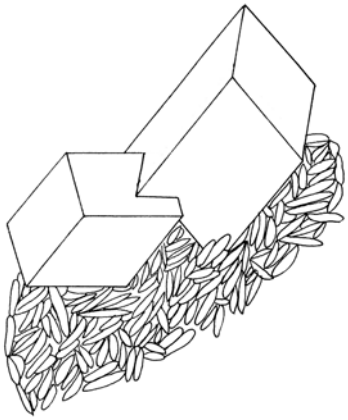
Fun Mineral Activities

Double Refraction

In this experiment, you will see a special property that happens with clear, colorless pieces of calcite. Another name for clear calcite is *Iceland Spar*.

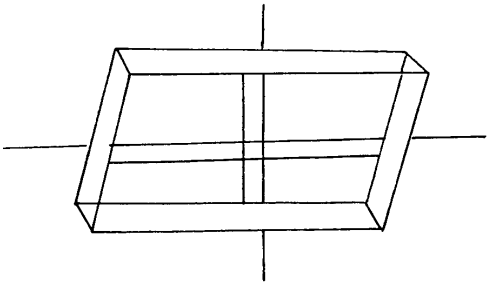
What you will need:
--Paper and pen or pencil
--A piece of colorless, clear calcite (Iceland Spar).



When calcite breaks, it breaks into *rhombs*. A *rhomb* is like a box that has been pushed over on its side. It looks like the specimen to the right.

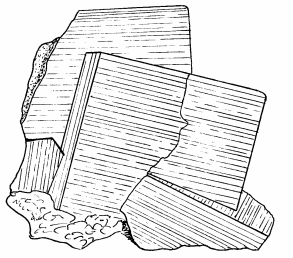
What to do:
Step 1: Draw a large "+" sign on a piece of paper.
Step 2: Place a piece of Iceland Spar on top of the lines.
What do you see?

This is a special property called *Double Refraction.* When light goes into Iceland Spar, the crystal breaks the light into two parts. As a result, you see two lines instead of one.



Sparks

The mineral *pyrite* is named after the Greek word *pur* which means *fire*. You will learn why in this experiment.



What you will need:
Safety goggles, a piece of pyrite (not a good display specimen), a steel hammer.

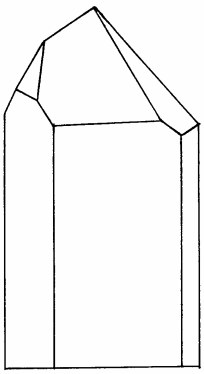
Step 1: Put on the safety goggles to protect your eyes.
Step 2: Hold a piece of pyrite firmly in one hand.
Step 3: Hit the pyrite with the edge of a hammer (or any other item made of steel). Turn the lights down (or off) and do this again. The results will be more dramatic.

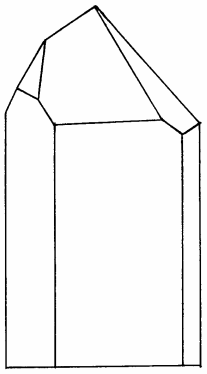
What do you see?_____. You will see the flash of sparks.
(You will also *smell* something. This is the smell of the sulfur that is in the pyrite crystal.)

A long time ago, this was a way people could start campfires in the wilderness.

Triboluminescence

Luminescence means *light*. *Triboluminescence* is light that is produced when certain objects are rubbed against each other, or pressure (force) is applied to some objects.
You will see triboluminescence in the mineral quartz.





What you will need:
Safety goggles, two clear quartz crystals (not display quality specimens).

This activity may take a little practice. You will need fairly large quartz crystals, about palm size or larger. To make this work, you will have to be in a dark room.

What to do:
Step 1: Hold one crystal in each hand.

Step 2: Rub the edge of one crystal back and forth across the face of the other crystal. A "face" is the flat surface of a crystal. The "edge" is where two faces come together. *For best results, repeat this with the lights out.*
When you rub the edge of one crystal against the face of the second, push down so that you are really grinding the two crystals together. If you cannot create light, try again, this time pushing even harder.

Step 3: What do you see? You will see a brief flash of light on the *inside* of the quartz crystal.

Triboluminescence: Making Light with Candy

What you will need:
A roll of ***Wintergreen Lifesavers™***. No other flavor will work! (And they must have REAL wintergreen oil in them, not artificial!)
A dark room.
A friend to do the experiment with.

What to do:
Step 1: Face a friend in a dark room or under a blanket.
Step 2: Bit into a wintergreen lifesaver with your mouth open! Be sure to really crunch it into lots of little pieces all at once. When you do it right, your friend will see a very fast, small *flash of blue light*.
Step 3: Brush your teeth really, really well!!!!!!!!!!

What makes it work? Go to http://www.waynesthisandthat.com/wintergreen.htm and find out!

Fiber Optics

Ulexite

The mineral called ulexite contains the element *boron*. In Boron, California, the ulexite is found in groups of long crystals that have grown side by side. It was discovered that when these bundles of crystals are sliced and polished on the top and bottom, something interesting happens.

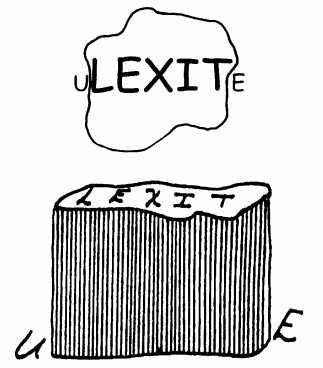
What you will need:
Paper and pen or pencil.
A piece of ulexite that has been polished on both ends.
Heavy fishing line.
Scissors.
A flashlight.
A rubber band.

What to do:
Step 1: Write your name on a piece of paper.
Step 2: Take a piece of ulexite and place it on top of your name. What do you see? **You should discover that it looks like the name is on the top of the crystal.**

Because of this, some mineral collectors call ulexite *television stone*.

Step 3: Cut 24 pieces of heavy fishing line that are the same length. 6 inches would be fine. Longer would be even better.
Step 4: Hold the 24 pieces together in a bundle. Hold the bundle together with the rubber band at one end of the bundle.
Step 5: Place the end of the bundle on the flashlight lens so the light can shine on the end of the bundle. Look at the other end of the bundle (the end that is not held together with a rubber band). What do you see? **You will see light at the end of each piece of fishing line.**

The light travels down the fishing line and comes out the end, not the sides, of the line. This is called* fiber optics. *The same thing is happening in the ulexite crystals.



Growing Borax Crystals

Items you will need:

--Borax ("20 Mule Team Laundry Booster" works very well. Do NOT use Boraxo Soap; it won't work!)
--Pipe Cleaners
--A pencil or stick of similar length
--String
--A large jar with a wide mouth (the pencil will have to sit across the mouth of the jar). A Ball canning jar will work well.
--Water
--Optional: Food coloring of any color you wish.

1. Bend your pipe cleaners in any shape you like. The borax crystals will grow on the pipe cleaners.
2. Tie one end of the string to the middle of the pencil (or stick) and the other end to the pipe cleaner. The string should be long enough to let the pipe cleaner hang in the jar without touching the bottom of the jar.
3. THIS STEP SHOULD BE DONE WITH YOUR PARENT'S HELP. Create a mixture of borax in water. Use 3 tablespoons of borax for every cup of water. Boil the water and carefully stir in the borax before the water cools. You may find that some borax won't dissolve and will settle on the bottom of the pan. That is ok. Add any color you wish at this point.
4. Pour this mixture into your jar. Fill it nearly full. You want to have enough mixture in the jar so that the pipe cleaner will be completely submerged in the water.
5. Hang the pipe cleaner in the mixture. Let the pencil/stick rest across the mouth of the jar. Check to make sure the pipe cleaner is not touching the bottom of the jar.
6. Crystals will grow overnight. They will get larger if left in the solution longer. You will discover that if they stay in the water too long, they will eventually grow into each other and then be covered by small crystals. Pull them out of the solution when they look the way you want them to.

Caution: Do not put borax in your mouth. It is harmful to eat borax.

Minerals in Action

Making Goop

Minerals are needed, every day, to make products that we can use. For example, copper is used to make wire and gold is used in computer circuit boards. Here is a fun recipe for making GOOP! It's rubbery, it won't stick to your fingers, it's gooey like slime. You can make it at home. **And you cannot make it without the help of a mineral.**

Items you will need:

--1 cup of white glue, like Elmer's glue
--Warm water
--Food coloring
--Borax (not Boraxo soap)
--2 mixing bowls

Directions:

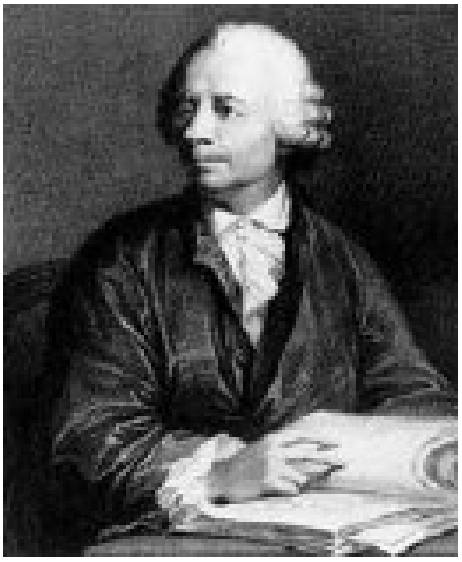
1. Mix 3/4 cup of warm water and 1 cup of glue. Add several drops of food coloring if desired. Set this mixture aside for later.
2. In a separate bowl, mix 4 teaspoons of borax in 1 1/3 cups of warm water.
3. Add the glue mixture to the borax/water mixture. Do not stir. Let the two mixtures sit together for 5 minutes.
4. Pull the goop out of the water. It's not sticky and messy like Play-Doh. Be careful, though, to avoid getting it on your clothes, furniture or rugs. It's a little tough getting it out of fabric. It won't stick to your fingers, though! You can squeeze it, pull it, stretch it, and make yucky sounds with it if you squeeze it between your hands.
5. When you are done playing with it, put it in a plastic bag and keep it in the refrigerator. It will last a long time for you!

How does this work?

Borax is a solid. To a chemist, glue is a liquid polymer. A "polymer" is a substance that is made up of many molecules that are connected to each other. When borax and glue are combined, a chemical reaction takes place. The borax turns the glue into a *polymer compound*. Goop is a polymer compound. Without the borax, the glue would either be runny or would dry out and harden. Plastic bottles and rubber bands are also polymers.

Euler's Magic Formula

Here's a little something for the mathematicians out there!



Leonhard Euler was a mathematician from Switzerland. He lived from 1707 to 1783. He is famous for the many mathematical discoveries that he made in his lifetime. He proved one special theorem that mineral collectors would find interesting.

Before I tell you the theorem, you have to know the definition of the word *polyhedron*. A *polyhedron* is a three-dimensional shape made up of flat faces (like crystal faces). A line (also called an edge) is formed where the faces meet each other and a point is formed where the edges meet each other. These points are called *vertices*.

And now, Euler's Magic Formula.

If you add the number of faces (call them "F") of a polyhedron to the number of its vertices (call them "V") and then subtract the number of edges (call them "E"), you will **always** get the number 2.

$$F+V-E=2$$

On the website are cut-and-fold crystal models. Put them together and see that the magic formula works. Or, find a crystal in your school's collection that is completely covered with crystal faces, like a perfect pyrite cube, and check out Euler's Magic Formula.

Ice Spikes

A Great Ice Experiment from scientist Dr. Kenneth Libbrecht at the California Institute of Technology.

When water freezes, it gets bigger! Fill a plastic bottle with water and put it in your freezer. When the water is frozen solid, you will see that the bottle has split open. When the water froze, it expanded, that is, it got larger.

This physical feature of ice helps create ice spikes in an ice tray.

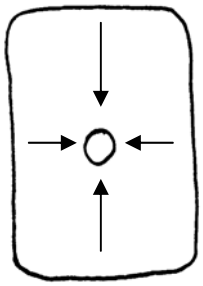
What You Need:

--Plastic Ice Tray
--Distilled Water (water from the faucet does not always work very well for this experiment)
--Freezer

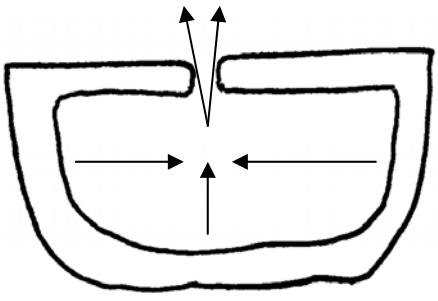
What To Do: Preparation for this experiment is very easy. Fill each section in the plastic ice tray with distilled water. Only fill each section about 2/3 full. Don't fill them to the point that they flow into each other.

Now, put the tray in your kitchen freezer. Place the tray so that there is at least two inches of space above the ice tray. When the water is frozen, you should have some ice spikes.

How Do Ice Spikes Form? Ice spikes are the result of the special feature of ice mentioned above: water expands (gets larger) when it freezes. This is what happens.



At first, the ice in the ice cube tray freezes at the edges of each section. Then, it freezes toward the center of the section. This will continue until there is a small hole in the middle of the top of the ice cube. While this is happening, the water is also freezing *below* the surface of the ice cube. Remember that water expands or gets larger as it freezes. So, as the water freezes at all the sides of the ice cube section in the tray, it pushes the unfrozen water up and out of the little hole on the top. The water that is pushed through the hole freezes in the shape of a small straw. More water is pushed through the straw and it freezes. This continues until all the water has frozen or the straw itself freezes solid. This "straw" is the ice spike!



Some Fun Mineral Activities

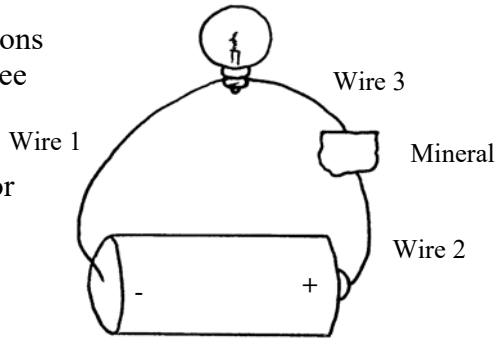
Magnetism

There are a small number of minerals that are magnetic. Magnetite is the most common and is the one that students typically encounter in their mineral lab. (Pyrrhotite is weakly magnetic, but it is very unlikely Pyrrhotite specimens will ever be presented in an Elementary or Middle School class.)

The students test for magnetism by simply touching their mineral specimens with a magnet. If the magnet sticks the mineral is, obviously, magnetic. This is a determinative test: if a mineral is magnetic, then it is magnetite.

Electrical Conductivity

Metallic minerals, that is, minerals that contain metal ions (like galena, pyrite, copper, silver, gold, etc.) will, to one degree or another, conduct electricity. The test for electrical conductivity can be challenging, but it can also be a LOT of fun for your students. You will need the following items to test for electrical conductivity:



--D-cell battery
--Three thin wires
--A small bulb from a flashlight
--Electrical tape
--Mineral specimens

What to do: The students will create a closed circuit in which the energy (electricity) from the battery will run through the wires, through the mineral specimen and through the bulb. If the mineral specimen conducts electricity, it is a *metallic mineral*. The students are to set up the experiment as seen in the drawing above. One end of two wires (wire 1 and wire 3) will be wrapped around the base of the light bulb. The other end of wire 1 will be taped to the bottom (negative) end of the battery. Wire 2 will be taped to the top (positive) end of the battery.

Once this is set up, the student then touches both free ends of Wires 2 and 3 to the mineral specimen (the wires cannot touch each other. If they do, they will complete the circuit and the bulb will light, potentially giving them a false result). Observe the bulb. Does it light up? If the answer is "Yes" then the mineral conducts electricity.

Double Refraction

Clear rhombs of calcite display an optical feature called *double refraction*. When a single ray of light passes through the calcite rhomb, it is broken into TWO rays! To see this in action, your students can place a clear calcite rhomb over a line or words on a page and look through the crystal. They will see TWO lines where there is only one on the paper. This property is typical of clear calcite and will not be seen in any other mineral that they study at this level of learning.