



STEM Science – It's a Girl Thing!

November 22-24, 2013

Websites to remember:

1. <http://www.letstalkscience.ca/contact-us/outreach-sites/ontario.html>

This organization will attend your meetings, free of charge, to provide scientific learning on a myriad of topics anywhere in Ontario. Please contact the site nearest your location for further information.

2. <http://www.ontariosciencecentre.ca/Sleepovers>

This will be a night you and your troupe will never forget. Brownies by the dozens sleeping on the floor of the Ontario Science Centre!

3. <http://www.thenakedscientists.com/HTML/about-us/>

Loads of cool science experiments to try at meetings.

4. <http://si.edu/>

The Smithsonian Institute has free lesson plans for teachers on so many topics it will take you forever just to read it all.

5. <http://www.makerkids.ca/>

These folks have issued an invitation for Brownie Leaders in the GTA to visit their lab downtown. Please contact Andy or Jenn to arrange a date. They suggest Adult night for the leaders to investigate on Mondays or attend open night with the brownies. There is a fee for materials but this is an opportunity for girls to take stuff apart, put stuff together and create. Assistance is given by the supervisors.

6. <http://dragon.sleepdeprived.ca/>

7. <http://www.cagis.ca/> Canadian Association for Girls in Science

8. <http://www.marshmallowchallenge.com/Instructions.html>



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Experiments to Do at Meetings

Chromatography for the Caffeine Addict

1. Cut a coffee filter in strips long enough to reach the bottom of your jar/glass with some left to fold over the top or to tape to the rim
2. Fold your leaf in half and run coin over the surface of the leaf on to the filter about an inch or so from the bottom of the filter.
3. Pour about a ¼ inch of acetone into your jar/glass
4. Place tip of filter with the leaf stain end into the acetone.
5. Discuss.

Chlorophyll is the chemical required by green plants to photosynthesize. Each autumn when the leaves turn those beautiful colours and the green fades, you know that the plant is no longer making food and is preparing to go dormant for the winter. Where are those other colours coming from? With this experiment you can show all the colours that the green hides all summer long. Some colours like the bright reds or pinks are manufactured by the leaf from glucose when the nights get cooler. Some other colours are made from waste products left after the chlorophyll disappears. Chromatography is a process by which the colours are physically separated by weight. As the colour bands move up the coffee filter you can show their relative weights when the pure colours appear.

Magic is Just Cool Science

1. Pick up your popsicle stick. Find its center of gravity. It is, oddly enough, usually in the center.
2. Grab 2 forks or a fork and a spoon. Find their individual center of gravity.
3. Now push them together and find the center of gravity. Problem? The combined center of gravity is about 2 cm out in space.
4. Push the popsicle stick in between the tines of the fork. Now find the center of gravity.
5. If you are really good you can balance the whole thing on the edge of a water glass.
6. Discuss:

The weight of the popsicle is negligible relative to the forks. The center of balance is still out in space so it looks like you are performing an amazing magic trick, but really you have just demonstrated a really cool physics experiment.



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Lava Flows in Miniature

1. Pour $\frac{1}{4}$ cup of baking soda into a cookie sheet or flat plastic dish
2. Mix Vinegar with a few drops of red food colouring
3. Drop vinegar mixture by the spoonful or the eyedropper full onto various spots in the tray of baking soda
4. Watch the lava flow.
5. Discuss

This is the classic baking soda reaction we all do but it's much tidier. The chemical reaction is NaHCO_3 (sodium bicarbonate) + HCl (hydrochloric acid) = NaCl + H_2O (salt and water). Try this next one if you dare...

The Great Mentos Soda Pop Geyser

1. You will need a Spangler Geyser Tube (\$5 at retail stores in toy section), a one litre diet pop and 7 Mentos mints.
2. Place cola on a picnic table or on the ground in a parking lot on an even surface. **DO NOT DO THIS INSIDE. EVER.**
3. Tie the string to the geyser tube's trigger pin.
4. Open the bottle of cola and attach the Geyser Tube. Put the trigger pin into the base of the tube.
5. Take the cap off the tube and place 7 mentos into the tube. Replace cap.
6. Back up
7. **Back up further**
8. Have a leader or a brave Brownie pull the string
9. Enjoy explosion
10. Discuss

Why this works is a source of debate even now in the scientific community, but here is a simple explanation. Carbon dioxide is dissolved in the pop. When the bottle is opened it starts to come out of solution causing the bubbles. Water forms a sort of strong mesh around the bubbles causing a surface tension that requires a significant force to expand or break the bubble. Water resists the expansion of bubbles in the soda. When you drop the Mentos into the bottle 2 things happen. First CO_2 bubbles form on its surface and second it begins to dissolve and this breaks the surface tension. If you look carefully at Mentos they are pitted leaving numerous spots for CO_2 bubbles to form. Because the pop bottle creates a closed system with a small opening a large amount of pressure builds up. All the gas is released in a huge CABOOSH blowing the remaining liquid sky high.



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Dancing Popcorn Experiment

1. Fill clear glass with clear soda: any flavour will do
2. Drop 1 teaspoon (or more depending on the size of your glass) popcorn into the soda.
3. Discuss: Similarly to the mentos experiment the CO₂ bubbles form on the surface of the popcorn kernel. The popcorn is small enough that its' actual density relative to the soda pop will change when the CO₂ bubbles form on its surface causing it to rise to the top of the glass. When the popcorn kernel breaks the surface of the pop the surface tension of the bubbles break and the popcorn drifts back to the bottom of the glass due to its higher density relative to the liquid.



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JUMP Start
2nd Grade

SUBJECT
Math, Language Art

GROUPING
**Whole Class, Small Groups
or Individual**

JUMPSTART MODULE
Jukebox

A PENNY FOR YOUR NAME

DESCRIPTION Students will practice computational skills while finding the coin value of their names and other words.

MATERIALS *Values* master, paper, pencils, calculators (optional)

PREPARATION Make one overhead transparency or a copy of the *Values* master for each student.

PROCEDURE Ask students to calculate the value of their name. Begin with first names, then add surnames. Find out whose name is the most valuable.

EXTENSIONS Find the value of class theme words. Switch the value of the letters (e.g., make **Z** worth 1¢ and **A** worth 26¢, or make vowels worth 10¢ each and the remaining consonants worth from b = 1¢ to z = 20¢). Again, find the value of class theme words.





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The Marshmallow Challenge

Assemble a kit for each team:

1. ♦ Spaghetti: Ensure that you use uncooked spaghetti. Avoid spaghettini as it is too thin and breaks easily. Fettuccini is too thick.
2. ♦ String: Include string that can be easily broken by hand. If the string is thick, include scissors in your kit.
3. ♦ Marshmallow: Use a name brand or private label brand of marshmallows that measure the 'standard' size, about an inch and a half across. Avoid mini or jumbo marshmallows. Also avoid stale marshmallows. You'll want squishy marshmallows that give the impression of lightness.
4. ♦ Masking Tape: Get standard masking tape. Generally, you'll want to put the tape on the side of the table, the back of a chair or a nearby wall. Rolling it in the bag tangles the tape.
5. ♦ Paper Lunch Bags: Standard size lunch bags work well as do letter size manila envelopes.

Also ensure that you have the following tools to run the challenge:

1. ♦ Measuring Tape: Have a contractor's retractable measuring tape available after the challenge is finished so you can measure the height of the structures.
2. ♦ Countdown Application or Stopwatch: The actual marshmallow challenge takes eighteen minutes. Eighteen minutes seems to be the magic time. Twenty minutes is too long and fifteen is too short. You can use a stopwatch, but better yet is to use a video projector and display the countdown time. For Shareware Windows applications, consider <http://www.timeleft.info/> and <http://www.orzeszek.org/blog/2009/08/21/simple-countdown-timer-for-windows/>. For a Mac, consider, <http://www.baldgeeks.com/3-2-1.htm>.
3. ♦ Video Projector and Sound System (optional): For more impact, use a video projector to deliver the Marshmallow Challenge Presentation (or your own) and a sound system for music during the challenge. Time out a play list of exactly 18 minutes of music. You'll want the challenge to end at the conclusion of the last song.
4. ♦ Download a copy of the presentation: You can find the pdf instructions here: [TED2010 Tom Wujec Marshmallow Challenge Web Version.pdf](#)



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The Rules and how to win

1. ♦Build the Tallest Freestanding Structure: The winning team is the one that has the tallest structure measured from the table top surface to the top of the marshmallow. That means the structure cannot be suspended from a higher structure, like a chair, ceiling or chandelier.
2. ♦The Entire Marshmallow Must be on Top: The entire marshmallow needs to be on the top of the structure. Cutting or eating part of the marshmallow disqualifies the team.
3. ♦Use as Much or as Little of the Kit: The team can use as many or as few of the 20 spaghetti sticks, as much or as little of the string or tape. The team cannot use the paper bag as part of their structure.
4. ♦Break up the Spaghetti, String or Tape: Teams are free to break the spaghetti, cut up the tape and string to create new structures.
5. ♦The Challenge Lasts 18 minutes: Teams cannot hold on to the structure when the time runs out. Those touching or supporting the structure at the end of the exercise will be disqualified.
6. ♦Ensure Everyone Understands the Rules: Don't worry about repeating the rules too many times. Repeat them at least three times. Ask if anyone has any questions before starting.