Cloud in a Bottle

Adrianne Larson-Biology Post Bac

MATERIALS:

Clean Clear 16oz Plastic Water Bottle and Lid
Rubbing Alcohol

SETUP:

For advanced setup, have the alcohol already coated on the insides of the bottle.

PROCEDURE:

1. Take a 16 oz clear plastic water bottle and dump out or drink the water.
2. Fill the bottom of the plastic bottle with rubbing alcohol. Swirl the alcohol around the sides coating the inside of the bottle.
3. Screw the cap on firmly.
4. Grab the bottle around 1/4 of the way up from the bottom and start twisting it with both hands in opposite directions. As you twist notice the pressure in the top begins to increase. Keep twisting until you can twist anymore. Now the pressure is very high!
5. Slowly unscrew the cap until you feel it's about to pop off. Make sure the cap is not pointing at anyone!
6. Now give the cap one last quick flip with your finger to and let it pop off. Make sure to do it fast and not to block the cap coming off in a bang.
7. Instantly the clear bottle is filled with a nice white cloud.

TIPS:

Make sure your water bottle is the lightweight kind (not heavy duty plastic that won't bend easily). This will allow you to bend the bottle more.

EXPLANATION:

Invisible water molecules are always present in the air that surrounds us. That is what we call water vapor. Twisting the plastic bottle compresses the air molecules inside. When we release the cap, we are permitting the air molecules to expand. When the air molecules expand the temperature lowers and they get colder. As they cool, the molecules start sticking together (water / alcohol vapor, and air molecules). This combination allows small water drops to form. Just like the clouds in the sky. Except water vapor in the sky finds pollution and other particles to stick on as well!

SAFETY:

Make sure the cap is not pointed at anyone when taking it off.

Tornado in a Bottle
Adrianne Larson-Biology Post Bac

MATERIALS:
2 plastic Bottles (empty 1 liter water bottles work well)
Water
Food Coloring (Optional)
Small Washer 1/4"
Duct tape

SETUP:
For advanced set up, complete steps 1-5.

PROCEDURE:
1. Fill one of the empty bottles to the top with water.
2. Add a couple drops of food coloring if you want.
3. If you have small Styrofoam balls put them in to simulate flying debris.
4. Put the 1/4 inch washer on top of the filled bottle.
5. Now invert the other bottle on top of it so they are connected. Use duct tape to make a nice water tight secure connection between the bottles. One bottle should be empty and one should be full.
6. Take a little extra time to ensure the bottles are snug / flush against the washer before duct taping together. You want everything perfectly flat when you tape.
7. Turn the bottle with the water upside down so the water is on top.
8. To make a Vortex put the bottle with the water on top. Hold the bottles with your hand in the middle where the two connect. Then twirl the bottle around in a circular motion for a few seconds and hold still. Wham!

TIPS:
Make sure the bottles lie flat with tape, so that no water leaks out. Use a liter bottle for the demonstration.

EXPLANATION:
Twirling and swirling the bottle creates a vortex as the water moves down through the hole in the washer. What you see is basically a tornado in a plastic bottle. When the vortex is generated, air from the bottom bottle can more easily move to the top bottle and the water comes out quicker.

SAFETY:
There are no safety concerns.

Colorful Convection Currents

Brooke Lyons - Biology Post-bac

MATERIALS:

Four small glass bottles (Starbucks Frappuccino bottles work well)
Hot and cold water
Liquid food coloring (red and blue)
Playing card or small laminated card
Large rimmed baking sheet

SETUP:

1. Fill two of the bottles with hot water. Fill the other two with cold water. Place inside of large rimmed baking sheet to catch water in case of spills.
2. Place two drops of blue food coloring in the two bottles with cold water, and place two drops of red food coloring in the two bottles with hot water.

PROCEDURE:

1. Hot over cold: Place the index card or old playing card over the mouth of one of the warm water bottles. Hold the card in place as you turn the bottle upside down and rest it on top of one of the cold water bottle. The bottles should be positioned so that they are mouth to mouth with the card separating the two liquids.
2. Carefully slip the card out from in between the two bottles. Make sure that you are holding onto the top bottle when you remove the card. Observe what happens to the colored liquids in the two bottles.
3. Cold over hot: Repeat steps 2 and 3, but this time place the bottle of cold water on top of the warm water. Observe what happens.

TIPS:

NONE.

EXPLANATION:

Warm air rises. Similarly, warm water is lighter in weight or less dense than cold water. When the bottle of warm water is placed on top of the cold water, the more dense cold water stays in the bottom bottle and the less dense warm water is confined to the top bottle. However, when the cold water bottle rests on top of the warm water, the less dense warm water rises to the top bottle and the cold water sinks. The movement of water is clearly seen as the yellow and blue food coloring mix, creating a green liquid.

The movement of warm and cold water inside the bottles is referred to as the convection current. In our daily life, warm currents can occur in oceans, like the warm Gulf Stream moving up north along the American Eastern Seaboard. Convection currents in the atmosphere are responsible for the formation of thunderstorms as the warm and cold air masses collide.

Although the bottles whose colored liquids mix are more interesting to watch, the other set of warm and cold water bottles helps to illustrate another important phenomenon that occurs in the atmosphere during the winter months. During daylight hours, the sun heats the surface of the earth and the layer of air closest to the earth. This warm air rises and mixes with other atmospheric gases. When the sun goes down, the less dense warm air high up in the atmosphere often blankets the colder air that rests closer to the surface of the earth. Because the colder air is denser than the warm air, the colder air is trapped close to the earth and the atmospheric gases do not mix. This is commonly referred to as temperature inversion.

SAFETY:

None.

SOURCE:

http://www.stevespanglerscience.com/lab/experiments/colorful-convection-currents

Coriolis Effect Demo

For this demo, a pen/pencil, paper, and either any sort of rotating object or another person are needed. Place the paper on the rotating device, or have the second person hold the paper and in whichever situation, rotate the paper counter-clockwise. While the paper is rotating, have the person with the pen/pencil start at the center of the paper and try to draw a straight line in any direction. Afterwards, observe what the drawn line looks like. Which way does it curve? Then try clockwise. What way does the line curve? Explain to the observer that in the northern hemisphere, moving air is subjected to this same occurrence and is curved right. In the southern hemisphere, air is curved to the left.

Faulting
Danielle Feil, Earth Science Major

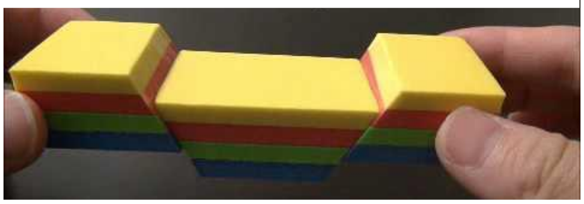
Materials:
- Foam blocks cut like diagram below
- Painted rock layers optional

Procedure:
1. Put foam blocks together
2. Push on the sides causing middle block to rise
3. Hold blocks up and slowly pull apart causing middle block to slip downwards
4. Observe each and then explain what each fault is called and what stress causes it.

Tips:
- Create blocks big enough to see.
- Steady hands so that blocks do not fall anywhere

Explanation:
When the foam blocks are pushed together this is showing compression creating a reverse fault. When the blocks are slowly pulled apart, it is showing tension creating a normal fault.

Safety:
- When making foam blocks handle scissors with care.
- Do not let students eat the foam.



Slinky Waves

Danielle Feil, Earth Science Major

Materials:
- Slinky
- One other person to hold one slinky end

Procedure:
1. Have a volunteer hold one end of a slinky very still
2. You will hold the opposite end of the slinky and cause the motion
3. Represent first wave by pushing the slinky forcefully forward then going still
4. Explain P waves
5. Represent second wave by shaking slinky right to left
6. Explain S Waves

Tips:
- Practice before presenting to know how to move the slinky
- Have a spare slinky in case of tangling

Explanation:

This demonstration shows two of the types of waves that occur during an earthquake; P waves and S waves. P waves or primary waves are known as compression waves (push waves). P waves are fast and can be shown by pushing the slinky to see how places of the slinky are compressed and others are stretched out. S waves or secondary waves are known as transverse or longitudinal. These waves come second because they are slower than P waves. They can be shown by waving the slinky in a back and forth motion. Both waves are better visualized with the slinky because they are different and a lot of students just think the ground shakes during an earthquake but this shows the wave movement from the earthquake.

Safety:
- Give directions to volunteer very clearly so they do not let go of the slinky
- Stand clear of people to not hit them with slinky

Balloon Skewer
Allison Hanlin, Biology Major

Materials:

Several latex balloons (9-inch size)
Bamboo cooking skewers (approximately 10 inches long)
Cooking oil

Procedure:

1. Inflate the balloon until it's nearly full size and then let about a third of the air out. Tie a knot in the end of the balloon.
2. Find the thick area of rubber at both ends of the balloon (where you tied the knot and the opposite end).
3. Soak the skewer in cooking oil.
4. Place the sharpened end on the skewer on the thick end of the balloon and carefully slide the skewer into the balloon.
5. Push the skewer all the way through the balloon until the tip of the skewer touches the opposite end of the balloon (the other thick portion of the balloon). Keep pushing until the skewer penetrates the rubber.

Explanation:

The latex in the balloon is made of long stands of molecules called polymers. The elasticity of these polymer chains causes the rubber to stretch when the balloon inflates. Because the most stretch occurs in the center of the balloon, the long chains of polymers are under much more stress than the chains at either end of the balloon. By piercing the balloon at the ends, where less stretch occurs, it allows the skewer to pass without popping the balloon.

Safety:

Be careful not to jab yourself or the balloon with the skewer. Also, know that it is possible for the balloon to pop while doing this experiment. Be prepared just in case this happens.

Cooking up a Comet

Andy Potts, Biology Major

Materials:

Bowl
Window cleaner
Trash bag
Charcoal
Dry ice
Whoopee-cushion
Water
Sand

Procedure:

1. Place the trash bag in the bowl
2. Add the ingredients to the bowl one at a time, explaining what they represent
3. Crush up the dry ice and place it into the bowl
4. Squeeze the air out of the bag and work the ingredients around in the bag
5. Once it has frozen solid you are finished

Tips:

- Add more dry ice if it is taking too long to freeze
- Do not actually add the whoopee-cushion, simply squeeze air from it into the bowl to represent methane being added

Explanation:

We often think of comets, and refer to them, as balls of ice, but there is more than frozen water in comets. This demo adds all the common components of comets into a bowl so you can make your own comet for the students to see and feel. The window cleaner represents ammonia, the charcoal carbon, the sand silicates, and the whoopee-cushion methane.

Safety:

Dry ice should be handled with gloves

Warped Gravity

Andy Potts, Biology Major

Materials:

5 gallon bucket
1 yard of spandex
Various weighted spheres (bocce balls, marbles, and ball-bearings)
Elastic cable
Ruler

Procedure:

1. Stretch the spandex tightly over the top of the bucket and secure it with the cable
2. Place a large, heavy ball in the center of the spandex
3. Observe how the fabric is stretched and warped by the ball
4. Note the slope of the curve is greater nearer the ball, using the ruler to extend the slope

Tips:

- Play around with the different balls to see how they are affected by the warping

Explanation:

We can think of large masses as actually warping space to cause gravity wells. This explains why two objects of different mass will fall at the same speed, because they are both, in effect, slipping down the same slope.

Safety:

The balls represent a slipping hazard should they become loose

Color and Temperature of Stars
Andy Potts, Biology Major

Materials:
Filament lamp
Variable resistor
Wires
Power supply

Procedure:
1. Wire the lamp to the resistor and power supply
2. Set the resistor to its lowest voltage setting and observe the reddish color of the lamp
3. Move the resistor to a higher voltage and observe the yellowish color of the lamp
4. Continue to the highest voltage setting and observe the white color of the lamp

Explanation:
Students often struggle with the idea that the color of a star is related to its temperature. This demo shows how at lower temperatures stars will appear more reddish and at very high temperatures stars will appear white. We can therefore use observations about the color of stars to make inferences about their temperatures.

Safety:
Make sure the devices are wired correctly and use caution when touching them to avoid electrocution

How Massive?

Andy Potts, Biology Major

Materials:

10lb bag of potatoes
5 gallon bucket
Smaller bucket
Cutting board
Knife

Procedure:

1. Place the smaller bucket upside-down inside the larger one, then place the potatoes on top of the smaller bucket to give the appearance that the 5 gallon bucket is full of potatoes
2. Explain that the "100" potatoes in the bucket represent all the mass in our solar system
3. Take one potato and cut it into seven pieces, placing all but one of those back into the bucket
4. Explain that the 99 and 6/7ths potatoes represent the mass of the sun
5. Cut the remaining 1/6th of the potato into ten pieces
6. Explain that seven of these represent the mass of Jupiter and two the mass of Saturn
7. Cut the last piece in two now, explaining that these represent the mass of Uranus and Neptune.
8. Explain how the tiny specks of potato left behind represent the mass of the remaining planets Mercury, Venus, Earth, Mars, dwarf planets, moons, asteroids, and comets

Tips:

• Play around beforehand with the bucket to get it to look like it is completely full of potatoes

Explanation:

It can be difficult to describe just how massive the sun really is to students. This demo shows how the sun makes up 99.8% of the mass of the solar system, and shows how the remaining mass falls amongst the rest of the bodies of the solar system

Safety:

Use caution not to cut yourself when using the knife

Create a Sunset
Sara Heidel- Earth Science Senior

Materials:
Flashlight
Clear glass container
¼ cup of milk
2 gallons of water

Procedure:
1. Add the water to your container
2. Shine the flashlight through the water, noticing how you cannot see the beam of light
3. Add ¼ cup of milk to the water and stir
4. Shine the light through the container so the viewer can see the beam of light from the side
5. Shine the light through the container so it is shining directly at the viewer

Explanation:
When you added milk to the water, you added many tiny particles to the water. Milk contains many tiny particles of protein and fat suspended in water. These particles scatter the light and make the beam of the flashlight visible from the side. Different colors of light are scattered by different amounts. Blue light is scattered much more than orange or red light. Because we see the scattered light from the side of the beam, and blue light is scattered more, the beam appears blue from the side. Because the orange and red light is scattered less, more orange and red light travels in a straight line from the flashlight. When you look directly into the beam of the flashlight, it looks orange or red.

Oil and Gas Production
Shelby Hojio-Ratzlaff - Biology Senior

MATERIALS:
1x2 wood board
1x6 wood board
Drill
¼ in drill bit
screw driver
air compressor
½ inch clear tubing
2- 3/4in hose clamps
5- 2x ¼ in steel fittings
2- ¼ in steel T's
¼ in 90 degree fitting
2- ¼ in plugs
3- ¼ in ball valves
1 roll ½ in steel pipe tape
1 roll ½ in pipe strapping
6- 12x ¾ in screws
3- 12x 1 ½ in screws
1 liter clear plastic bottle with screw on lid
¼ in push connect
¼ in break line
200 Scrubber pot
Water
Food coloring
pipette
(all parts are available at any local hardware supply, except the 200 scrubber pot which can be found at a specialty oil field supply store)

SETUP:
1. Screw wood boards together to make an upside down T with the 1x6 board at the bottom.
2. Tape the threads on the ¼ in push connect and tighten securely into ¼ ball valve.
3. Tape the threads on one of the 2x ¼ in steel fitting and thread into the other side of the ball valve from step 2.
4. Screw one of the ¼ in steel T's onto the open threads of the steel fitting from step 3. Make sure the T is upside down in this process. It should look like this.
5. Screw another 2x ¼ in steel fitting into the T at the exposed right end.
6. Screw a ball valve onto the steel fitting you added to the T in step 5.
7. Screw the scrubber pot into the ball valve from step 6.
8. Working upward from the exposed top end of the T. Screw another 2x ¼ in steel fitting into the top of the T.
9. Stretch the ½ in clear tubing around the threads of the steel fitting from step 8.
10. Place a hose clamp around the clear tubing and tighten around the threads of the steel fitting from step 8.
11. Stretch the other end of the tubing over another 2x ¼ in steel fitting.
12. Place a hose clamp around the clear tubing and tighten around the threads of the steel fitting from step 11.
13. Tape the exposed threads of steel fitting from step 11.
14. Screw a ball valve onto the threads of the steel fitting.
15. Screw another 2x ¼ in steel fitting in the open end of the ball valve.
16. Screw a ¼ in T onto the steel fitting. The T should look like this.
17. Screw a ¼ plug into the top of the T. Leave loose so that it can be removed for the demonstration.
18. Tape another 2x ¼ in steel fitting on both sides.
19. Screw the steel fitting into the last opening of the T, left side.
20. Screw the ¼ in 90 degree fitting onto the exposed threads of the steel fitting from step 19.
21. Tape one side of the last 2x ¼ in steel fitting.
22. Screw the taped end into the 90 degree fitting.

23. Take the cap off of the 1 liter clear bottle.
24. Drill a ¼ in hole in the top of the cap.
25. Thread the steel fitting into the cap.
26. Screw the bottle into the cap.
27. Use the pipe strapping to secure the steel fitting to the 1x2 wood board above the bottom T using screws and screw driver.
28. Use the pipe strapping to secure the clear tubing towards the top of the apparatus below the ¾ in hose clamp around the clear tubing. Use the screws and screw driver to hold in place
29. Use more pipe strapping to secure the 1 liter bottle to the apparatus.
30. Wrap the pipe strapping around the 1 liter bottle and around the 1x2 wood board making sure the strapping goes between the board and the clear tubing.

PROCEDURE:

1. Fill the scrubber pot with air by opening the two ball valves at the bottom and making sure the ball valve at the top is closed.
2. Using the air compressor place the nozzle into the ¼ in push connect on the left hand side of the apparatus.
3. Fill the scrubber pot to approximately 60psi.
4. Close the bottom valves before taking the nozzle off of the push connect to ensure the psi does not leak.
5. Take the plug out of the T at the top of the apparatus
6. Open the top valve, expect a small amount of pressure to be released.
7. Put food coloring into the water
8. Pipette water into the top T to fill the clear tubing half way full.
9. Replace the plug at the top of the T.
10. To demonstrate oil coming to surface using down hole pressure slowly open the ball valve on the right hand side closest to the scrubber pot.
11. The water should move up the tubing and into the 1 liter bottle.

EXPLANATION:

This apparatus demonstrates how natural gas is used to move oil from sandstone formations that are approximately 7,000 to 8,000 feet below the surface of the Earth. The scrubber pot is acting as the sandstone formation. This formation is porous, it stores oil and gas. Before a well can produce, the formation must be fractured, creating roadways for oil and gas to come to the bottom of the hole that was drilled, also called a well boar. Opening the ball valve simulates how pressurized natural gas from the sandstone formation pushes oil to the surface. Oil will enter a production tank (the one liter bottle), where it will be stored until it is transported to a refinery. The natural gas that brings the oil to surface will be burned off or sold down a gas gathering system.

SAFETY:

There are pressurized items involved with this apparatus. Caution should be taken while handling the apparatus when it is pressurized. Always open valves SLOWLY so that all parts stay secure.

Disappearing Balls
Casey Coy – Earth Science Senior

MATERIALS:
Clear glass bowl
2 ping-pong balls
Several metal balls or marbles
A bag of pinto beans

SETUP:
Have all materials ready on table to be placed into bowl at specific times.

PROCEDURE:
Pour pinto beans over the ping-pong balls so that the ping-pong balls are completely covered. Next, place metal balls or marbles on top of the pinto beans. After materials are placed in the bowl gently shake the bowl until the pingpong balls rise to the top and the metal balls or marbles sink to the bottom.

TIPS:
Do not shake the bowl too violently as you will not see a good result. Best results happen when bowl is gently shaken back and forth.

EXPLANATION:
As you shake the bowl each of the various components will separate according to its relative density. The metal balls will sink from the top to the bottom, the pinto beans should stay in the middle and the ping-pong balls will rise to the top of the bowl. This demonstration visually shows how differing densities separate in a solution. An earth science application would be in a geologic setting where different densities of sediment settle out in either a river or sediment bed. Could also be used in chemistry to illustrate the property of density.

SAFETY:
Make sure students are warned of allergy risks.

Tension Cracks in Cheese
Casey Coy – Earth Science Senior

MATERIALS:
Cheese squares (Kraft singles work best)
Straight edge (butter knife works)

SETUP:
Have all materials ready on the table and take cheese out of its packaging.

PROCEDURE:
Either take one piece of cheese for a class demonstration or distribute cheese slices to entire class for best results. Gently make incisions to the cheese with your straight edge or knife. Place fingers on the edges of the cheese slice perpendicular to the incisions and pull apart the cheese slowly and gently. Experiment with varying patterns of incisions in the cheese to simulate cracks in the Earth's surface.

TIPS:
Do not pull the cheese slices with too much force as they will likely break at the wrong points. Pull with even force very gently to achieve realistic results.

EXPLANATION:
The Kraft single acts like the Earth's crust. Just like on Earth there are cracks in our surface that are susceptible to differing forces. When forces are applied to the surface of the cheese or crust, weak points are revealed and show the results of the force by breaking and separating even more. This demo can be used in classroom to demonstrate tension forces and their results in the real world. Everyday example where this happens is in asphalt. Cracks in asphalt are the result of forces that are acting on the surface and the cracks are the weakest points in the asphalt.

SAFETY:
Make sure students are warned of allergy risks to dairy products.

Dirty Laundry Analogy
Casey Coy – Earth Science Senior

MATERIALS:
Item – Full laundry basket

SETUP:
Simply have a naturally full laundry basket ready to take apart.

PROCEDURE:
Place the laundry basket up at the front of the classroom and ask the class to describe what sort of timetable is involved in it. Try and allude to the fact that each layer of clothing is part of a certain event in time and usually the clothes on top are worn more recently (younger) than the clothes on the bottom. Start by pulling the clothes on the top out of the laundry basket and have the class make some observations about. Do this until you reach the bottom of the laundry basket.

TIPS:
Might be appropriate to make sure there are no undergarments in the laundry basket for the students to comment on. Also, use a more vertical laundry basket to allow for more observations.

EXPLANATION:
The dirty laundry analogy is similar to that of the law of superposition in geology. In geology rocks that are near the top of the crust are generally younger than those towards the bottom of the rock column. Students are able to compare the two and see the correlation to stratigraphy in geology. Also, it demonstrates that rock layers usually have similar properties and were deposited under similar conditions. In the case of the laundry basket similarities in clothing type can tell us what sort of weather with which the clothes were as well as what they person may have been doing during that time.

SAFETY:
No safety considerations needed.

Peanut Butter Ridge
Casey Coy – Earth Science Senior

MATERIALS:
Two graham crackers
Jar of peanut butter

SETUP:
Spread peanut butter flat on a flat surface and place graham crackers on top of peanut butter.

PROCEDURE:
Place graham crackers together so their edges are touching over the peanut butter. Apply downward pressure to the graham crackers and slowly pull the graham crackers apart so they are not touching anymore. Continue to apply pressure downward as you pull the crackers apart causing the peanut butter to "ooze" from the center.

TIPS:
Separate the crackers slowly so the peanut butter has a chance to move out from under the graham crackers.

EXPLANATION:
This demonstration is designed to illustrate a mid-ocean ridge. Since humans have rarely captured this spot before we are able to recreate the crust (graham crackers) and the magma (peanut butter) that interacts at mid-ocean ridges. At mid-ocean ridges there is divergence and volcanic activity that creates new crust along each zone in the world. In this demonstrations case students are able to view the processes and results of a divergent boundary near a mid-ocean ridge.

SAFETY:
Make students aware of the use of peanut products.

Meteor Burnout
Casey Coy – Earth Science Senior

MATERIALS:
Large soda bottle 1/2 an alka seltzer tablet

SETUP:
Simply have a large soda bottle filled with water ready for observation.

PROCEDURE:
Remove lid from top of bottle and drop a 1/2 of a piece of an alka seltzer tablet so it descends to the bottom of the bottle. Observe the effects of the alka seltzer tablet as it descends to the bottom of the bottle.

TIPS:
The bigger the bottle the better the results.

EXPLANATION:
This demonstration illustrates what happens as a meteor or comet is torn apart either in the atmosphere or in space. As the tablet descends to the bottom it will break apart a leave a trail of debris just like a meteor or comet would do in real life. Students can make observations and discuss them as class.

SAFETY:
No safety considerations.

Earthquakes and Tuning forks
Justin Little- Earth Science Senior

MATERIALS:
Tuning Fork
Table (slate topped tables work very well, but almost any table will work)

PROCEDURE:

1. Ring tuning fork
2. Place on table top and listen

EXPLANATION:
The sympathetic vibration of the tuning for is causing the whole table to vibrate. These waves are propagating through the whole table just as the waves of an earthquake will. The waves travel in all directions as demonstrated by the whole table becoming the "speaker."

Rocks can fold?
Justin Little-Earth Science Senior

MATERIALS:
Paper towel
Water
Flat surface/ table
Document Projector (optional if students cannot crowd around a single table)

PROCEDURE:
1. Paper towel on table and push edges toward each other a. Will cause the towel to bow up in the middle: Large Scale Folding
2. Flatten towel back out and then mist with water until wet
3. Push edges toward each other again
    a. Will cause small wrinkles over the surface of the towel: Folding on a Small scale

EXPLANATION:
The paper towel represents a layer of rock, and pushing the ends toward each other represents the pressure possibly caused by plates colliding. When the paper towel is dry, there will be a large bulge in the middle of the paper towel. This represents large scale folding like an anticline. When the paper towel is wet, this represents a layer of rock with pressure coming from above, so only small folds can be created.

Faulting
Justin Little-Earth Science Senior

MATERIALS:
3 large sheets of Butcher paper (at least 2 different colors)

SETUP:
Cut two of the sheets into strips of different colors and glue them onto the other sheet creating layers of "rock" with different thicknesses. On Once dry, cut the paper in to two pieces along an angle creating your foot and hanging walls.

PROCEDURE:
Once the rock layers are created with a fault, move one piece up and one down along fault to demonstrate normal and reverse faults

TIPS:
May want to cut all there pieces into strips and glue together so you can show that the fault can go both ways (i.e., foot wall is not always on right side of the fault)

EXPLANATION:
The different colored strips of paper represent different layers of rock. Cutting the paper creates a fault in the rock record and is used to show the distinction between the foot and hanging walls. This is a very visual demonstration of the rocks moving.

Geologic Timeline on a Roll of Toilet Paper
Justin Little-Earth Science Senior

MATERIALS:
1 roll of perforated toilet paper
Felt tipped marker

SETUP:
Can be done as a class activity or as a demo.
If a demo: Mark down all dates and events listed on the time line sheet. This takes about an hour to write down dates and re-roll the toilet paper.

PROCEDURE:
1. Unroll toilet paper explaining important periods in time.
2. End with how much of the roll of toilet paper roll is taken up by human existence.

EXPLANATION:
Each square of toilet paper represents 20 million years on the timeline. Below are dates and square numbers for the timeline

Sheets	Event	Geological time (Number of years before present)	Comments
0.00	Present	0	
0.0005	Modern Man	10,000	
0.01	Neanderthal Man	100,000	
0.03	First use of fire	500,000	
0.06	Worldwide glaciation	1,100,000	
0.07	Homo erectus	1,300,000	
0.08	Linking of North and South America	1,500,000	
0.08	Oldest stone tools	1,600,000	
0.15	**Beginning of Quaternary period (end Tertiary/Neogene)**	**3,000,000**	
0.15	Australopithecus	3,000,000	
0.50	Beginning of Antarctic ice caps	10,000,000	
0.50	Opening of Red Sea	10,000,000	
0.75	Formation of Himalayan Mountains	15,000,000	
1.15	**Beginning of Tertiary/Neogene period (end Paleogene)**	**23,000,000**	
1.25	First evidence of ice at the poles	25,000,000	
2.00	Collision of India with Asia	40,000,000	
2.50	Early horses	50,000,000	
2.50	Separation of Australia and Antarctica	50,000,000	
3.00	Early primates	60,000,000	
3.00	Opening of Norwegian Sea and Baffin Bay	60,000,000	
3.00	Alps form	60,000,000	
3.25	**Beginning of Tertiary/Paleogene period**	**65,000,000**	
3.25	**Beginning of Cenozoic Era**	**65,000,000**	**“recent life”**
3.25	**Cretaceous Period, Mesozoic Era end**	**65,000,000**	
3.25	Dinosaurs became extinct	65,000,000	
4.00	Rocky Mountains form	80,000,000	
7.00	**Cretaceous Period begins (Jurassic ends)**	**140,000,000**	
7.50	Early flowering plants	150,000,000	
9.00	Early birds and mammals	180,000,000	

10.40	**Jurassic Period begins (end Triassic)**	**208,000,000**	
11.00	Opening of Atlantic Ocean	220,000,000	
12.25	**Triassic Period begins**	**245,000,000**	
12.25	**Beginning of Mesozoic Era (end Paleozoic)**	**245,000,000**	**"middle life"**
14.00	Final assembly of Pangaea	280,000,000	
14.50	**Beginning of Permian period (end Carboniferous/Pennsylvanian)**	**290,000,000**	
16.25	First reptiles	325,000,000	
16.15	**Beginning of Carboniferous/Pennsylvanian period (end Mississippian)**	**323,000,000**	
18.15	Early trees, formation of coal deposits	363,000,000	
18.15	**Beginning of Carboniferous/Mississippian period (end Devonian)**	**363,000,000**	
20.45	**Beginning of Devonian period (end Silurian)**	**409,000,000**	
21.50	Early land plants	430,000,000	
21.95	**Beginning of Silurian period)end Ordovician)**	**439,000,000**	
24.50	Early fish	490,000,000	
25.50	**Beginning of Ordovician period (end Cambrian)**	**510,000,000**	
28.50	Early shelled organisms	570,000,000	
28.50	**Beginning of Cambrian period (end of Precambrian time)**	**570,000,000**	**Rise of multicellular animals**
28.50	**Beginning of Paleozoic Era**	**570,000,000**	**"ancient life"**
28.50	**Beginning of Phanerozoic Eon (End Proterozoic)**	**570,000,000**	**"visible life" (or 544 million years ago)**
35	Early multi-celled organisms	700,000,000	
40	Breakup o early supercontinent	800,000,000	
70	Formation of early supercontinent	1,400,000,000	
60	First known animals	1,200,000,000	
125	**Beginning of Proterozoic Eon (end Archeon)**	**2,500,000,000**	**"earlier life"**
135	Buildup of free oxygen in atmosphere	2,700,000,000	
170	Early bacteria & algae	3,400,000,000	
190	Oldest known Earth rocks	3,800,000,000	
200	**Beginning of Archeon Eon**	**4,000,000,000**	
230	**Precambrian time begins**	**4,600,000,000**	
230	Origin of earth	4,600,000,000	

Note: I've set the scale to use 230 sheets rather than the usual 250 because it makes the conversion more obvious -- 20 million years per sheet.

Sun Distribution & Earth's Seasons
Laura Pedersen – Earth Science Senior

MATERIALS:

1. Peg Board
2. Ball (Dark color for presentation purposes
3. Bright light (overhead projector)

SETUP:

1. No setup required

PROCEDURE:

1. Shine the light through the peg board onto sheet of dark paper
2. Show students that the light (energy) is distributed evenly
3. Shine the light on the ball
4. Show students that the light spreads with the curvature of the Earth
    a. This represents direct and indirect light
5. Then draw in a line to represent the equator
6. Then tilt the Earth to show the students that the tilt is what creates seasons

TIPS:

Experiment with the peg board and light to determine appropriate distances

EXPLANATION:

Many students have a misconception about how Earth gets its seasons. Many believe that during summer we are just simply closer to the sun and vice versa. Although once a year we are closer to the sun (perihelion), it is actually during the Northern Hemisphere's winter. This demonstration illustrates to students that seasons are created due to the Earth's tilted axis as well as the energy distribution. Because the globe is round, the sun's incoming energy is more concentrated on some portions of the earth than in others. Lower latitudes, near the earth's equator, receive a greater concentration of incoming energy than higher latitudes. This is because at higher latitudes, the same amount of incoming energy is spread over a larger area of the earth than at lower latitudes. Because of the tilt of the earth, during certain times of the year the northern hemisphere is tilted toward the sun; at other times, the southern hemisphere is tilted toward the sun. Accordingly, the region of the globe receiving the most concentrated rays changes. It is this phenomenon that results in seasons.

SAFETY:

No safety precautions needed during this demonstration

Wilson's Cycle – Ocean Evolution
Laura Pedersen – Earth Science Senior

MATERIALS:

1. Fun-sized Milky Way candy bars (one per student)
2. Handout/Overhead copy of Wilson's cycle

SETUP:

No setup is required!

PROCEDURE:

1. Pass out Milky Way bars to students
2. Pass out handouts or project copy of Wilson's cycle
3. Stage one: Embryonic a. Milky Way bar "untouched"
4. Stage two: Juvenile
    a. Have students slowly pull candy bar apart, but not too much
    b. This illustrates that the crust has just broken
5. Stage three: Mature
    a. Have students pull a little bit more, but not completely apart
    b. At this point the caramel should be drooping, representing the asthenosphere
6. Stage four: Declining
    a. Have students start pushing their candy together, but not quite all the way
    b. If possible, have them push it together at an angle to represent a subduction zone c. This illustrates a convergence/subduction zone
7. Stage five: Terminal
    a. Have students push their candy all the way together
    b. This represents convergence with uplift
8. Stage six: Suture
    a. Have students push their candy even further; smashing the chocolate together
    b. This represents mountain building (like Himalayas)

As most of us know, the oceans open and close throughout time, the Wilson's cycle explains how the oceans evolve throughout time. As shown in the figure below, there are six stages affiliated with the Wilson's cycle and they are as follows: (1) Embryonic; stable rifts (2) Juvenile; beginning of divergence (3) Mature; completely open & subduction begins (4) Declining; convergence; starting to close (5) Terminal; uplift and closure (6) Suturing; convergence & fully closed. This demonstration will help students visualize and interpret the Wilson's cycle.

SAFETY:

1. Allergies?
    a. Milky Way candies do not contain peanuts, but students may be allergic to other contents
    b. Check with students first!

Fire by Steam
Matt Shade – Earth Science Senior

MATERIALS:
Hot Plate
Erlenmeyer flask
Rubber Stopper for Erlenmeyer flask
Flexible Copper Tubing, 1/4'', roughly 5' long
Strike Matches
Tongs
Propane torch.

SETUP:
First, coil the flexible copper tubing approximately 3-4 times around an "imaginary" circle with a diameter of approximately 4-5 inches. Leave both ends pointing 90 degrees away from each other with approximately 4-6 inches left on each end. Refer to image below.

Next, insert one end of the copper coil through the rubber stopper. If your rubber stopper does not have a hole for an object to be inserted through it(like a thermometer), you can also drill a hole roughly ¼'' in diameter. The end of the copper coil should go through the rubber stopper with 1-2 inches of copper showing.

Now, fill the Erlenmeyer flask roughly 1/4th full with water and stopper with the copper coil/rubber stopper. The copper coil may be too heavy for the Erlenmeyer flask to safely support; if so, build an apparatus to provide that support.

Finally, place the Erlenmeyer flask on the hot plate, and have matches and propane torch on hand along with necessary precautionary equipment (fire extinguisher, etc).

PROCEDURE:
Begin by turning on the hot plate and wait for the water to boil (you may add a boiling chip if you wish). Once the water in the Erlenmeyer flask has come to a rolling boil, use the propane torch to heat up the copper coil. The best place to point the torch is into the coils themselves- stay away from the ends of the copper, especially the end with the rubber stopper. This super-heating process may take 20-30 seconds or more. Once the gas exiting the copper tubing has turned colorless(you are no longer seeing the steam), take a match, put it in tongs, and place the head of the match directly in front of the exiting stream of steam.

EXPLANATION:
Quite simply, once the steam is superheated, it now has the energy required to light a match. First and foremost, this is a demonstration meant to convey the true power that steam can have. When normal steam is created from a pot of boiling water, it turns into vapor at 212 degrees Fahrenheight(standard pressure) and no more. However, this temperature is nowhere close enough to power the immense turbines in coal power plants, which provide roughly 70% of our nation's energy. These power plants superheat their steam to temperatures reaching 1000 degrees Fahrenheight, allowing them to reach much higher levels of energy efficiency. One way they reach these super high temperatures is they pump steam through pipes and superheat those pipes. This demo would go well with any unit dealing with energy or energy sources.

SAFETY:
Do not, under any circumstances, put any body part or foreign object in front of the steam exit point. This experiment should be conducted on a fire-safe surface. Participants should not wear clothing with loose components, such as a tie. Fire extinguishers should be on hand. Prior to setup, you may want to ensure that the copper pipe is free of foreign objects by blowing through one end. This prevents any situation where dangerous levels of pressure would build up within the Erlenmeyer flask while boiling the water.

Water vs. Steel
Matt Shade – Earth Science Senior

MATERIALS:
Steel Pipe, roughly ½'' diameter, roughly 6 inches long, threaded on both sided (inside or out). Caps or plugs for the steel pipe.
Refrigerator

SETUP:
Begin by capping one end of the steel pipe. Then, fill the steel pipe to its brim with water(this part is critical, you do not want any air in the pipe). Very carefully, without spilling any water, seal the 2nd end of the pipe. Tighten the caps as tightly as possible

PROCEDURE:
After you have filled the steel pipe with water and tightly capped it, put it in a refrigerator for approximately 3-5 hours. Depending upon the strength of the pipe, size of the pipe, etc, you may have to wait a while. Once the appropriate time has passed, the pipe should have split and you can take it out and use it as a demo. TIPS: Black steel pipe is cheap and can be bought at most hardware stores.

EXPLANATION:
This demonstrates the extremely powerful forces behind expanding water. As the water freezes, it attempts to form crystal lattices which take up more space than when it was in liquid form. Water cannot freeze without forming these crystals. As such, the colder the water gets, the more force it will exert onto the steel pipe as it attempts to freeze (until it overcomes the steel). This demo also shows the incredible forces that water can exert during the erosion process of granite in mountains.

SAFETY:
If you freezer also contains glass or other delicate items, put the pipe into a towel. When the pipe bursts, it will jump.

Lake Overturn
Matt Shade – Earth Science Senior

MATERIALS:
2 Jars that can stack on top of each other safely (mason works well).
One container of warm/hot water that can overfill one jar
One container of cold water than can overfill one jar
A laminated card large enough to completely cover the lid of one jar.
Large tub
Food Coloring, Blue and Red work best

SETUP:
Fill one jar to the very brim with warm water, and add food coloring (red). Now, fill the other jar to the brim, and add a different food coloring (blue). Make sure to do this just prior to the demo; the greater the temperature difference between the two liquids, the better. Put both jars into the large tub.

PROCEDURE:
On top of the lid of the warm jar, place the laminated card. The card should make a tight seal against the lid of the jar due to the water. Next, very, very carefully tip the jar over, keeping one hand on the bottom of the jar and one hand on over the card. When you do this, no water should fall out. Then, just as carefully, place the warm jar upside down on top of the cold jar. Essentially, the lids of both jars would be touching together if not for the card in between. Carefully remove the card from between the two jars, allowing the two liquids to touch. Because the warm liquid is on top, no mixing of colors should occur.

When ready to demonstrate what happens when a lake overturns, very, very, very carefully grasp both jars, lift them up without separating them or allowing any liquid to escape, and flip them. Make certain to do this over the tub just in case.

TIPS:
Make certain the laminated card is as thin and stiff as possible. Anything as flimsy as an overhead will fail. Practice, practice, practice the flipping portion; when the jars are filled with water, they can be heavy and difficult to deal with. Be sure not to make your “hot” liquid too hot, the heat will transfer easily through the jars.

EXPLANATION:
Large bodies of water, such as lakes and oceans, often segregate themselves based upon density. Density can be influence by salt content, but density is most influenced by temperature. In these bodies, less dense, or warmer, waters tend to float above more dense, cooler waters. During summer, density remains relatively stable in lakes because the top is warmed by the sun, while the bottom remains cool against the earth. During winter, however, lakes (especially lakes in Colorado) undergo a process known as overturning. This is where the top of a lake becomes significantly cooler (denser) than the bottom, and the lake itself flips from the bottom up. This is a very, very important process for the health of a lake because during summer, the top of a lake begins to lose nutrients as those nutrients slowly fall towards the bottom of the lake. Conversely, as fish move deeper to gain access to these nutrients, they begin to deplete oxygen at lower depths. This results in lakes which are nutrient deficient near the top and oxygen deficient at the bottom. The process of overturning mixes the lake, and brings oxygen to the bottom and nutrients to the surface, resulting in a much healthier ecosystem. Oceans do this too, but by much different mechanisms. This demo is best done during any unit on oceans, marine ecosystems, or density and temperature.

SAFETY:
Bring a spare pair of pants the day you do this, just in case.

Sediment Sorting
Matt Nolen –Biology

MATERIALS:
Large, clear container with sealable cap
Water
Gravel
Pea-gravel
Sand
Silt
Clay

SETUP:
Place some of the gravel, pea-gravel, sand, silt, and clay into the container. Then add water to the container leaving just a little air space at the top to help when shaking it up. Seal the container with the lid.

PROCEDURE:
Shake the container and its contents so that they are all in suspension and then let it sit undisturbed so that the contents can fall out of suspension.

TIPS:
Vary the particle sizes enough to ensure that they will fall out of suspension at different rates in order to be observed.

EXPLANATION:
Rivers and streams have the ability to transport a variety of differently sized sediments. However, these sediments will be transported varying distances based on stream velocity and particle size. This demonstration shows that the larger sediments will fall out of the water column before the finer sediments. Therefore, larger sediments such as rocks and gravel will not travel as far as finer sediments such as sand, silt, or clay. This demonstration may also allow the presenter to discuss the effects of erosion and how it affects water quality.

SAFETY:
Choose a container strong enough to withstand the abuse of rocks being shook inside of it.

Evaporative Cooling
Ross Kononen – Earth Science Graduate Student

MATERIALS:
Sling Psycrometer
Misting Spray Bottle
Water
Hollowed-out Shoelace

PROCEDURE:
1. Dampen shoelace until saturated with room temperature water (not dripping)
2. Slide shoelace over wet-bulb thermometer
3. Note both temperature readings (should be approximately equal)
4. One hand: Spray a fine mist of water with the spray bottle Other hand: Spin the sling psycrometer through the air that is being misted for ~10 seconds
5. Note the wet-bulb and dry-bulb temperatures
6. Repeat steps 4 & 5 as many times as you like

TIPS:
Have sling psycrometer out several minutes before demo to allow the thermometers to adjust to room temperature. Pre-dampening the shoelace is also recommended.

EXPLANATION:
When matter changes phases there will be an energy effect on the environment. In this case, liquid water is being misted into the air. Due to its surface area and the humidity (or lack there of) indoors, some of the water will evaporate into water vapor. This phase change will require energy, in the form of heat, to be taken from the environment. The thermometers on the sling psychrometer will show that less heat is present where the liquid mist is changing into water vapor.

Pop Bottle Barometer
Deidra Shutte - Biology Senior

MATERIALS:

Glass measuring cup with spout, or glass vase
Empty, clear pop bottle
Food Coloring
Water
Marker

PROCEDURE:

1. Pour water in glass container.
2. Add a couple drops of food coloring and mix well.
3. Turn empty pop bottle upside down into the glass container. Make sure the bottle fits tight into the container so that the bottle does not touch the bottom of the glass.
4. Mark a line on the cup to indicate the water level within the pop bottle.
5. Reexamine the water level as the weather changes.

EXPLANATION:

The amount of air within the bottle is fixed at whatever the atmospheric pressure is on day one. The pressure on the surface of the water depends on the current air pressure. As the weather becomes drier, the air pressure increases, forcing the water to rise in the bottle.

Transduction of sound wave energy

Nicholas Horianopoulos – Earth Science Education Graduate Student

MATERIALS:

Item 1: Stove Pipe/Drum with reflective mirror, mounted upon a tripod
Item 2: Laser, mounted upon a tripod
Item 3: Demonstration facility, 15m minimum

SETUP:

A 1' x 6" round stovepipe can be constructed as a drum with a cut latex glove. Rubber bands are used to mount the glove over one end of the pipe. Small machine screws should be threaded into the pipe near the latex to insure that the rubber bands will not slip over the end of the pipe, and a ¼" x 20 hole can be threaded into the body of the pipe in order to make it mountable to a standard tripod attachment. A 1" square of mirrored glass should be glued to the center of the glove with silicon. An inexpensive laser can be mounted to a riflescope mount, the mount threaded ¼" x 20, and an additional tripod can be used to mount the laser securely.

PROCEDURE:

The laser can be placed any distance from the Stove Pipe/Drum device, engaged, and aimed at the mirror. Then the beam reflected by the Stove Pipe/Drum device can be aimed at a distant surface. With the laser engaged, a person can yell into the Stove Pipe/Drum device, making the latex vibrate, wobbling the mirror, and showing that sound can be transduced into mechanical motion.

TIPS:

The longer the space you have to demonstrate the experiment, the greater the deflection of the beam, and the less you will have to shout to get apparent motion of the latex drumhead. Also, make sure your rubber bands are located beyond the screw heads so you can ensure they will retain their hold upon the latex. A balloon may offer better resilience against the metal of the stovepipe, and you may wish to sand the sharp edges to prevent the latex from tearing.

EXPLANATION:

Transduction of sound waves into mechanical energy is a natural occurrence in the Earth system. Creatures use this type of energy transfer to detect noise in the natural environment, and condenser microphones are similarly configured.

SAFETY:

Participants should not look into the laser

Body and Surface Waves in Earthquakes
Nicholas Horianopoulos – Earth Science Education Graduate Student

MATERIALS:
Item 1: Slinky x 4
Item 2: 3 volunteers

SETUP:
Volunteers will make the toy known as a "slinky" move to correspond with P-Waves, S-Waves, Rayleigh Waves and Love Waves, which are the four types of body and surface waves created by earthquakes.

PROCEDURE:
The instructor will create a "P-wave effect" with forward pulsations. Volunteers will create "S-Wave Effects," "Rayleigh Wave Effects," and "Love Wave Effects" when directed by the presenter.

TIPS:
Use a table top to manage motion so the effects of gravity don't disrupt your image of a wave.

EXPLANATION:
Sound waves are propagated in rock at velocities in the neighborhood of 5000 m/s (for P-Waves). S-Waves, propagated 90 degrees to the direction of their travel, can travel 3000 m/s. Rayleigh and Love Waves travel even slower, and are transmitted on the surface of the planet. The slower arrival time of secondary and the surface waves can be used to locate earthquakes via triangulation.

SAFETY:
There should be no concerns with this experiment.

Cloud in a Bottle
Kaleo Chung

MATERIALS:
Glass bottle
Rubbing alcohol
Pump
Rubber stopper
Chalk dust

PROCEDURE:
The principles behind cloud formation can be shown with a clear glass bottle, a bike pump, and a rubber stopper. Drill out the rubber stopper so that it fits snug over the bike pump nozzle. Add chalk dust to the interior of the bottle and this will act as dust particles for the evaporated molecules to cling too. Attach the rubber stopper to the glass jar and begin pumping. This increases the pressure in the bottle and forms heat. Some of the water will evaporate due to this pressure. Quickly remove the rubber stopper from the glass bottle, in doing so the pressure will be reduced, which will cool the air and condense the evaporated molecules onto the dust particles creating a cloud in a bottle.

CONCEPTS:
Pumping the bottle forces the molecules to squeeze together or compress. Releasing the pressure allows the air to expand, and in doing so, the temperature of the air becomes cooler. This cooling process allows the molecules to stick together - or condense - more easily, forming tiny droplets. Clouds are nothing more than groups of tiny water droplets! The reason the rubbing alcohol forms a more visible cloud is because alcohol evaporates more quickly than water. Alcohol molecules have weaker bonds than water molecules, so they let go of each other more easily. Since there are more evaporated alcohol molecules in the bottle, there are also more molecules able to condense. This is why you can see the alcohol cloud more clearly than the water cloud.

Gelatin Volcano Demonstration
Arnold, Tamara Senior-Biology

TOPIC:
Magma Flow- This demonstration shows how and why magma flows through volcanoes.

MATERIALS:
Volcano:
- Four unflavored/uncolored gelatin packets
- 2 cups cold water
- 6 cups hot water
- Large mixing bowl
- Small containers (Tupperware works well)
- Refrigerator

Magma:
- Syringe
- Red food coloring
- 1 cup of water
- Plastic straw or tubing

Other:
- Peg board or a base with small holes punched in it
- Draining pan
- 2 blocks or stable objects to keep peg board elevated

PROCEDURE:
To create the gelatin volcanoes, mix the four packets of gelatin with 2 cups of cold water in a large mixing bowl. Stir for approximately 2 minutes. Add the 6 cups of hot water and stir until gelatin is dissolved. Distribute the gelatin into the Tupperware containers. Place in the refrigerator for at least 3 hours. Once gelatin molds are set, mix the red food coloring and remaining water to create the "magma". Dip a Tupperware container in hot water to loosen the gelatin. Place the peg board or other base material on top of the Tupperware and flip the container so that the base is on the bottom. The gelatin mold should easily slide down to rest on the base. If it does not, gently shake the materials until the gelatin is released. Place base material on top of blocks to elevate it and place draining pan underneath. Attach a straw or plastic tubing to one of the holes in the base. Inject "magma" into the tubing using the syringe, refilling syringe as necessary until "magma" emerges through volcano.

EXPLANATION:
A volcano is a place on the Earth's surface (or any other planet's or moon's surface) where molten rock, gases and pyroclastic debris erupt through the earth's crust. Volcanoes vary quite a bit in their structure - some are cracks in the earth's crust where lava erupts, and some are domes, shields, or mountain-like structures with a crater at the summit. Volcanic vents are openings in Earth's crust where molten lava and volcanic gases escape onto the land surface or into the atmosphere. Most volcanoes have a circular central vent near their summit crater that serves as a conduit for ongoing volcanic construction. The central vent system is often plugged between large eruptions. Lava may fill fissures on the flanks of the mountain creating radial dikes. Gases and fluids also escape from secondary vents, creating fumaroles and hot springs on the slopes of a stratovolcano.

SAFETY:
Be careful when handling the hot water and food coloring as not to burn or stain skin/other objects

Cleaning up an Oil Spill
Genevieve Froid Post-Baccalaureate Student

The purpose of this experiment is to demonstrate some of the ways that scientists and others use to clean up oil spills especially in regards to the resent oil spill in the Gulf of Mexico. Scientists have been collecting and using hair to create booms to soak up a lot of the oil out of the ocean.

MATERIALS:
¾ Motor Oil
¾ Water
¾ Spoon
¾ Clear Plastic Cup
¾ Hair (Human or animal)
¾ Paper towels
¾ Bags for trash

PROCESS FOR THE OIL SPILL SCIENCE EXPERIMENT:
1. Pour water into the cleat plastic cup until its about 1/2 way full.
2. Begin adding the motor oil until you have a nice oil slick on top of the water.
3. Take some hair and start sprinkling some onto the top of the oil slick
4. Wait a few minutes and watch what happens to the oil.
5. Take a large spoon and scoop out the oil now that is attached to the hair and is easy to scoop out in a ball.

THE SCIENCE BEHIND THE OIL SPILL EXPERIMENT:
Hair is a great resource to clean oil because it is an organic, natural, renewable material that exists in plentiful quantities and is usually considered a waste material and thrown in the trash. Hair doesn't exactly soak up the oil; the oil clings to thousands of tiny scales on hair shafts. The oil clings to the outer layer of the hair, the cuticle. The cuticle consists of several layers of flat, thin cells laid out overlapping each other like roof shingles.

A public charity called Matter of Trust has asked salons and retailers around the country to send all the hair and nylons they can as an effort to make ultra-effective booms, or floating barriers that soak up the oil. Even Petco and other pet groomers are donating hair to help clean up the Gulf, too. Booms are traditionally filled with air or Styrofoam, but hair is great at retaining oil too. So far, Matter of Trust has collected 400,000 pounds of hair. Once the hair is soaked with oil, oyster mushrooms are placed on them to absorb the oil, converting it to compost in about 12 weeks. Mushrooms have been used in the bioremediation of many types of toxic substances for years.

Sugar Cube Rock Cycle

Kaylyn James-Senior Earth Science Major

MATERIALS:

-box of sugar cubes
-tea candle/jar candle
-lighter/matches
-aluminum foil
-hammer/book
-two pieces of scratch paper

PROCEDURE:

1. Examine compacted sugar cube (sedimentary rock), place in between two sheets of scratch paper
2. Use hammer/book to smash sugar cube (weathering)
3. Fold a boat out of foil (Note: thin, flat bottom necessary for quick melting and make a handle to hold boat with)
4. Transport crushed sugar into foil boat (erosion)
5. Light candle and place foil boat over the candle's flame
6. Allow enough melting time for sugar to become transparent (melting/magma)
7. Take boat off of the flame, allow cooling time
8. Once cool to touch, break the sugar in the boat and examine the results(weathering; process begins again)

This demonstration is great for scaffolding student's approach to understanding the rock cycle on a smaller scale, while using inexpensive materials. Sugar cubes show the best changes due to the ability to be compacted, representing sedimentary rock, to be crushed as weathering and transporting sugar sediments to the foil boat as erosion. Then students represent melting of sediments using a candle flame then cooling the melted sugar to be crushed again, to represent weathering. The sugar cubes demonstrate the continuous stages of the rock cycle and how the cycle never ends. Typically, students will ask for a sugar cube at the end of this, I suggest, have extra boxes of sugar cubes for this reason.

Kaitlin Griffin – Senior – Earth Sciences Major

POP BOTTLE BAROMETER

Subject Area: Physical and Earth Science

Concepts Addressed: Meteorology- air pressure and weather phenomena.

Materials Required:

- Empty pop bottle
- Glass measuring cup with a spout
- Colored water

Procedure:

1. Turn the empty pop bottle upside down into the measuring cup containing the colored water. Make sure the bottle fits tight into the cup so that the lip of the bottle does not touch the bottom of the glass.
2. Mark a line on the cup to indicate the water level within the pop bottle.
3. Reexamine the water level as the weather changes.

Rationale:

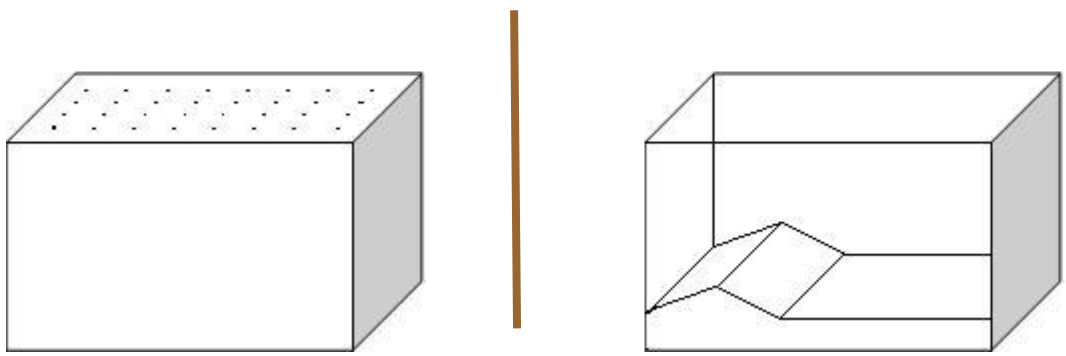
The amount of air within the bottle is fixed at whatever the atmospheric pressure was on the day you turned the bottle upside down during the initial demo. The pressure on the surface of the water depends on the current air pressure. As the weather becomes drier, the air pressure increases, forcing the water to rise in the bottle. As the weather becomes wetter pressure decreases and water in the bottle will lower. This can be used in a meteorology unit where students can observe and predict weather patterns by keeping an eye on the barometer. Students can decide weather temperature has anything to do with air pressure and explore what force is acting on the water in the bottle.

MAPPING THE OCEAN FLOOR

Materials:

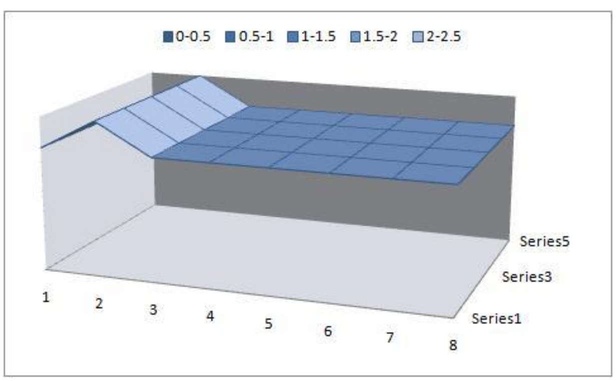
- Box with holes in top (holes are equidistance creating a grid type pattern)
- Rows and Columns must be differentiated for data entry (We used: Rows A,B,C… & Column 1,2,3,,,)
- Dowel rod (if too short it falls into the box) marked with numbered hash lines representing distance
- Create the bottom of the ocean with paper mache or foam overlaid with strapping tape (remember students will push the rod through the material if it's not tough enough to resist) foam comes in a spray can called *Great Stuff*
- Log sheet
- Excel or other spread sheet program

Students will replicate the in-class version of the seismic mapping process using a dowel rod. The student slides the dowel rod down each hole in the surface of the box (holding it perpendicular to the surface of the box) and when it touches the bottom the depth (numbered hash mark on the dowel) is recorded on a log sheet. After all measurements have been taken the data is then entered into an Excel (or similar) program and the computer produces a graphical representation of the bottom of the ocean represented by the data. We used 6 boxes; each box containing a different ocean floor shapes (i. e., oceanic plate separation, ocean-ocean convergence, ocean continent convergence, mid-ocean ridge transform fault…). Each student actively participate in mapping the ocean floor and contemplating what caused that structure; was it plate convergence or plate divergence, or was it due to volcanic activity or earthquake activity or some combination of these factors. Be prepared for those students that try to look inside; however the unknown builds the anticipation.



The Box as the student sees it The Shape inside the Box

An example of the computer printout and the data table from Excel provided below.



Oceanic Depth Measurements Data Chart

	A	B	C	D	E	F	G	H
1	2	2.5	2	2	2	2	2	2
2	2	2.5	2	2	2	2	2	2
3	2	2.5	2	2	2	2	2	2
4	2	2.5	2	2	2	2	2	2
5	2	2.5	2	2	2	2	2	2

Dillon Glatther – Senior Earth Sciences Major

Rate of Evaporation

This demo shows that evaporation removes heat only using three thermometers. One thermometer is the control. One is wrapped in a water soaked paper towel. And the last is wrapped in an alcohol soaked paper towel. Since alcohol evaporates the fastest the thermometer should show the fastest temperature drop. The water one will show less of a drop and the control should change very little.

El Nino

This demo uses a clear tub with warm, red water over clear cold water to depict normal Pacific ocean layers and compare to El Nino.

Laura Marschke – Graduate Earth Sciences Major (undergrad. Physics Major)

Candy Cratering

Purpose:

The purpose of this demonstration is to show, in a simplistic way, the nature of impact crater formation. This demonstration can be easily expanded to a laboratory exercise for students to learn more about impact crater formation and the relationships between mass, velocity and crater size.

- As a lab activity, the "meteorites" will be moving too slowly to create all the observed features of impact craters. This can be discussed before or after doing the lab.

Materials:

this is the material list for a lab activity; not as much is needed for a demonstration; multiply the supplies by the number of groups if doing a lab

- Deep plastic container (shoe box size)
- 6-8 cups of flour
- Chocolate drink powder
- Sifter or small strainer
- Powdered sugar
- Candies of multiple shapes and sizes to be used as "meteorites"
  - Recommended: peanut M&Ms, jelly beans, whoppers, milk duds
  - Corn, beans, marbles, and beads would work as well
- Meter stick
- Garbage bags
- Scissors
- Smooth object to smooth out layers
- Spoon/tongs/large tweezers (to retrieve meteorites)
- Stop watches (optional)
- Goggles are recommended if you are doing this as a lab activity

Procedure:

- Cut open a plastic trash bag and lay out on the counter or tape to the floor
- Place the plastic container on top of the bag and fill approximately 2/3 full of flour
- Tap the container gently on the table or floor to settle the flour and smooth if necessary
- Using the sifter, place a coating of powdered sugar on top of the flour (this helps to provide a barrier so the candy isn't flour-coated when the activity is done)
- Use the sifter and sprinkle a thin layer (approximately 2 mm thick) of chocolate drink mix over the flour to act as top soil
- Stand up the meter stick and drop candies of various sizes from various heights
  - Use of meter stick is not really necessary for a demonstration since you can easily show higher and lower drop heights
- Watch craters form!
- Repeat as necessary/desired and watch craters form on top of craters (older craters versus younger craters

- Retrieve meteorites, smooth and re-powder the top layer when a clean start is needed (i.e., when you can't see which craters you are currently making)

Additional measurements and information that can be discussed in a lab setting:

- Diameter of crater
- Depth of crater
- Velocity of projectile (would need stop watches)
- Diameter of ejecta
- Mass of projectile
- Width of crater at largest point
- Sketches of crater and crater patterns made by different "meteorites"
- Which craters are "older" and "younger" and why
  - Crater counting activities can be used in conjunction with this information

Note:

This demonstration was adapted from the activity Dr. Shauna Sallmen (University of Wisconsin – La Crosse) and I taught at a "Girls in Science"conference. However, the following are terrific websites to help expand the demonstration into a lab:

http://www.rpls.ws/lgiat/2007/READ/Lunar_Crater_Lab.pdf (candy lab plus cratering notes)

http://www.spacegrant.hawaii.edu/class_acts/CratersTe.html (same lab concept with different materials, blank data table pages, blank graph paper, and teacher note pages all linked to this page)

<u>Snicker's Metamorphosis</u>

Principles: This demonstration shows the process of metamorphism (changing form). It will show the transformation of a pre-existing rock type into a new rock type using a Snickers candy bar for the rock.

Materials: Snickers bar

Two pieces of wood

A volunteer

Procedure:

1. Cut the snickers bar cleanly in half to show the layers of this "pre-existing" rock.
2. Place one half of the candy bar between the two pieces of wood.
3. Have a volunteer stand or jump on the pieces of wood to represent the pressure it takes to morph one object into another.
4. Cut the smashed snickers bar cleanly in half to view the "new" layers.

Source: darylscience.com

#3. ATMOSPHERIC PRESSURE

Directions:

1. Put two three holes (about the diameter of the lead in a pencil) on one side of a plastic pop bottle, one near the bottom, one about the middle of the bottle, and one near the top.
2. Put a piece of tape on each of the two holes.
3. Fill the bottle with water, you can dye the water in order to see it better.
4. Screw the cap back onto the bottle.

(During the demonstration)

5. Take the tape off the first hole closest to the bottom of the bottle. Observe what happens. (The water should not come out of the hole. Now unscrew the cap and the water should come out of the hole.

   Screw the cap back on again and the water should stop coming out again.

6. Uncover the next hole and then the next, observe what happens. The results may vary. Either nothing will come out of either hole or there will be bubbles of air going into the top hole and the water leaking out of the bottom.
7. Unscrew the cap, observe what happens to each of the holes. This time there will be water coming from all three holes. Which hole produces the stream of water that shoots out the furthest?

   The middle hole should have the water squirting out the furthest.

Demonstration by Judson Doyle

Earth Science Major

#7. CLOUD IN A JAR

Materials: Rubbing Alcohol- Evaporate

Chalk Dust- Condensation Nuclei

Glass Bottle (abput the size of a wine bottle

Air Pump with a Needle Through a cork or stopper

Procedure:

Place a small amount of alcohol in the bottom of the bottle and a little chalk dust in the bottle as well. Apply pressure to the bottle with the pump and increase the pressure and temperature inside the bottle. Once the cork is ready to pop off the top, take the cork and needle off and quickly place your thumb on top of the bottle to trap the cloud. The sudden decrease in pressure and temperature will cause the liquid to condense on the nuclei and form a cloud. Also, place the cork and needle back on top while the cloud is still visible and the increase of pressure and temperature will cause the cloud to dissipate.

#10. THERE IS NO "SUCKING" IN SCIENCE!!!

Materials 1/8 inch clear tubing (32 feet)

Stairway that goes up at least 30 feet

water and container (bucket)

clamps for the tubing

Method: Slowly fill the tubing by submerging it into a pail of water. Make sure there are no air bubbles. Once the tube is completely filled, clamp the exposed end so that no water can escape. Have a student walk up the stairway until the water starts to drain back into the bucket. The water should begin to drain at about 30 feet depending on elevation.

#14. WHY DO WE NEED TO TAKE CARE OF OUR SOIL?

Materials- One apple

A small knife

(Next items are

Soil medicine examples (antibacterial gel, facial masks)

Soil art examples (sand painting, pottery)

Soil building examples (red brick, adobe)

Makeup (foundation, blush)

Plant

Procedure- Take apple and explain that it is the earth. Ask how much of the earth is covered by water, cut apple in quarters and get rid of three quarters. That is the amount of water (oceans lakes and streams) that covers the earth (75%). Now show the one quarter piece and tell them that it represents the dry land. Cut this piece in half and throw it away. Tell them that this represents desert, polar or mountainous land which is not productive (too hot, too cold or too high). Cut 40% of the apple and tell them that this piece of dry land is limited by terrain, fertility, or lots of rainfall (too rocky, steep, shallow, poor or too wet to grow food). Tell them what is left is 10%. Peel the skin from this portion and pass it around. While passing it around explain that this is the soil we depend on for the world's food supply. Tell them that it has to compete with other needs (housing, cities, schools), and discuss ways in which we could help our problem of soil shortage.

Demonstrations by Katherine (Mariko) Ryer

Earth Science Major

#21. MICROBURST

Materials: Blue food coloring, bluing

Clear plastic container shoebox size

A small container for blue water

Procedure – Fill shoe box half full of room temp water. In small container (Styrofoam cup or film canister) Add colored water with ice. Cup or container will have a hole in the bottom to release the blue water into the shoebox. The resulting cold water into the warm water will represent a microburst (cold dense air).

Acknowledgement for idea from Meg Jacobson, Windsor H.S.

#22. CANDY TECTONICS

Material Handout

Candy bar – dark milky way works best

Procedure – hand out candy…..

- First begin by pushing up the middle of the candy this represents uplift in the embryonic stage.
- Slowly pull the bar apart, this shows divergence in the juvenile stage
- Continue to pull the bar apart to show the mature stage
- Begin to push the bar together, this shows convergence in the declining stage
- Continue to push the bar together you have convergence and uplift, showing the terminal stage.
- Last the bar is getting pushed totally together showing the suturing, with convergence and uplift.

Acknowledgement for idea from Dr. Hoyt, UNC.

Chocolate chip mining **Sarah Bieber**

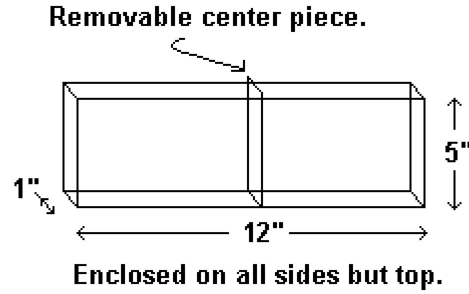
This activity shows the limited resources we have on Earth. Each cookie represents an area of Earth that has many minerals or other resources. Using toothpicks, remove the chocolate chips. After you have removed them all, try to put the cookie back together in a useful way so that you can use it in the future.

A variation of this may include showing different ways of mining. Soaking the cookie in water or milk, until you can strain the chips out, or crumbling the cookie into small bits to retrieve the chips.

This can lead to a discussion on mining practices and how to save resources.

DENSITY OF WATER

A very interesting demo can be performed with a transparent trough of plastic with a center divider similar to the diagram shown at right. The dimensions are not critical*. A drop of blue food coloring in dropped into a beaker containing about 500 ml of cold tap water. A drop of red food coloring is dropped into a beaker containing about 500 ml of hot tap water.



Both beakers are then poured into the trough; warm water on one side of the center piece and cold water on the other side. The water is allowed to calm down for about a minute. The center piece is then quickly removed. The heavy cool (blue) water moves under the lighter warm (red) water and two distinct layers are formed. Cool dense water on the bottom and warm less dense water on the top. If the water is allowed to sit for some time the layers will gradually dissipate as the temperature of the two layers equalize. The demonstration is ideal for discussing temperature distribution in lakes or the atmosphere.

* A workable device has been constructed with from a plastic shoe box with a center piece cut from a milk carton held in place by toy modeling clay although a thinner trough seems to work a bit better. A commercial version of this device is available from Flynn Scientific Inc., P.O.Box 219, Batavia, IL, 60510 catalog #AP4784 for about $30.00

5. How Massive? - April Griffo

How much of the solar system's mass is contained in the sun? Where's all the matter in the solar system?

There are nine planets, 65 moons, and billions of smaller objects in the solar system. But almost all of the matter in the solar system is contained in one object, namely the sun. Imagine you have a basket containing 100 potatoes. Those 100 potatoes represent the whole mass, or amount of matter, in the solar system. Take one potato out of the basket and cut it in to seven equal pieces. Put six of these pieces back into the basket. Those 99 potatoes plus the extra six pieces of the cut-up apple stand for the mass of the sun!

The one piece of potato left over stands for the mass of the rest of the solar system. Cut that piece in 10 equal parts. Seven of these parts are for Jupiter, the largest planet. Two of these parts stand for Saturn, the second-largest planet.

Most of the remaining part of the potato can be divided among the other seven planets. Cut the remaining part in half. Those two pieces stand for Neptune and Uranus. The small specks of potato left on the knife represent Earth, Venus, Mars, Pluto, and Mercury. Some of the microscopic particles of the potato would make up the 65 moons, the comets, the asteroids, and the meteoroids that are also part of the solar system.

The basket of potatoes gives you a model for understanding how mass is distributed in the solar system.

Compare the mass of each planet to the mass of the Earth.

10. Water Distribution Demonstration - Chad Unrein

This demonstration is designed to show students the amount of useable water the earth contains. It also will show students the percentages of the amount of water contained in the oceans, icecaps and glaciers, ground water, surface water, and air and soil.

97.2% Oceans (saltwater)
2.8% Freshwater

Freshwater
2.38% Icecaps, glaciers
0.397 Ground water
0.022% Surface water
0.0001% Air and soil

To start this Demonstration you will fill up a jug with 1000 ml of water this represents all the water on earth. Next you will pour out 972 ml of water in separate jug to represent the ocean waters. The remaining 28 ml of water represents the freshwater. Next you will pour out 23 ml to represent the amount of water contained in the Icecaps and Glaciers; then 4 ml to represent ground water. Next you will take your eye-dropper and use 2 drops for surface water and 1 drop for the water in the air and soil.

GLACIER MELT

You need: A small cup or yogurt container piece of board, to make an incline, Sand hammer and nail, Small rocks or pebbles thick rubber band, Water watch, Freezer

Advanced preparation: Place a one-inch layer of sand and gravel in the cup, followed by a few inches of water. Place it in the freezer. When frozen solid, repeat the process, adding sand and gravel, and some water. Then freeze. The cup should be filled to the top.

Next, carefully hammer a nail partway into the middle of one end of the board. Place that end against something immovable to form an incline or slant. Now you are ready.

An alternative to the large rubber band and top nail in very short picture frame nails in the area the glacier will sit. The nails will provide a rough texture to impale the ice on so it will not slide down the slope. The rubber band will not be needed, allowing a clear view of all sides of the melting ice and falling rocks.

What to do for the students: With the board flat- Spray the area below the glacier location and put some fine sand (I suggest bird gravel and grit). The sand will provide a surface for the water runoff to form an alluvial fan. If darker dirt was used in making the glacier you will observe the glacial runoff pattern against the lighter sand.

IT IS BEST TO DO THIS OUTSIDE OR OVER A SINK OR DIP-PAN

Remove your model glacier from the freezer. Warm the sides of the container under warm tap water just enough to get your model glacier to slide out when tapped. With the rock/and-side down, place the glacier at the top of the incline and fasten the rubber band around its middle and around the nail. Now place your board at a slight incline, and brace to prevent board slippage. How long will it take your glacier to melt, move and leave rock and sand deposits? Time it

What happens: As the glacier melts rock and sand deposits will fall off in clumps, some will slide down the board, while other separate bits and pieces will form along the board surface in strange patterns, much like moraine or glacial matter

Andy Caldwell

23. IMPACT CRATERS: NOT JUST HOLES IN THE GROUND

Purpose: To demonstrate the process by which impact craters are formed, and the morphology of the structures.

Standard: 4. 1, Bullet 3, Using evidence to investigate how Earth has changed or remained constant over short and long periods of time.

Procedure: Set out needed supplies.

· Fill a large tray with about 1/2" of white flour.

· Cover that layer with a thin layer of brown flour, just enough to cover the white layer.

· Cover the brown layer with just enough flour to hide it.

· Provide students with several different objects to drop into the flour. They don't need to be round.

Students can measure the mass of the objects and calculate the Kinetic Energy of the impacts.

· Have students drop the objects from various heights to create craters.

Questions: · How is this experiment similar to how a real crater forms? How is it different?

· What are the various parts of the crater called? How could you tell?

· How is the flour like statagraphic layers on Earth?

· What happened to the stratrigraphy when it was impacted? * What does this tell us about finding ancient craters?

Andy Caldwell

24. LOOKING FOR LIFE ON MARS

Purpose: To demonstrate a similar procedure to the one used by the Viking spacecraft when it looked for life on Mars in 1976.

Standard: 4.4, Bullet 5, Identifying and describing the everyday impact of recent space technology.

Procedure: Set out needed supplies.

· Fill three cups about 1/4 full of sand, or sandy soil.
· Add 1/2 tsp. of sugar to each of the cups.
· In one cup, place a crushed alka-seltzer tablet.
· In one other cup, pour 5-ml of dry yeast.
· Add hot tap water to each of the cups. 9 Monitor results

Questions:

· How is this experiment like the one Viking performed? How is it different?
· Which of the cups contained life? How could you tell?
· How long did it take for one of the samples to show that life existed in it?
· How could this demonstration be made more realistic?
· What does this tell us about finding life on Mars?

Joe Mock

28. MAKING A CLOUD

Materials: Pop bottle with cap, Water, Matches

Method: Fill a pop bottle about half full with water. Ask questions regarding the pressure and temperature of the room and inside the bottle with the cap off. Light three or four matches and blow them out. Quickly place them in the bottle and tightly seal the cap on top. Ask the same question as earlier. Squeeze the bottle. It may take a couple of times before anything occurs, but a cloud will appear with the squeezing of the bottle. The cloud will disappear and reappear with subsequent squeezes.

Why it works: Squeezing the bottle forces the air particles together increasing air pressure and temperature (slightly). As the air expands back to its original volume lowering the pressure and temperature, the air can condense. The smoke particles from the match are necessary as they provide the material for the water to condense on. The cloud formed inside the bottle is the condensation.

TORNADO IN A JAR (Jocelyn Friedman)
This is a good demonstration to do when starting a lesson on tornadoes. Another ideas is to have the students create one of their own.

The materials you need are: 1 mayonnaise jar, 1 spoonful vinegar, 1 spoonful Ivory soap, Water, light food coloring

Mix the vinegar and Ivory soap in the jar. Then add water to fill the jar. Add in a drop of food coloring and your tornado in a jar is complete. Shake the jar horizontally and a funnel cloud will appear.

GLACIAL MOVEMENT (Trey Griffin)
The manner in which a glacier moves across the land is rather complex. In this demonstration, I will use common household materials to simulate a glacier. The material shows the kind of motion the top of the glacier has as it moves downhill and where the fastest movement is in the glacier.

MATERIALS: 1 oz. shampoo concentrate, 2 index cards (one 4x6, one 3x5), 5 numbered circles of paper from paper punch, tape

Prepare a V-shaped valley by folding a 4x6 index card lengthwise and taping it to a 3x5 card. Add additional tape where the two cards meet so that any material placed in the V will not flow through the crack. Holding the trough so that the open end is up and the closed end forms a pocket, squeeze about 1 oz. of shampoo concentrate into the trough. Number the five small circles of paper 1 through 5. Hold the trough so that no movement of the concentrate occurs while you line up the five paper circles in order across the concentrate near the 3x5 card. If you dampen a finger, it will pick up the circles. As the shampoo concentrate is allowed to slowly flow down the valley, you can record the position of the circles every 30 seconds.

This demo shows how a glacier moves through a valley. The dots can be considered the markers and then the end moraine product. By tracking the movement we can then observe the fluid motion of the glaciers in a valley.

MOVING FAULTS (Trey Griffin)
The way faults move is an interesting and important concept. Through the use of clay you can easily simulate the types of faults that occur.

With your hands flatten four different colored pieces of modeling clay into flat pancakes about.5 to 1 cm thick. Put them on top of each other to make a stack of different colored layers. These layers represent the layers of the earth's crust. Make a line across the top of the clay to represent a road on the surface of the earth. Cut the stack in half. Pick up the two halves of clay. Move one half up. Keep the other half down. That is one way faults move. It is called a dip slip fault. This is what people normally think of as a fault. Now align the two halves of clay on a table top. Move the two halves past each other horizontally. This is another way faults move and it is called a strike slip fault. This is the way the famous San Andreas fault in California moves. Sorry but California is not going to fall into the ocean someday.

CHOCOLATE CHIP MINING (Donna M Wilson)

This activity represents the limitations of the earth's natural resources. A chocolate chip cookie will represent an area of Earth that is rich in minerals (chocolate chips). Have the students take a cookie and "mine" the chips with toothpicks. Have the students note that different cookies have different amounts of minerals and resources. The amount of minerals may vary. When students have removed all the resources from their cookies, ask them to try and put the cookie back together so that it can be an area full of abundance again for future generations.