SUPER Science SATURDAY

November 8, 2014
10:00 am – 1:00 pm

Special Events

Lasting Impressions

by Children's Museum of Saratoga

Did you know New York State was once covered by water? It's true! Kids learn this and more about New York's history by observing and handling real and replica fossils native to our state. This station-based program allows kids to be paleontologists for the day and uncover what fossils can teach s about the past. **Shows will be held at 10:30am, 11:15am and 12:15pm.**

Leaf/Bark Identification and Maple Sugar Demonstration

Trees...Trees…and More Trees!!! Did you know that you can tell the difference between types of trees just by looking at their leaves or bark? Did you know that maple syrup is made from *trees???* Visitors of the Leaf/Bark Identification and Maple Sugar Demonstration will learn how to tell the difference between types of trees based on their leaves or bark. Kids will also learn the difference between Conifer and Deciduous trees; how tell the age of a tree by counting the tree rings; how trees help our environment and what their uses are; and will learn about the time honored tradition of "sugaring," or making maple syrup!!! **Shows will be held at 10:15am, 11:15am, and 12:15pm.**

Planetarium Adventures: The STARLAB Learning Dome (Gym)

Journey through space and time in the STARLAB and explore the universe and ancient cultures. The STARLAB is a portable planetarium and interactive teaching tool that is guaranteed to capture the attention and enthusiasm of students while teaching them astronomy. **Shows will be held at 10:15am, 11:15am and 12:15pm.**

Knolls Atomic Power Laboratory: Science Demonstrations

The Knolls Atomic Power Laboratory NOVA Society tables offer simple hands-on science demonstrations of the Laws of Science.

- Children can balance a ping pong ball with air pressure,
- Implode a soda can
- Overcome the force of gravity, electroplate a coin,
- Play 'spin the wheel'
- Become a 'human lighting circuit' with a 15,000-volt Tesla coil
- Explore what makes a "good conductor, bad conductor" of electricity
- Test your strength against a 1.5-volt electromagnet
- Have a 'hair-raising experience' with the Van de Graaff generator.

These practical experiments are simple, safe, and fun for all ages, even Moms and Dads!

Pumpkin Launch… 5, 4, 3, 2, 1…BLAST OFF!

Take a step outside during our scheduled launch-times to see some pumpkins fly! Do you enjoy making marshmallows fly with the catapults you make at Super Science Saturday? Did you know that when you are in high school you can make HUGE catapults – called trebuchets, and use them to launch pumpkins? Some of the students from the Ballston Spa High School Physics classes have joined us today to show us the trebuchets they designed and built! Yes, that's PHYSICS!

Possible Science Fair Projects:
What is the effect of the length of the effort arm of a lever (the spoon) on the distance the marshmallows travel?
http://www.life.illinois.edu/boast1/sciencelessons/levers.htm
(Note: you do not want to build models for the Science Fair – so just building a catapult would not be an appropriate project – but that doesn't mean catapults are out – you just need to come up with a question to research about the design of the catapult, like the above example! There are lots of websites that tell how to build a catapult – you need to come up with the new idea to test – but be sure to get an adults okay and be sure to be safe!)

How does launch angle affect the distance a ping pong travels? (Launch Away! A Ping Pong Catapult)
http://www.sciencebuddies.org/science-fair-projects/project_ideas/ApMech_p008.shtml#summary

PUMPKIN MATH!
You must be out of your gourd!

Materials:
Pumpkins!
Your Math Skills
Clothespins
Oaktag (manila folders work)
Weighty objects of known mass
Scale
3 rulers
String
Ruler/Meter Stick

Procedure:

1) Pumpkin Graphing

Poll your friends and family and keep track of data using clothespin graphs. Use a piece of oaktag or foam board to construct the actual graph part that is reusable. Write the question on a sheet of paper and attach it to the top of the board. Use clothespins to affix to the yes or no side of the graph. You can even write the names of the people you poll on the clothespins if you use wood ones.

Today's questions are all about pumpkins!

- Do you like pumpkin pie?
- Have you ever gone to a pumpkin farm to pick out a pumpkin?
- Do you like to eat pumpkin seeds?
- Have you ever carved a jack-o-lantern?

2) One Phat Pumpkin - Estimate and Weigh a Pumpkin

You need a selection of weighty objects of known mass. Lift each object, decide if it weighs more or less than the pumpkin you want to know the mass of. Using the known weight of each object, estimate the weight of the pumpkin, and record your guess. Finally, weigh your pumpkin on a scale, record the mass and compare it to your estimate.

3) Pumpkin Pi

Time to determine the circumference of your pumpkin. The formula for circumference is $C = \pi d$ (circumference equals pi times diameter). First determine the diameter of your pumpkin: extend rulers from the widest points of both sides of your pumpkin, then use a third ruler to measure the distance between the two rulers. That distance is the diameter of your pumpkin. Now, multiply that number times 3.14 (the value of pi). Now you know the circumference of your pumpkin. But there is another way: use the piece of string to measure the circumference – wrap the string around the widest part of the pumpkin and use a ruler or meter stick to measure the distance of the string that was wrapped around the pumpkin. Compare the two values. You can also use the formula $d = C / \pi$ to determine the diameter – and compare that value to your original diameter measurement.

Possible Science Fair Projects:

What is the effect of size of the pumpkin on the number of seeds inside?
How does the size of the pumpkin seed affect seed germination?

There are various websites that can help you plan these experiments, e-mail the Science Fair Planning Committee if you need help or guidance.

Other Display and Demonstration Events Include:

- **Amazing Math by Mrs. Ernest,**
- **Apple Tasting and Graphing,**
- **Computer Programming Activities,**
- **Edwards' Vacuum,**
- **Pumpkin Decorating,**
- **Robotics Teams, and**
- **BSCSD Elementary Science Fair.**

Experimental Stations

Physics Stations

Milk Carton Catapult: *How far will your marshmallow fly? Will a large marshmallow fly further than a small one? Build your own catapult to find out.*

Materials: ½ gallon milk carton,
rubber bands,
spoon,
2 pencils,
tape, and
a toothpick

Procedure:

1. Lay the Milk carton on its side and cut the top and 1 side off.
2. Cut holes in the sides of the milk carton about the size of a pencil.
3. Cut a hole in the bottom side of the milk carton.
4. Next, put a rubberband through the hole in the bottom and loop the rubberband around the toothpick and tape it in place on the bottom of the milk carton.
5. Tape the spoon to the pencil covering half of the pencil with the spoon.
6. Stick the second pencil through the holes in the side.
7. Using a rubberband lash the two pencils together so the form a cross shape.
8. Finally, hook the rubberband to the end of the pencil, load marshmallow to the spoon and release.

Discussion:
What can be changed to make the marshmallow fly farther?
What will affect the flight of the marshmallow?
Increasing the length of the lever arm will have what effect?

Balance Birds: *Is it magic? Using the properties of center of gravity these two forks are balanced on the edge of the glass by a toothpick.*

Materials: Glass
Two forks
Cork
Toothpick

Procedure:
Step 1: Take the two forks and stick them into either side of the cork.

Step 2: Stick the toothpick into the bottom of the cork.

Step 3: Now try to balance the “bird” on the side of the glass.

"When you try to balance an object, if the point of support, the pivot point, is not at the center of gravity then the object will rotate either clockwise or anti-clockwise depending on which side has more torque. However, if the pivot point is on the same vertical line as the center of gravity, then the object, no matter what shape, is going to balance. It will be stable if the center of gravity lies below the pivot point. If the center of gravity is above the pivot point, even a slight disturbance will pull it off balance. In our case if you want to have a stable situation, the center of gravity of this assembly has to be below the pivot point. The pivot point is where the toothpick rests on the rim of the glass. The actual center of gravity must lie in the empty space between the two forks and below the pivot point to achieve stability."

Bibliography:

Arbor Scientific - Balancing Bird Tsing Barden - Physics Toys - Center of Gravity of Two Forks Cornerstone Networks - Lesson 15 - Calder Mobile Lenox Software - ballerina image Chris Reeder Video - www.unicyclist.com John Regehr - Calder image in the National Gallery of Art San Francisco Museum of Modern Art - Calder "Steel Fish" (1934) TradingStories.com - balance toys Dr. Raymond C. Turner - Clemson University - Billy, the Balancing Man UNESCO - Calder "Spiral" (1958)

Galileo's Leaning Tower of Pisa Experiment: *Do heavier objects fall faster than lighter objects?*

Materials: Balls of similar materials but different sizes & weights:

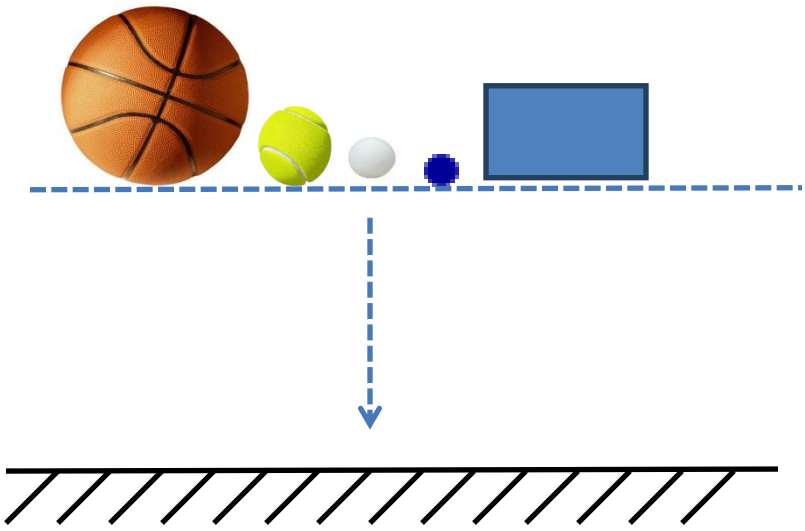
- Rubber bouncy ball
- Ping pong ball
- Tennis ball
- Mini Basketball

3"x5" Card

Procedure:

1. Pick up two balls of different sizes, one in each hand.
2. Hold each ball up so the bottom of each ball is at eye level.
3. Drop both balls AT THE SAME TIME and watch to see which ball hits the ground first.
4. Which ball hits the ground first? The larger heavier ball or the smaller one… OR do they hit the ground at the SAME TIME.

5. Now, pick up one ball in one hand and a 3”x5” card in the other hand.
6. Hold each object up so the bottom of each is at eye level.
7. Drop the ball and the card AT THE SAME TIME and watch to see which object hits the ground first. Did the ball hit the ground first?



Result: Since the balls are the same shape/made of the same materials (roughly) and are falling through the same medium (air on Earth) then the objects fall at the same speed. Heavier objects DO NOT fall faster than lighter objects. It is reported that famous scientist Galileo demonstrated this theory by dropping cannon balls of different weights from the top of the Leaning Tower of Pisa (they hit the ground at the same time).

When you drop one of the balls and the card, the ball hits the ground first not because of its size or weight but because of its different material/shape and how the atmosphere (air on Earth) affects the object.

Web Resources:
During the Apollo 15 mission to the Moon, astronaut David Scott recreated Galileo’s experiment by dropping a hammer and a feather (objects of different materials and shape). What do you think was the result? Did the hammer hit the ground first? Remember that there is no atmosphere (air) on the moon. Google “Apollo 15 hammer and feather drop” to watch the result!

Marshmallows Under Pressure: *Can you make marshmallows dance without touching them?*

Materials:
Small canning jar with lid
A drill or a hammer and nail
Marshmallows
Hot glue gun
Hand air pump with ball needle

Procedure:

1. Drill or hammer a hole through the center of the lid of the jar. Try to make the hole the size of the ball pump needle.
2. Insert the ball pump needle through the lid and use hot glue on the outside and inside of the lid to secure the needle and create air tight seal.
3. Fill the jar with marshmallows and screw the lid onto the bottle.
4. Pump air into the jar a few times and watch the marshmallows dance/shrink.
5. Unscrew the hose from the pump to allow air to escape from the jar. What happens to the marshmallows?


What's going on? A marshmallow's size depends on air. Air bubbles inside the marshmallow push out, making it puffy. Air outside the marshmallow pushes in. When you pump air into the jar, air pushes against the marshmallows, causing them to shrink and move. When the air escapes from the bottle, the marshmallows expand back to their original size.

Marshmallows NOT Under Pressure (in a vacuum): *What happens to marshmallows when there is no air pushing on them?*

Materials: Marshmallows
FoodSaver vacuum sealer and container

Procedure:

1. Place marshmallows inside the FoodSaver container.
2. Seal the container, see picture #1.
3. With an adult's help, attach a hose to the container and to the vacuum sealer (see FoodSaver instructions for more details)
4. Turn on the FoodSaver to vacuum air out of the container. What happens to the marshmallows? See picture #2.
5. Disconnect the hose from the container and press the release valve (see picture #3) to allow air back inside the container. What happens to the marshmallows now? See picture #4.

What's going on? When you turn on the FoodSaver, you are vacuuming air out of the container. With less air pushing against the marshmallows, the air bubbles inside the marshmallow expand, making it grow; see picture #2.

Discussion: After you unsealed the container, did your marshmallow look small and wrinkled (see picture #4)? This may happen because air bubbles inside the marshmallow break open as the marshmallow expands, letting air leak out. With less air inside the marshmallow, it shrinks to a smaller size when the air pressure returns to normal.

Biology Stations

Bird Seed Coated Bird Feeder: *Make a bird feeder to attract birds in your neighborhood!*

Materials: A large aluminum pan
A pinecone (or a stale piece of bread)
Crisco shortening (or peanut butter or lard)
Bird seed
A few feet of string

Procedure: Spread the shortening around the pine cone. Pour the bird seed into the aluminum pan and place the pine cone in, turn over to coat both sides and get as much

bird seed sticking to the shortening as possible. Tie the string around the pine cone (might be best to tie it on first) and hang outside.

Note - For Bread feeders: Use a straw to puncture a hole in the top of the slice of stale bread. It may be fun to use cookie-cutters to cut shapes in your bread, but do this before it goes stale or it will just crumble into pieces!

Result: Birds will love it! It may take a couple of days for birds to come to it because the human scent needs to wear off first.

Possible Science Fair Projects:
What seeds do birds prefer to eat?
http://www.sciencebuddies.org/science-fair-projects/project_ideas/Zoo_p028.shtml#summary
What colors are birds attracted to?
http://www.all-science-fair-projects.com/project1121_78.html

Colorful Carnations:

Materials: Cups
Food Coloring
Water
Fresh Carnations

Procedure:

1. Fill four of the cups one-half full with water.
2. Add about 20-30 drops of food coloring to three of the cups of water (red, blue, and green). In this case, more food coloring is better! The fourth cup should contain just plain water.
3. Before placing any of the flowers in the cups of water, have an adult trim the stem of each flower at an angle to create a fresh cut. For cut flowers, it is important for the stem tubes to be filled with water. If air gets in the tube no water can move up the stem. Many gardeners and florists cut stems under water so no air bubbles can get in to break the tube of water and make the flower wilt.
4. Place one freshly cut white carnation in the cup containing the uncolored water. Then place a freshly cut white carnation in each of the three cups of colored water. Save the remaining two carnations for the next step. As you wait to see the results, make some predictions: How will the carnation in the plain water compare to the carnations in the colored water? Which color will be soaked up first? How long will it take? Will one of the colors create a deeper colored flower or do the colors all absorb to the same degree?
5. The next step is a popular trick called "Split Ends," and it requires some help from an adult. Have your adult helper use a sharp knife to slit the stem straight down the middle. Put each half of the stem into a cup of different colored water (try positioning the red and blue cups next to each other, for example). Make a few more predictions: Which color will be soaked up? Will the colors mix to make a new color or will the color of the flower be divided down the middle? Just remember to keep the ends of the stems wet at all times and to make fresh cuts on the ends. You'll want to check back every few hours to see how things are progressing. It may take as long as 24 hours for the colored water to work its way up to the white petals.

At the conclusion of your experiment, remember to examine the whole plant carefully including the stems, leaves, buds, and petals to find every trace of color.

How Does It Work? Most plants "drink" water from the ground through their roots. The water travels up the stem of the plant into the leaves and flowers where it makes food. When a flower is cut, it no longer has its roots, but the stem of the flower still "drinks" up the water and provides it to the leaves and flowers. There are two things that combine to move water through plants -- transpiration and cohesion. Water evaporating from the leaves, buds, and petals (transpiration) pulls water up the stem of the plant. This works in the same way as sucking on a straw. Water that evaporates from the leaves "pulls" other water behind it up to fill the space left by the evaporating water, but instead of your mouth providing the suction (as with a straw) the movement is due to evaporating water. This can happen because water sticks to itself (called water cohesion) and because the tubes in the plant stem are very small (in a part of the plant called the xylem). This process is called capillary action. Coloring the water with food coloring does not harm the plant in any way, but it allows you to see the movement of water through the roots to the shoots. Splitting the stem simply proves that the tiny tubes in the stem run all the way from the stem to the petals of the flowers. Our unofficial tests indicated that the blue dye went up the carnations the fastest, followed by the red dye and then the green dye. Like colored dyes in this experiment, some chemicals that pollute our waters can get into the soil and ground water and contaminate our vegetables and plants growing in the soil. Some chemicals and pollutants, just like the color dyes, may travel up into the plant and affect its health or growth. - See more at: http://www.stevespanglerscience.com/lab/experiments/colorful-carnations#sthash.FkGkGkhm.dpuf

Possible Science Fair Projects: (Try one of the question ideas mentioned above) or

Which type of flower changes color in colored water the fastest?
How does the length of the stem affect the amount of time it takes to color the flower?

What is the effect of adding two food colors on the coloration of carnations?
There are various websites that can help you plan these experiments, including:
http://www.sciencebuddies.org/science-fair-projects/project_ideas/PlantBio_p033.shtml#summary

Grow a Seed: *Do you want to conduct your own plant investigation?*

Seeds come in all shapes, sizes, and types. There are some seeds that are so tiny, they look like dust. Other seeds, though, can be as big as a basketball! Seeds remain asleep until they are given soil, water, and light. In fact, all plants need certain things to

grow, including: room to grow, the right temperature, light, water, air, nutrients, and time.

Have you ever wondered how a seed becomes a plant? Now is your chance to find out! You get to grow a plant from a seed!

Materials: 6–8 seeds (see note below)

3–4 paper cups (or other small containers)

One small plastic lid per cup (to catch the water)

Soil

Pencil

Note: If you're using seeds from a seed packet, follow the planting instructions on the packet. You can use dried beans from the cupboard, but you may want to soak them in water for a couple hours first.

Procedures:

1. Place your cup on a table covered with newspaper to protect the table. (You could also work outside.)
2. Poke a hole in the bottom of the cup with a pencil.
3. Fill the cup almost full with soil.
4. Make a couple holes in the soil with your finger or pencil.
5. Place one or two seeds in the hole and cover them with soil.
6. Place plastic lid under cup, water the seeds, and place the cup in a sunny spot.
7. Water the soil when it looks dry. If you stick your finger one inch into the soil and it feels dry, then water your plant. When you water the plant, moisten the soil by using enough water so that it starts to come out of the hole in the bottom of the cup.
8. Remember that it takes time to grow and care for plants. Some plants require more time to grow than others.

Note: These directions are guidelines for planting and caring for a seed and plant. You should follow the directions that come with your seeds for the best results.

<u>Other factors to try</u>:

- Light vs Dark
- Phototropism
- Temperature
- Gravity
- Soil Types
- Crowdedness
- Water
- Pollution

For more information, visit:
http://seeds.sciencenetlinks.com/investigation/
http://sciencenetlinks.com/esheets/planting-seeds-watching-them-grow/
http://sciencenetlinks.com/lessons/look-at-those-seeds-grow/

http://www4.ncsu.edu/~jmalonso/Alonso-Stepanova_Outreach.html

Leaf Rubbings: *How can I keep my leaves colorful all year long?*

Materials: Real leaves
Any thin sheet of paper
Crayons or Oil Pastels

Procedure:

1. Collect leaves of various shapes and sizes.

2. Place a leaf bottom side facing up on a flat surface.

3. Put a thin sheet of paper on top of the leaf.

4. Rub the side of a crayon or an oil pastel gently on the area over the leaf. Observe as part of the leaf shape start to appear.

5. Continue until you've rubbed over the entire leaf.

6. Remove the leaf from under the paper.

7. Repeat using other colors and other leaf shapes.

8. You can also overlap the rubbings to create a leaf print collage.

For more information, visit:
http://www.firstpalette.com/Craft_themes/Nature/Leaf_Rubbings/Leaf_Rubbings.html

<u>Make Your Own Ice Cream</u>: *Make ice cream anywhere, anytime, and have a "ball"!*

Materials: Ice Cream Ball
Ice
Rock Salt
Cream
Sugar
Vanilla

Procedure:

1. Fill the ice end with as much ice as possible, then add 1/2 cup of rock salt. ***(MEGA**: **Add 3/4 cup of rock salt)**. The lid should be hand tightened - do not use the wrench!*

2. Mix up your ice cream ingredients in a container, then pour mix into the end with the metal cylinder, leaving about an inch for expansion at the top. Hand tighten the lid.

3. Have a ball! Shake, roll and pass it around as you mix and freeze the ingredients. It's not necessary to shake the ball...just motion will do it!

4. After about 10 minutes **(15 for the MEGA ball)** open the ice cream end using the included plastic wrench. Scrape the sides of the cylinder to mix up the ice cream using a plastic or wooden spoon (don't use a metal spoon as it will scratch the cylinder). Then check the ice end. Pour out the excess water and add more ice and up to 1/3 cup more rock salt to enhance the freezing ability. Close the lids securely and continue having a ball for approximately 5–10 more minutes. **(15 for MEGA)**

5. You now have about a pint **(or quart for the MEGA ball)** of delicious soft-serve ice cream. The consistency will vary based on the ice, your mix, the outside temperature, shaking frequency, etc. Once the ice cream is to the consistency of your liking, gently scoop it out and Enjoy!

6. Important tips for using your Play & Freeze™ Ice Cream Maker:

- Directions and recipes are inside the Ball.
- Use cream instead of half 'n' half for richer tasting ice cream.
- Leave about an inch of space for expansion when you fill up the can with the ice cream mix.
- After 10 minutes **(15 for MEGA ball)** of mixing (shaking, rolling, passing), its important to stir the ice cream mix (it freezes more around the can). Also drain the water and refill with ice and additional rock salt. Have fun for another 10 minutes and you're done. **(15 for MEGA ball)**.
- Use the provided plastic wrench to open the ball, but not to close it.

Chalk one up for Fall!: *Enjoy drawing with chalk on your sidewalk before the snow falls!!!*

Materials: Dixie Cups
Scissors
Duct Tape
Wax Paper
3/4 cup warm water
Small bucket or disposable container
1 1/2 cups Plaster of Paris
2-3 tablespoons dry tempera paint

Procedure: Cover one end of each tube with duct tape. Cut as many pieces of wax paper as you have tubes. Each piece should be as long as the tube and about 4 inches wide. Roll up each piece of wax paper and slip it into the tube. Pour the water into the bucket. Sprinkle the Plaster of Paris over the water and stir the mixture thoroughly with a spoon. Mix in the Tempera Paint (If you would like pastel colors, you can mix brighter colors of Tempura powder with some white.) Place each tube tape side down, on a level surface. Pour the wet plaster mixture into the tubes. Lightly tap the sides of each tube to release air bubbles, and then set the plaster-filled tube aside to harden for a few days. Once they are dry, peel off the tubes and wax paper. Your chalk is ready for action!

Result: Once they are dry, peel off the tubes and wax paper. Your chalk is ready for action! Plaster of Paris has been used since ancient times and dates back to 9000 years ago to Anatolia and Syria. Egyptians used to use plaster as a binding material in their pyramids. In fact we call it Plaster of Paris because large quantities of gypsum are available from Montmartre in Paris. Plaster of Paris is made by subjecting gypsum to high temperatures. The mixing of water with plaster causes an exothermic chemical reaction that releases heat. This heat helps to harden the Plaster of Paris allowing it to set. When a doctor sets a plaster cast to hold broken bones together he uses a little extra water. This extra water helps absorb the excess heat released, while some heat is lost to the surroundings. The large surface area of the cast also helps to dispel the heat of this chemical reaction evenly.

Predators of the Night: *Do you PREY at night? Some animals do!! – Predators of the Night*

Nocturnal animals have special adaptations that allow them to thrive at night! See if you can piece together the perfect nocturnal creature.

Procedure:

1. If you are awake at night, what is the most advantageous coloration to have to allow you to rest undisturbed during the day? Consider different colorations organisms could have, from red with black spots (like a lady bug) to black and white stripes (like a zebra)!

2. During the night, animals rely on senses other than sight. What kind of ears might a predator of the night have?
3. Whiskers are an adaptation for feeling what's around you. Would they be beneficial to a nocturnal animal?
4. What about night vision? What eye characteristics are good for night-time hunting? Big or Small eyes? What about the pupils in the eye?

Possible Science Fair Projects:
Predators and Prey: How Do Cats Respond to Bird Sound Recordings?
http://www.sciencebuddies.org/science-fair-projects/project_ideas/MamBio_p017.shtml

How does coloration aide in survival? (M&M Survival Challenge)
http://www.sciencebuddies.org/science-fair-projects/project_ideas/Zoo_p012.shtml#summary

Chemistry Stations

Magic Sand: *What Makes Magin Sand Magic? How can something submerged in water stay dry?*

When ordinary sand gets wet, the result is a clumpy mess. However, "Magic Sand" begins as normal looking sand, until it's coated with a substance that repels water. This special coating keeps the sand dry even after it has been dumped into a container of water. Build castles and other structures under the water, then simply pour the water off when you're finished and the sand is still dry!

Materials: Regular Sand
Water
Cups
Plastic Soda Bottle
Vegetable oil
Food coloring
Plastic spoons

Procedure:
1. Fill a cup 3/4 full with water.
2. Slowly pour Magic Sand in a continuous stream into the water. Look closely at the sand. What is that silver-like coating on the sand?
3. Pour off the water from the sand into a second container. Touch the sand and see what you find. To your amazement, the sand is completely dry! To better understand how Magic Sand works, try this demonstration…
4. Fill a plastic soda bottle (16 oz works well) 3/4 full with water.

5. Fill the remaining portion of the bottle with vegetable oil or mineral oil. Immediately, the students will notice that the oil and water do not mix.
6. Add a few drops of food coloring to the mixture. Notice how the food coloring only colors the water and not the oil… even when the bottle is shaken.

How does it work?
This is a great demonstration to introduce students to the properties of substances that are hydrophobic and hydrophilic. *Hydrophobic* substances do not mix with water. The term "water-fearing" is often used to describe the word hydrophobic. *Hydrophilic* substances, on the other hand, are "water-loving." Notice how the drops of food coloring color only the water and not the oil. Since oil is hydrophobic, the oil did not mix with the food coloring or the water. What are other examples of oil and water not mixing? A newly waxed car will make water form beads on its surface. Oil from cars will float on top of puddles. Oil and vinegar salad dressings need to be shaken up before using. So, how does Magic Sand work? The surface of sand grains is made wet by water, which means that water molecules are attracted to sand grains. Remember, this water-loving property of sand is called a hydrophilic property. Magic Sand is regular sand that has been coated with an oil-like substance that is water-hating or hydrophobic.

For more information visit,
http://www.stevespanglerscience.com/lab/experiments/magic-hydrophobic-sand

MAKE YOUR OWN VOLCANO

How can I make my volcano erupt faster or bigger?

Materials: A volcano - Talk to an art teacher about making a volcano out of paper mache or plaster. You can also use clay or if you're in a hurry to make your volcano, use a mound of dirt outside.

A container that 35mm film comes in or similar size container.

Red and yellow food coloring (optional)

Vinegar

Liquid dish washing soap

Procedure:

1. Go outside or prepare for some clean-up inside
2. Put the container into the volcano at the top
3. Add two spoonfuls of baking soda
4. Add about a spoonful of dish soap
5. Add about 5 drops each of the red and yellow food coloring

Now for the eruption!:

6. Add about an ounce of the vinegar into the container and watch what your volcano come alive.

A VOLCANO is produced over thousands of years as heat a pressure build up. That aspect of a volcano is very difficult to recreate in a home experiment. However this volcano will give you an idea of what it might look like when a volcano erupts flowing lava. This is a classic experiment in which a CHEMICAL reaction can create the appearance of a PHYSICAL volcano eruption. You should look at pictures of volcanoes to be familiar with the different types. (A SHIELD volcano, for example is the most common kind of volcano, and yet few people know about them) The reaction will bubble up and flow down the side like a real volcano (only much faster!) Look for videos of volcanoes erupting and be sure that you understand how heat and pressure work to really make volcanoes erupt.

MAKE IT AN EXPERIMENT

The project above is a **DEMONSTRATION**. To make it a true experiment, you can try to answer these questions:

1. Does vinegar temperature affect how fast the volcano erupts?
2. Does the shape of the volcano affect the direction the eruption travels?
3. What can be added to the "lava" to slow it down and make it more like real lava?
4. What combination of vinegar and baking soda creates the biggest eruption?

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Rainbow Effect – Chromatography: *Gloomy day? Need a rainbow to make you smile? Come make your own rainbow with Chromatography.*

Materials:
Several different water based markers
Coffee filter
Water
Pan
Paper clip

Procedure:

1. Make as many different colored dots as you wish on the coffee filter, keeping them about 15 mm (3/4 inch) from the edge of the filter.
2. Fold the filter in half.
3. Fold the filter in half again.
4. Secure the edge of the filter with the paper clip so that a cone is formed.
5. Fill the pan up to about 10mm (1/2 inch) from the bottom.
6. Stand the filter in the water, forming an upside down cone.
7. Observe the water move up the filter.

8. When the colors have moved up to the top of the cone, remove the filter from the water.
9. Allow the filter to dry.

What's going on? The coffee filter is separating out the molecules of pigments in the markers. When the water soluble markers are dipped in water, the water rises up the coffee filter paper via capillary action, (which is similar to but not quite the same as drinking through a straw). When it reaches the water soluble ink, the ink will dissolve in the water and some of the molecules will be carried along with the water molecules. Different pigments in the sample mixture travel at different rates due to differences in solubility in the solvent, and due to differences in their attraction to the fibers in the paper. Basically, some of the molecules will stick to the paper at various points, while others travel farther. There may not be complete separation of colors because they have similar solubility's.

Some markers have only one pigment – like blue, and other colors are mixtures of more than one pigment – like brown and orange

Web Resources:
http://theexplorationstation.wordpress.com/2009/04/14/coffee-filter-chromatography/
http://www.hightouch-hightech.com/downloads/chromatography_flower.pdf
http://www.hometrainingtools.com/colorful-chromatography-science-newsletter/a/1703/

Marshmallow Diamonds!: *Build a molecular superstructure.*

Materials: Marshmallows
Toothpicks

Procedure: Push 3 toothpicks into a marshmallow or gumdrop to form a triangular base. Put one additional toothpick in the top. Build more samples of the shape. Put them together by anchoring them with another marshmallow or gumdrop. Build a triangular base and then build another layer.

Result: Why are diamonds so hard? The tetrahedral shape you just built is very strong. This is the shape of the carbon atoms in diamonds. The toothpicks are the bonds between the atoms. In diamonds, four bonds to other carbon atoms nearby hold the carbon atoms tightly. The bonds are so strong is it very difficult to break, making diamonds very hard. When carbon atoms are connected in different shapes (including to other types of atoms), they are softer (like the graphite in pencil lead). Try building other molecular structures that are shown at the experimental station!

Balloon Rockets!!!

Materials: 1 balloon (round ones will work, but the longer "airship" balloons work best)
1 long piece of kite string (about 10-15 feet long)
1 plastic straw
tape

Procedure:

1. Tie one end of the string to a chair, door knob, or other support.
2. Put the other end of the string through the straw.
3. Pull the string tight and tie it to another support in the room.
4. Blow up the balloon (but don't tie it.) Pinch the end of the balloon and tape the balloon to the straw as shown above. You're ready for launch.
5. Let go and watch the rocket fly!

Result: So how does it work? It's all about the air...and thrust. As the air rushes out of the balloon, it creates a forward motion called THRUST. Thrust is a pushing force created by energy. In the balloon experiment, our thrust comes from the energy of the balloon forcing the air out. Different sizes and shapes of balloon will create more or less thrust. In a real rocket, thrust is created by the force of burning rocket fuel as it blasts from the rockets engine - as the engines blast down, the rocket goes up!

MAKE IT AN EXPERIMENT

The project above is a **DEMONSTRATION**. To make it a true experiment, you can try to answer these questions:

1. Does the shape of the balloon affect how far (or fast) the rocket travels?
2. Does the length of the straw affect how far (or fast) the rocket travels?
3. Does the type of string affect how far (or fast) the rocket travels? (try fishing line, nylon

string, cotton string, etc.)

4. Does the angle of the string affect how far (or fast) the rocket travels?

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Hope you had fun at this year's

Super Science Saturday!