Queen's University
Faculty of Education

Program

&

Take-home Activities

KINGSTON

The City of Kingston

PROCLAMATION

Science Rendezvous Day

WHEREAS there is an international decline in the number of students who are pursuing careers in Science, Technology, Engineering and Mathematics (STEM), and

WHEREAS there is a need to encourage children to be curious and aware of STEM related careers, and

WHEREAS there is a need to support teachers, community leaders, parents, and other adult role models to encourage children's interest in and pursuit of science and engineering-based professions; and

WHEREAS research findings suggest that "particularly in fields like science and technology—the best scenario for learning is one in which, outside the classroom, students remain immersed in curiosity, discovery, and experimentation," and

WHEREAS Kingston has three post-secondary institutions that have active research programs in science; a number of businesses and industries that are committed to the implementation of scientific research; many local museums dedicated to science; a large number of community organizations dedicated to conservation and ecology; and

WHEREAS the City of Kingston is widely recognized for its efforts in sustainability; and

WHEREAS, across Canada the second Saturday in May is dedicated to *Science Rendezvous*—a day to celebrate and honour science, research, scientists and careers in science;

THEREFORE, I, Mark Gerretsen, do hereby proclaim May 12, 2012, as "Science Rendezvous Day" in the City of Kingston. I encourage all citizens open their eyes and minds to the wonderful world of possibilities that exists by pursuing science studies and considering scientific careers.

DATED at Kingston this 18th day of April, 2012

Mark Gerretsen
Mayor

Schedule of Events

10:00 a.m.	**OPENING CEREMONIES** *Chris Whyman, Kingston Town Crier* *Dr. Ted Hsu, MP, Kingston & The Islands* *Dr. Stephen Elliott, Dean, Faculty of Education, Queen's* *Dr. Alan Harrison, Vice-Provost and Vice-Principal (Academic), Queen's*
10:15 a.m. to 3:00 p.m.	Science Rendezvous Stations and Explorations, Grant Hall
11:00 a.m.	Chemistry Magic Show, Kingston Hall, Room 201
1:00 p.m.	Chemistry Magic Show, Kingston Hall, Room 201 *introduced by Ontario Attorney General, John Gerretson MPP*
2:45 p.m.	Draws for Door Prizes and Volunteer Appreciation Prizes
3:00 p.m.	CLOSING REMARKS Dr. Lynda Colgan, *Coordinator, Community Outreach Centre, Faculty of Education, Queen's*
9:00 p.m.	Queen's Observatory (Ellis Hall) *Open House, featuring local astronomer & author Terence Dickinson*

Community Outreach Centre
Queen's University
Faculty of Education A364
511 Union Street
Kingston ON Canada K7M 5R7
(613) 533-6000 X 75775
community.outreach@queensu.ca

To learn more about the work of the Community Outreach Centre; download resources (including math songs, lessons and video) to use to support learning at home or in the classroom; or, register for workshops & activities, visit:

http://educ.queensu.ca/community/outreachcentre.html

Community Outreach Centre

Queen's University

Faculty of Education

SCIENCE RENDEZVOUS

WHERE PEOPLE AND SCIENCE MEET

Community Outreach Centre

Queen's University

The Community Outreach Centre, Faculty of Education, Queen's University would like to express appreciation to the following businesses and organizations for supporting the 2nd Annual *SCIENCE RENDEZVOUS KINGSTON* held on Saturay May 12, 2012 at Grant Hall, Queen's University. Without their generous support, this important public education event would not have been possible.

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Metro, Barrie Street

Marine Museum of the Great Lakes

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Community Outreach Centre

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Royal Military College (Departments of Chemistry and Chemical Engineering, & Physics)
Let's Talk Science
Queen's Graduate Chemistry Society
Queen's Department of Chemistry
Miller Museum of Geology
Queen's Solar Design Team
The Pump House Steam Museum in collaboration with Queen's University Faculty of Engineering and Applied Science
The MacLachlan Woodworking Museum
Dr. Henk Wevers (Queen's Mechanical Engineering)
Queen's Child and Adolescent Development Group
Queen's Human Mobility Research Centre
Queen's School of Computing
The Cataraqui Archaeological Research Foundation
Cataraqui Region Conservation Authority Educators and Matt Ellerbeck (Turtle Conservationist)
Science Quest
Queen's Pathology Graduate Students
Prince Edward Point Bird Observatory
Queen's Pharmacology and Toxicology Graduate Students
Kingston Field Naturalists
Queen's Ultrafast Group (Dept. of Physics, Engineering Physics, and Astronomy)
Queen's Geological Sciences and Engineering Jolliffe Club
Little Ray's Reptile Zoo: Endangered Ontario
Frontenac, Lennox, and Addington Science Fair
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SCIENCE
RENDEZVOUS
WHERE PEOPLE AND SCIENCE MEET

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PUMP HOUSE STEAM MUSEUM

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TRUTH • DUTY • VALOUR
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Queen's UNIVERSITY

The Volunteers Who Make It Happen

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Jesse Pelow

CATARAQUI ARCHAEOLOGICAL RESEARCH FOUNDATION
Nadine Kopp

CATARAQUI REGION CONSERVATION AUTHORITY
Jesse Pelow

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SPECIAL MENTION
Terry Bridges, Sponsorship & Donations, Facebook/Web Page

Emily LaBine, Developer of the Floorplan & Guide to Science Rendezvous Kingston 2012

Cui (Jessica) Wei, Developer of Science Rendezvous Volunteer Facebook Page

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Emily LaBine
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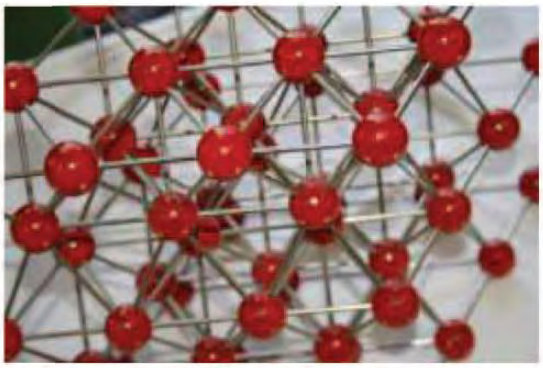
Community Outreach Centre

Science Rendezvous 2011



SCIENCE
RENDEZVOUS
WHERE PEOPLE AND SCIENCE MEET

Chemistry Magic of Matter Show

Reacting metals in oxygen/ air

What colours appear when you burn these metals? Match the metal on the left with the correct colour on the right.

Calcium (Ca)	yellow
Potassium (K)	green
Sodium (Na)	orange
Lithium (Li)	red
Copper (Cu)	violet

11 am & 1 pm

Don't try these at home!
Elephant Toothpaste, Genie in a bottle, Ethanol cannon & much more!

Fun At Home

Try the vinegar popper

~ Vinegar
~ Baking Soda
~ Film Canister
~ Plastic Bottle Cap

Note: Make sure the bottle cap slides freely into the film canister. Also the cap

Directions:

1. Fill the film canister ¼ full with vinegar
2. Fill the bottle cap with baking soda. Keeping the open end of the cap facing upwards, insert it into the film canister and let it float on the vinegar.
3. Carefully close the film canister so that the vinegar doesn't splash around.
4. Give the popper a solid toss. As it tumbles, the vinegar with mix with the baking soda, creating enough carbon dioxide to pop open the film canister

Queen's Chemistry

Answers: Ca = orange, K = violet, Na = yellow, Li = red, Cu = green

Science Rendezvous 2011

SCIENCE RENDEZVOUS
WHERE PEOPLE AND SCIENCE MEET

The volunteers who have made Science Rendezvous Kingston 2012 possible would like to extend your experience beyond our one day festival by inviting you to try out some simple, but exciting activities, projects and experiments at home.

On the following 28 pages, you will find instructions and information about everything from making your own environmentally-friendly cleaners to identifying birds. You will learn about steam engines, nuclear reactors and find recipes for rock candy and oobleck. You can find out how to make your own fossil and take a quiz to identify local birds by looking at their silhouettes.

RESOURCES FOR PARENTS & TEACHERS

Websites

http://science-at-home.org/

http://www.pbs.org/parents/exploringscience/

http://www.tryscience.org/

http://www.aaas.org/port_kid.shtml

Free e-book

http://science-at-home.org/wp-content/plugins/downloads-manager/upload/Young%20Scientists.pdf

Make Your Own Fossil!

Miller Museum of Geology
Queen's University, Kingston

Fossils tell us about life in the past. Often they are originally parts of animals or plants that have been buried in sand or mud. You can make a mould of an object in modeling clay, fill it with plaster, and when it dries you can paint it to make a "fossil" of your own!

What you will need:

- Small object to mould and "fossilize"
- modeling clay
- small aluminum pie pan
- plaster of Paris, water and a mixing bowl
- vegetable oil
- water colours, or tempra paint

Step 1: Choose your object!

We are making a mould of the toe bone from a small meat-eating dinosaur! You can use a boiled and cleaned chicken bone, or a shell or other object.

Step 2: Press the modeling clay into the pie pan

Make sure the clay is fairly smooth. Any bumps will show up in your fossil cast, so press it and smooth it as much as you can.

Step 3: Make the "mould"

Press the object into the modeling clay, and then carefully pull it out again. The mark that you leave in the clay is called the mould. Many shell fossils found in rocks are actually just moulds that were made in soft mud or sand. The shell itself often dissolves, leaving just the imprint in the rock. Put a bit of vegetable oil in the mould so that the plaster doesn't stick.

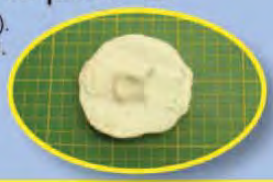
Tip: Any other marks you make in the clay will also show up on your fossil. Use popsicle sticks to make marks that look like footprints or plants in the clay.

Step 4: Fill the mould with plaster

Plaster of Paris can be purchased at any home renovation store. Mix up enough to fill the mould using the directions on the box. Carefully fill the mould with plaster, and then cover the rest of the modeling clay with plaster to make the "rock"

Step 5: When it is dry, remove the "cast" and paint it!

The plaster will dry in a couple of hours (or leave it overnight to be safe). Carefully peel the plaster away from the clay to reveal your "cast" fossil. The plaster can be painted with water colours or tempra paints to look like a fossil in the rock underneath!



let's talk science
inspiring discovery

Queen's University

We encourage you to keep science alive at home! Try the fun, hand-on science activity below to make an amazing bottle rocket with everyday materials!

Let's Talk Science is an award-winning, national, not-for-profit science outreach organization dedicated to bringing science to life for children and youth across Canada.

Rocket Science!

Objective: Learn about forces and energy while making a bottle rocket!

Time involved: 30 minutes

What You Need:

- 1L plastic pop bottle with a standard opening
- 1 piece corrugated cardboard (cut from cardboard box)
- 1 cork (to seal bottle's opening - try a hardware or craft store)
- Hammer
- Scissors
- 2 plastic tie wraps
- 1 sports needle (used to inflate soccer ball - try a sports store)
- Jug of water
- 1 bicycle pump
- Eye protection

Building Instructions:

1. Cut three similar cardboard fins about 10-15 cm long, at least 3 cm wide at the top, in any shape.
2. Make two holes at the top of the fin (Fig.1). This can be reinforced with a plastic eyelet (optional).
3. Thread the tie wraps through the holes, and tighten them to affix the fins to the bottle opening (Fig.2).
4. Using a hammer, drive the sports needle through the cork so that the tip comes out at the bottom (Fig.3). It may help to prepare the hole using a small nail. Verify that the cork will form a tight seal between the needle and the bottle neck.

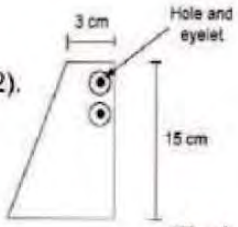


Fig.1

Launching Instructions*:

1. Pour about ½ cup of water into the bottle rocket.
2. Fit the prepared cork into the bottle opening.
3. Attach the bicycle pump to the sports needle.
4. Lean the rocket at a proper angle in an appropriate direction (the rocket can travel up to 20 metres).
5. Have your child pump air into the rocket, using the bicycle pump.

***When launching the rocket, wear eye protection and aim it away from people, animals and structures.**

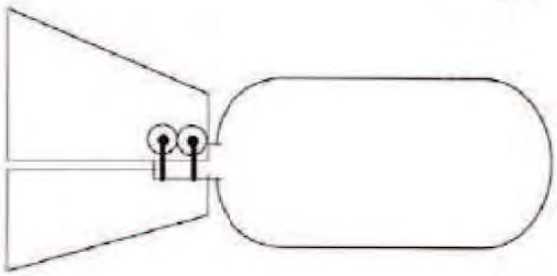


Fig.2

What's happening:

Real rockets are based on the principle of propulsion. Fuel is burned inside their boosters (red and white tanks on the space shuttle, for example), which produces gas. The gas builds up the pressure inside the booster, and escapes through the nozzle. The gas escaping produces an opposite reaction force, which sends the rocket upwards and into space.

A similar thing happens with the bottle rocket. Your child pumped air (gas) into the rocket, simulating the gas build-up produced by burning fuel. When enough pressure built up inside the bottle, the gas escaped by popping the cork, and the water and air escaping produced an opposite force that sent the rocket flying through the air.

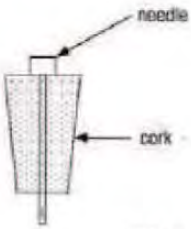


Fig.3

For more free hands-on activities, visit our database at letstalkscience.ca or the lab section of curiocity.ca.

Visit www.letstalkscience.ca/queensu to learn more about local Let's Talk Science Activities!

ROCK CANDY

THE SCIENCE BEHIND ROCK CANDY

How do rocks and minerals form in the subsurface? Well, much alike to rock candy, minerals and rocks are comprised of many small crystals formed from a solution that undergoes mixing, cooling and evaporation.

Rock candy is a large collection of sugar crystals "grown" from a sugar-water solution. As the water evaporates from the sugar-water solution, the solution becomes super-saturated in sugar and the sugar precipitates as small crystals on the string or wooden skewer. Since the sugar crystals precipitate over a long time period they are able to form large crystals.

How to Make Rock Candy

MATERIALS NEEDED:

4 cups sugar
2 cups water
piece of string (30cm)
small, clean glass jar
weight to hang on string (washer)
wax paper
small saucepan
wooden spoon
pencil (to suspend string over the jar)

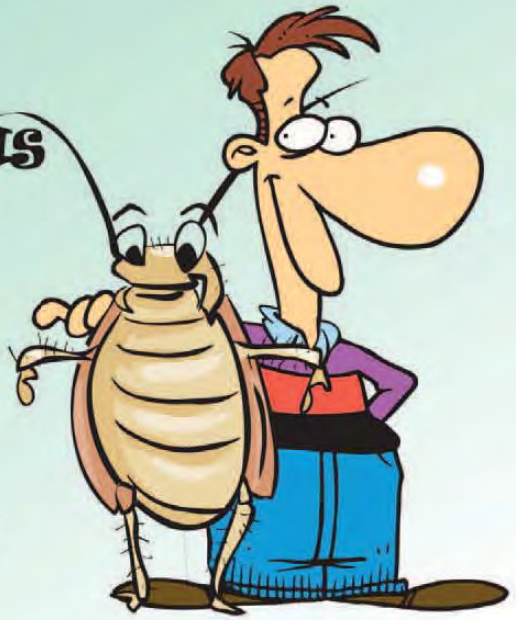
INSTRUCTIONS:

1. With help from an adult, bring water to a boil in a saucepan over medium-high heat.
2. Completely dissolve the sugar in the boiling water, stirring continuously with the wooden spoon until the solution grows clear and it reaches a rolling boil.
3. Remove the solution from the heat, and then carefully pour it into the jar. Cover the jar with a small piece of waxed paper.
4. Gently suspend the prepared string in the solution and let sit at room temperature, undisturbed, for several days. You can check each day to see how much your crystals have grown. It's tempting, but don't touch the jar until the experiment is finished—it usually takes about seven days.
5. At the end of the week, the crystals on your string should be clearly defined, with sharp right angles and smooth faces of various sizes.
6. Enjoy your rock candy!

Jolliffe Club
Graduate Students in Geological Sciences and Engineering

Queen's University
36 Union St.
Kingston, ON
K7L 3N6

Beauty of the Beast: What can cockroaches tell us about the nervous system?



Did you know that many different animals have nervous systems?

Even little cockroaches have neurons that sense things and control them.

Senses:

You aren't the only thing that can sense. Just like you can feel touch, cockroaches can feel touch as well, using the little hairs on their legs. We can listen to the cockroach's neurons with electrodes to investigate.

Muscles:

Just like you, cockroaches have muscles that move their legs. They control their muscles with neurons in their legs. We can show how this works by stimulating the neurons with electricity to make the cockroach legs move.

These little critters can help us to understand our own nervous systems, advancing science and medicine for all.

CENTRE FOR NEUROSCIENCE STUDIES

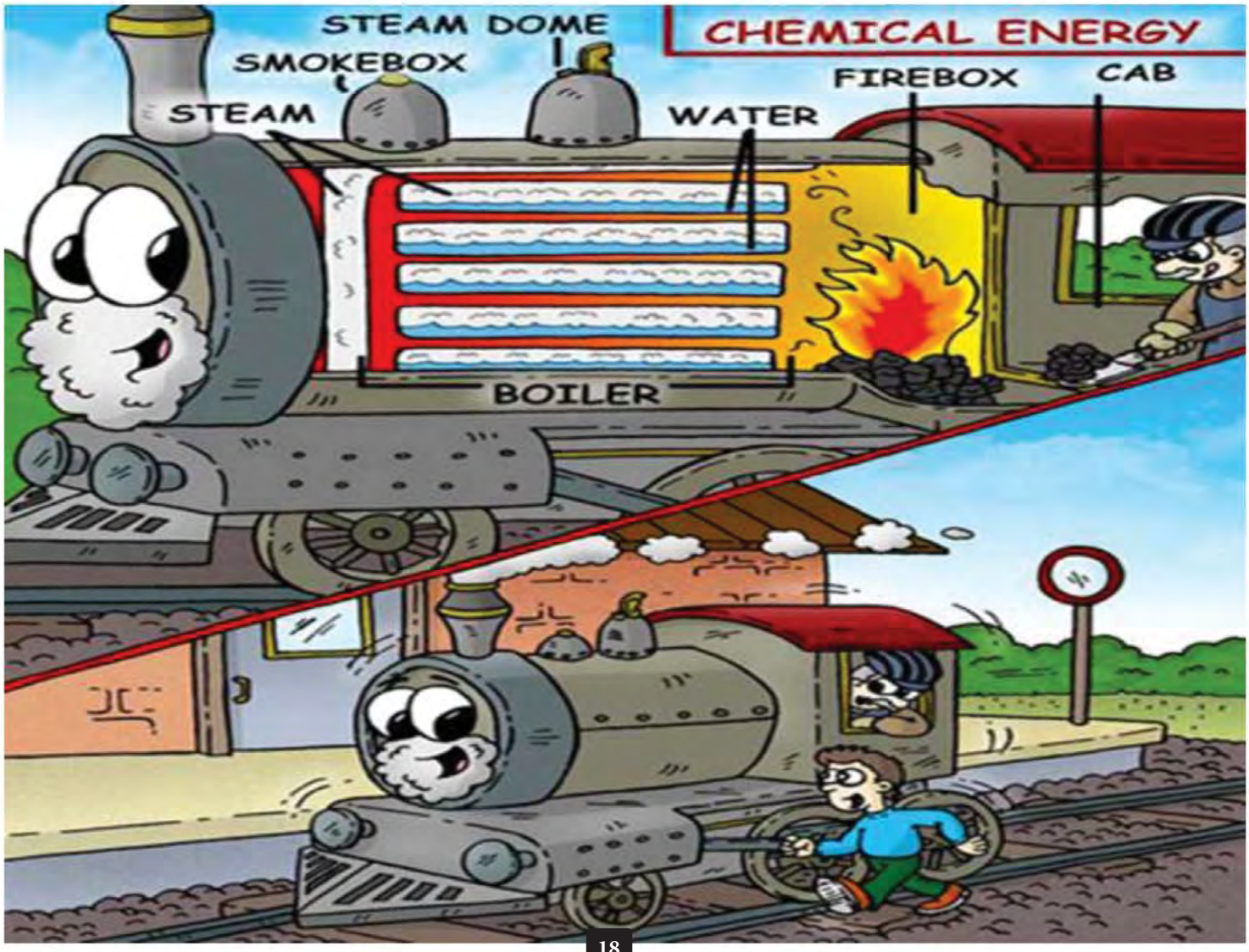
The Magic of Steam Engines

This information is reproduced with permission from www.ScienceWithMe.com

Have you ever ridden a steam locomotive? You can find a classic steam locomotive on old railways because it was traditionally used to transport both people and merchandise to various locations. Merchants use the steam locomotive to carry their goods and sell it in trade fairs or markets. Before the modern railroad system was introduced, all railways used a steam locomotive for their trains. You probably have wondered what makes a steam locomotive so fascinating, and that's because it's powered by a steam engine!

What is a steam engine?
A steam engine is the main reason why steam locomotives can function. With the steam engine people can travel faster which made trade more efficient. Steam engines are among the most brilliant discoveries by mankind. Although most steam locomotives are no longer operating on railways today, you can still find steam engines being used in various factories and industrial plants.

What powers a steam engine?
A steam engine is a type of machine that only relies on steam to facilitate energy. That's right! Energy from a steam engine comes from the heat that emanates from the boiler, which works much like a huge pot filled with water. Burning coal to fire up the boiler is similar to turning on the stove to boil water in a kettle. Men continuously place coal to burn so that the heat can circulate within the boiler, and as the water continues to boil it releases steam which in turn makes the machine work. It looks so simple that it's amazing how this can power an engine!

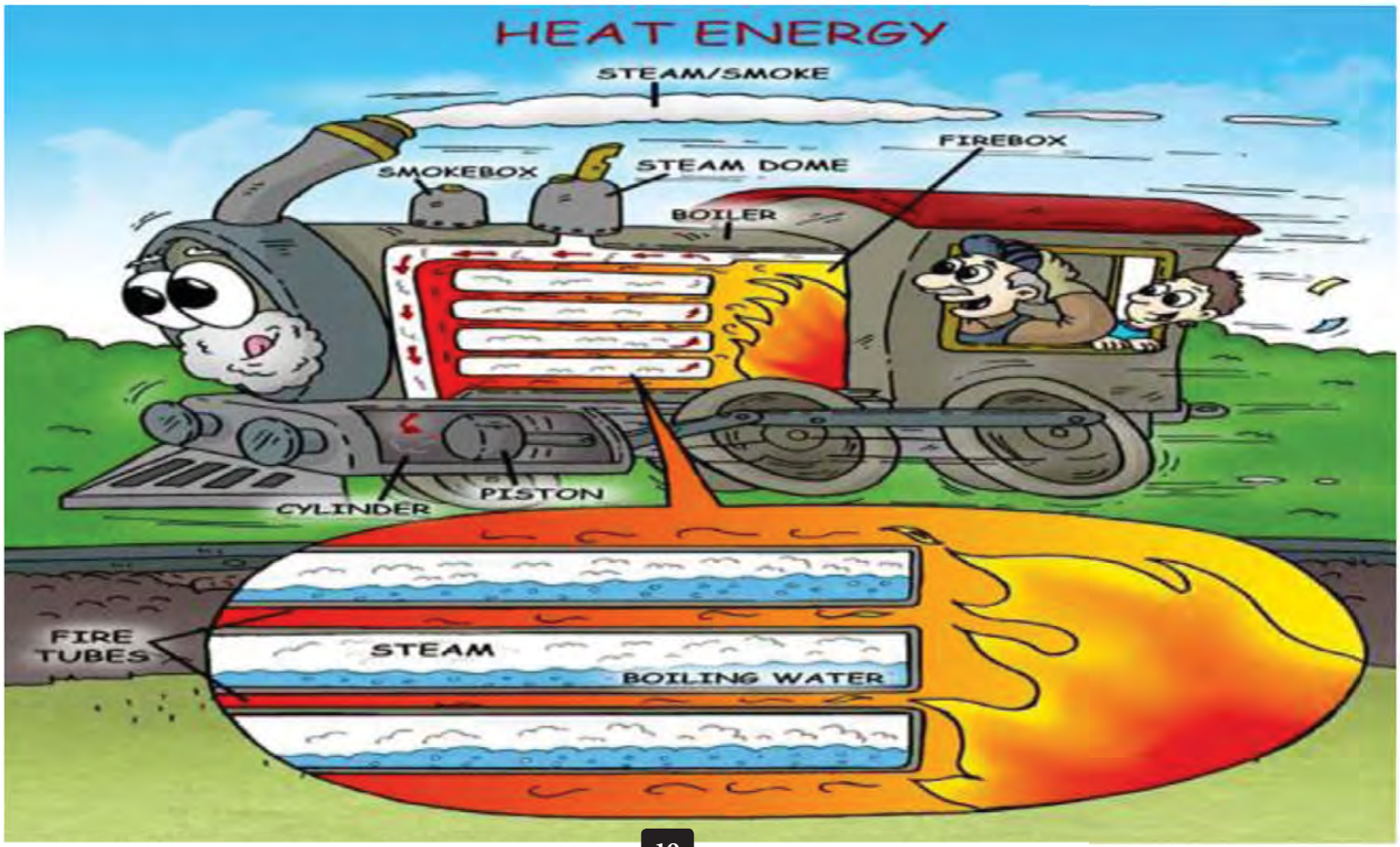


Understanding energy from steam engines

Like steam engines, everything uses energy to function. For example, food that we eat gets digested, and then converted into fuel that our body needs to perform our daily tasks. Energy can be used and converted, but can never disappear. It only passes from one state to another, and steam engines are the perfect example of seeing how it happens. For steam engines to work, energy is derived from four different kinds: chemical energy, heat energy, kinetic energy and then finally, potential energy.

- **Chemical energy.** To produce steam which a steam engine uses to operate, coal is loaded onto the firebox, which is essentially like an oven or wooden stove. Because coal is fuel which can transmit heat efficiently, it is used to increase the temperature for the boiler. The moment coal touches the fire and bursts into flame, it combusts. This kind of chemical reaction is called *chemical energy*.
- **Heat energy.** The conversion of energy begins in the firebox and ends in the boiler. In a steam engine, chemical energy is transformed to produce *heat energy* after the coals are set on fire. Heat energy is directed by a change in the temperature. Right after the coals ignites, that chemical energy gets converted to heat energy, which is used to boil the water and produce steam.
- **Kinetic energy.** With steam, the engine can now use this energy to force motion into the gears or in a case of a steam locomotive, the wheels. The steam forces the cylinder and piston within the steam engine to shuffle and move, initiating the turning of the wheels and putting it in motion. This is called *kinetic energy*. Kinetic energy derived from heat energy (steam) gives power to the cylinder and piston to act forward and backward, triggering mechanical action towards the wheels.
- **Potential energy.** Lastly, steam engines have potential energy when there is a need to function through a gravitational pull. When a steam locomotive goes up a hill, the kinetic energy that generates movement of the wheels suddenly becomes potential energy before the locomotive goes downhill. As the locomotive travels down the hill, this same potential energy converts back to kinetic energy, helping to bring the locomotive down.

Simply put, steam engines use fire and coal (chemical energy) to boil water and produce steam (heat energy), which in turn pushes the cylinder and piston to drive the movement of the wheels (kinetic). As the wheels turn and move towards a slope or a hill carrying a load (potential energy), it can also go faster when it goes downhill (kinetic energy). This gradual yet steady shift of energy forms makes it possible for a machine like the steam engine to work!



Extract your own DNA!!

You can't normally see your own DNA but with a few items from around the house you can see those tiny molecules that hold all of the important information that make you so unique!!

What you will need:
** make sure you have the help of an adult!

- 500 millilitres of drinking-water
- 1 tablespoon of cooking salt or table salt
- 1 clear cup or glass
- 125 ml of chilled rubbing alcohol (Isopropyl alcohol USP 70%)
- A few drops of blue food colouring
- 1 eyedropper or 1 spoon
- 1 drop of clear dishwashing detergent
- 1 stir-stick
- Safety Glasses
- 1 pair of rubber gloves

Step 1: Add the salt to the water and stir until the grains of salt have disappeared. Pour 3 tbsp of the salty water into a cup.
Step 2: Gargle and swish all the salty water from the cup around your mouth. Do not swallow the water. Spit it back into the cup.
Step 3: Dip the stir-stick in the drop of dishwashing detergent and gently stir it in the cup 2 to 3 times.
Step 4: Add 2 or 3 drops of food colouring to the rubbing alcohol if you want, and stir well. The blue food colouring will help you distinguish the alcohol from the water.
Step 5: Use the eyedropper to dribble the rubbing alcohol down along the inside wall of the cup. Try to add the alcohol very gently, so that the water and the alcohol do not mix.You want the alcohol to form a separate layer on top of the water. Pour enough rubbing alcohol to create a 2 cm-high layer on top of the water.
Step 6: Watch the thin strands of DNA collect together in the alcohol. The strands link together and form nets or webs of DNA. If the alcohol is cloudy, try the experiment again and add the alcohol more slowly.
Step 7: Discard the contents of the cup and clean up.

How did this work?

The skin cells inside your mouth were removed by gargling and swishing the water in your mouth. Salty water was used because it acts like the salty fluids inside our bodies.

Our cells are protected by "walls" that are really a fatty layer called a membrane. When you added the drop of dish soap you broke open the cell membrane and the DNA was released into the water.

When the alcohol layer was added, the DNA strands gradually moved into it and joined to other DNA strands. As more and more strands stuck together, the DNA became visible.

What does DNA stand for?

DeoxyriboNucelic Acid

Why is DNA important?

DNA carries the genetic instructions for making living things.

DNA is passed down from parents to children and is what makes us unique.

DNA is what determines the hair colour and eye colour that you have! (and many other things)




science at home!

THE PING-PONG PADDLE GAME

How your brain helps you follow rules

The Science Behind the Game

The largest part of the human brain, and the one that takes the longest to develop, is the frontal lobe. A healthy frontal lobe is really important when we need to control how we move and follow rules. It is really hard to follow rules when the rules go against things that we usually want to do. As our frontal lobes develop from childhood through adolescence, we get better at following rules, even in challenging circumstances. The ping-pong paddle game is one way of giving our frontal lobes a really challenging workout. See how well you do!

Play the Game!

Materials Needed

- Two ping-pong paddles with different colours on each side (for example, Red and Green)
- A friend, parent, brother, sister, grandparent, neighbour.... anyone!

Instructions

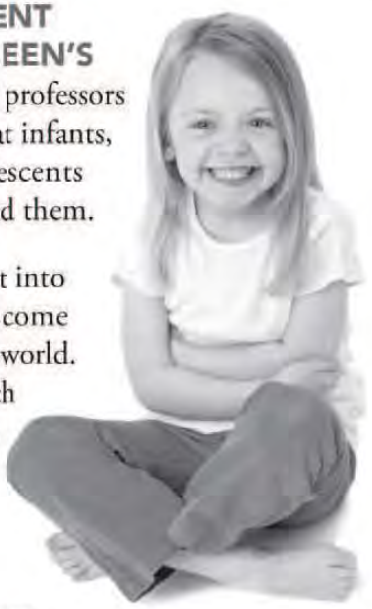
1. Hold one paddle in each hand.
2. Stand facing your partner.
3. Explain the rules to your partner: "When I lift a paddle showing the GREEN side, you raise your hand that is on the SAME side as the paddle (like if you were looking in the mirror). But, when I lift a paddle showing the RED side, you raise your hand that is on the OPPOSITE side of the paddle.
4. Do about 20 paddle raises, alternating hands and colors randomly. It's pretty hard, and your partner will make some mistakes. Even adults do!

Questions

1. What kinds of things do you think that you can do to increase the number of mistakes your partner makes?
2. Why do you think that the game is so hard?

CHILD AND ADOLESCENT DEVELOPMENT AT QUEEN'S

We are team of students and professors interested in finding out what infants, toddlers, children and adolescents know about the world around them.



Our research provides insight into how people grow, learn and come to interact successfully in the world. The findings from our research have important implications for how best to educate children and how to help children with special needs.

HOW DO I PARTICIPATE?

- Contact us to make an appointment.
- Come to Queen's University to participate in our fun and interactive studies.
- Parking is provided and siblings are always welcome.

CONTACT US:

Department of Psychology
Humphrey and Craine Halls
Queen's University
62 Arch Street, Kingston, ON K7L 3N6

Queen's University

Phone: **613-533-2476**
E-mail: **child.studies@queensu.ca**
Web: **http://psyc.queensu.ca/developmental**

Like us on Facebook for updates and study results! **(search for Child and Adolescent Development)**

613.533.2476
child.studies@queensu.ca
Twitter: @QueensChildDev

CHILD and **ADOLESCENT DEVELOPMENT**
Queen's University

Chemistry: The Study of Matter

Chemists study the matter that makes up the world around us: what it's made of and how it changes.

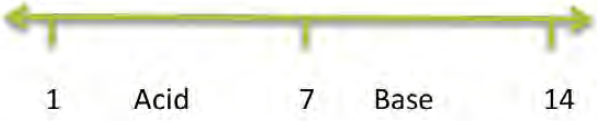
Explore the chemistry of acids and bases at home!

What are acids and bases?

Acids are substances that produce hydrogen ions when dissolved in water. They taste sour and are corrosive.

Bases can accept hydrogen ions from other substances and feel slippery.

Chemists use a number called "pH" to describe acids and bases. The pH scale ranges from 1 to 14, with 7 being neutral.



Where can you find acids and bases?

Many juices are acidic because they contain citric acid. Your stomach is also acidic because it contains hydrochloric acid. The pH of rain is often acidic because of pollution.

Bases make very good cleaners that you can use around the house. Baking soda is also a base.

Test the pH of substances around your home:

1. Get your parents to help you cut up two cups of red cabbage in small pieces. Then ask them to help you boil it in about one cup of water for ten minutes. Warning: chemistry can be smelly!
2. Filter the cabbage juice using a collander or seive. Be careful with the hot liquid!
3. In a cup, add ½ teaspoon of the cabbage juice to 2 teaspoons of the liquid you want to test. (Hint: try orange juice, vinegar and window cleaner.)
4. You can also stain paper with your cabbage juice, dry it and then dip this in liquids to test their pH.
5. Watch what happens. Bases turn the juice green, acids turn it pink and if the pH is near 7, your juice will be reddish purple.

What happened?

Chemicals called anthocyanins are extracted from the cabbage when you boil it. These chemicals change colour depending on the pH of the liquid.

Inflate a balloon using an acid-base reaction:

1. Clean out an old 591 mL pop bottle.
2. Pour two tablespoons of vinegar into the bottle. Be careful so that it doesn't splash. Sometimes chemists wear goggles in case their experiments splash.
3. Spoon one teaspoon of baking soda into the balloon.
4. Stretch the neck of the balloon over the neck of the pop bottle without pouring the baking soda into the bottle.
5. Lift the balloon up so that the baking soda pours into the bottle.
6. Stand back and watch your balloon inflate. You may want to cover your ears in case the balloon pops.

What happened?

Vinegar is an acid and baking soda is a base. When you mix them, they neutralize each other, making carbon dioxide and water. The carbon dioxide gas fills the balloon.

Stop by the Department of Chemistry tables at Science Rendezvous to try some other hands-on chemistry experiments.

Queens Chemistry

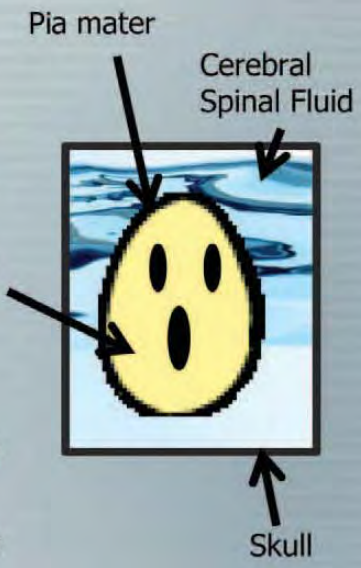
Chernoff Hall
90 Bader Lane
Kingston, ON K7L 3N6
http://www.chem.queensu.ca

Explore your Brain!

At-home experiments

Eggsperiment 1: Discover Cerebral Spinal Fluid

Cerebral Spinal Fluid (CSF) surrounds your brain inside your skull. In this experiment, we'll demonstrate how CSF can help protect the brain from injury. We'll pretend that an egg is the brain, and the shell is the 'pia mater' – the inner covering of the brain.



You will need:

-two eggs -water

-one plastic container and lid (a little bigger than the egg)

What to do:

Draw a funny face on the egg with a waterproof marker! Put the egg inside the container and shake it up. When you open the container, the egg will probably be broken! Next, use a new egg, and put it inside a container full of water this time. When you shake the container, the egg should remain unbroken. Why? The container is like the skull surrounding your brain. The water acts like CSF between your brain and your skull to protect it!

Experiment 2: Reaction Time with Rulers

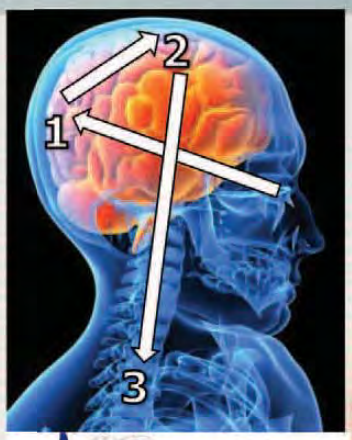
Measure your response time – or challenge a friend!

You will need:

-One ruler -One friend -One calculator

What to do:

Have a friend hold the top of the ruler at the 30cm mark. Place your hand at the bottom of the ruler so you are ready to catch it but not touching it. Have your friend drop the ruler unexpectedly and try to catch it as quickly as you can. Record the level in centimeters at which your fingers catch the ruler. Now let's figure out your reaction time. Because objects always fall at a constant acceleration, we can use a formula to figure out how long it took you to catch the ruler. Substituting "y" for the level (cm) where you caught the ruler will give you time "t" in seconds! $t=\sqrt{\frac{y}{980}}$



What happens in your brain?

1. Your eyes see the ruler fall and send a message to your visual cortex
2. The message goes to your motor cortex
3. Your motor cortex sends a message to the nerves in your spinal cord, which tell the muscles in your hand to catch the ruler!

Reynold's Lab
Centre for Neuroscience Studies
Botterell Hall
18 Stuart Street
Queen's University
Kingston, Ontario
(613) 533-6360

OOBLECK

A NON-NEWTONIAN FLUID

THE SCIENCE BEHIND OOBLECK

Is it a solid or is it a liquid? Well, actually, it's both! Sometimes Oobleck acts like a liquid and other times a solid. When you add cornstarch to water, they don't act mix together. Instead, the tiny, solid cornstarch particles are suspended in the water. When you apply a lot of force or pressure to Oobleck it acts exactly like a solid, but when you only use a small amount of force, it flows like a liquid. It is called a non-Newtonian fluid because it doesn't act like an ideal liquid, like water does. Ketchup and quicksand are also non-Newtonian fluids. Can you think of any others?

MAKE OOBLECK AND EXPLORE

Materials Needed

Table/floor covering (e.g. newspaper)
Food colouring (optional)
Large bowl/pan
1 cup cornstarch
Water *(Roughly a 2:1 ratio of cornstarch to water)*

Instructions

1. Cover the table and floor with newspaper.
2. Pour 1 cup cornstarch into a bowl and add a drop or two of food colouring.
3. Add the water slowly, mixing with your fingers.
4. Keep adding water until the Oobleck feels like a liquid when mixing it slowly. Try rolling some into a ball - it's just right when you stop rolling and it "melts" between your fingers (too powdery, add more water; too wet, add more cornstarch).

EXPERIMENTS TO TRY

1. Stir quickly and then slowly. What's the difference?
2. Pick up a handful and roll into a ball. What happens when you stop rolling?
3. Rest you fingers on the surface, then let them sink. Pull them out quickly. What happens?
4. Slap the Oobleck with your hand or a spoon? Does it behave like water?

CLEAN UP

Do not pour Oobleck down the drain. Let it dry out and dispose with other organic materials in your green box.

Explore the magical world of chemistry at home…

…with some hands-on kitchen-table science!

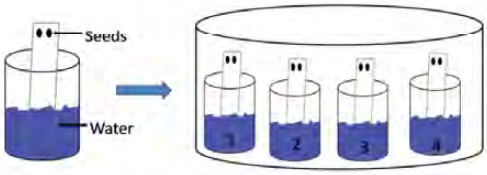
Graduate Chemistry Society

Queen's Graduate Chemistry Society
Queen's University
90 Bader Lane
Kingston, Ontario
Canada
K7L 3N6

qgcs@chem.queensu.ca

"The Dose Makes the Poison" (Paracelsus)

All drugs and chemicals go through the same process when they enter your body. The acronym we use for this is ADME.
A: Absorption
D: Distribution
M: Metabolism
E: Excretion



Healthy germinated seeds

Pharmacology & Toxicology in the Workplace

Students with a graduate degree in Pharmacology & Toxicology have job opportunities in:

- Government (eg. Health Canada regulatory affairs)
- Industry (eg. Industrial toxicologist)
- Academia (eg. Researcher and professor)

Find the Toxic Dose

In this experiment you will determine the toxic dose of a household chemical that will inhibit seed germination. The living system that you will perform this experiment on is the fast growing cabbage or radish seeds.

Materials Needed:

- Cleaning product (eg. Mr. Clean, Shout, etc.). It must be safe to handle and water soluble
- 4 germination chambers (eg. old film canisters, empty individual yogurt containers)
- Water mat, pellon or felt
- Cabbage or radish seeds
- Empty ice cream container (or other large sealable container)

Instructions:

1. Wash and thoroughly rinse the germination chambers. Number the containers 1-4. Add the same amount of water to each container so that they are about half full.
2. Add increasing doses of the cleaning product to the water in the germination chambers. (eg. container 1 put ⅛ tsp of cleaner, container 2 put ½ tsp, container 3 put 1 tsp, container 4 put 1 tbsp).
3. Wash and thoroughly rinse the water mat, pellon or felt. Cut into wicks.
4. Place wicks into germination chambers which contain increasing doses of cleaner. Once the wick has absorbed the solution, place two seeds onto each wick.
5. Seal it all in an airtight container and leave it undisturbed.
6. Observe. Germination will occur over the next 5-7 days. See which dose causes the seeds to not germinate.

Adapted from the Society of Toxicology's Paracelsus Series

Pharmacology & Toxicology
Graduate Program
Queen's University
Botterell Hall

http://meds.queensu.ca/departments/pharmacology_toxicology

Royal Military College of Canada
Nuclear Engineering

What We Do

Nuclear engineering means harnessing the power that's contained within the atom for the purpose of generating electricity, and powering our society. It means building, operating, and maintaining the reactors that we use to extract nuclear energy. More than power generation, nuclear engineering has applications in material science, radiation safety and medicine. At RMC, we model the performance of nuclear fuel, research radiation exposure in airplanes and spacecraft, investigate atmospheric dispersion, and design the next generation of reactors.

Oodles of Elements

There are 118 elements on the periodic table. The elements are the building blocks of matter, and everything around us and everything that we're made of is made out of them. At their heart, there is a tiny nucleus composed protons and neutrons.

Hydrogen, the lightest of all elements, is made out of only a single proton. Helium, the next lightest, has two protons and two neutrons. Heavier and heavier elements can be made simply by adding more protons and neutrons, and we get the wonderful variety of elements, from oxygen, to iron, to gold, to plutonium.

But there's a limit: the more protons and neutrons you cram in, the harder it is to keep them all together. Eventually, if you add even one more, the whole nucleus will break apart.

Image Source: Wikimedia Commons

Fission and the Chain Reaction!

You can picture the nucleus of a large atom like uranium as an unstable droplet of liquid. When hit by a neutron, the nucleus splits in half. The two parts fly off with great speed and great energy. You get 4 million times more energy for a gram of uranium than you do from a gram of gasoline.

But more than this, when you split uranium with a neutron, you get more neutrons. These neutrons go on to cause more fission in fresh uranium atoms in a chain reaction. The power from nuclear reactors is adjusted by controlling the number of free neutrons, so that for every fission, you get exactly one neutron to maintain the reactivity.

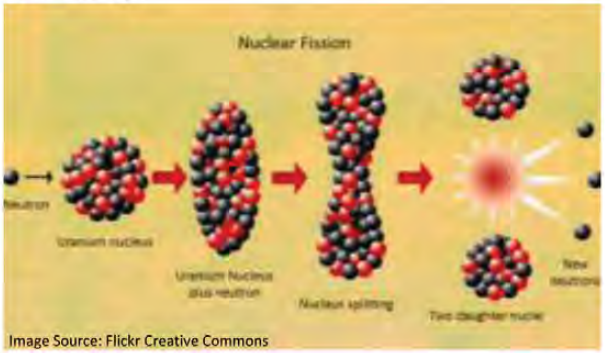
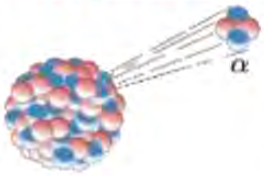


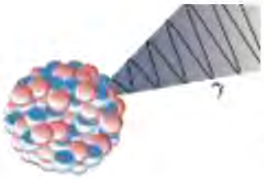
Image Source: Flickr Creative Commons

Types of Radiation



Alpha Particle, α
These are 2 protons and 2 neutrons bound together. They're ejected from heavy radioactive elements. They're very energetic, but can't penetrate very far!

Beta Particle, β
These are high energy electrons or positrons (anti-elections) that are ejected from the nucleus of a radioactive atom. Beta particles can be found in bananas!



Gamma Photon, γ
An electromagnetic wave (photon) emitted from the nucleus of an atom. It's able to travel through many materials and is used to treat cancers!

Image Source: Wikimedia Commons

How Does a Reactor Work?

Nuclear power reactors are used to generate the electricity that runs our homes, our factories, and our businesses. It's even used for some ships and submarines!

Fission of uranium atoms occurs in the reactor vessel. The heat that is generated is extracted in a two-step process and is used to produce steam. The steam that is generated flows to a turbine, which in turns drives a generator that produces electricity.

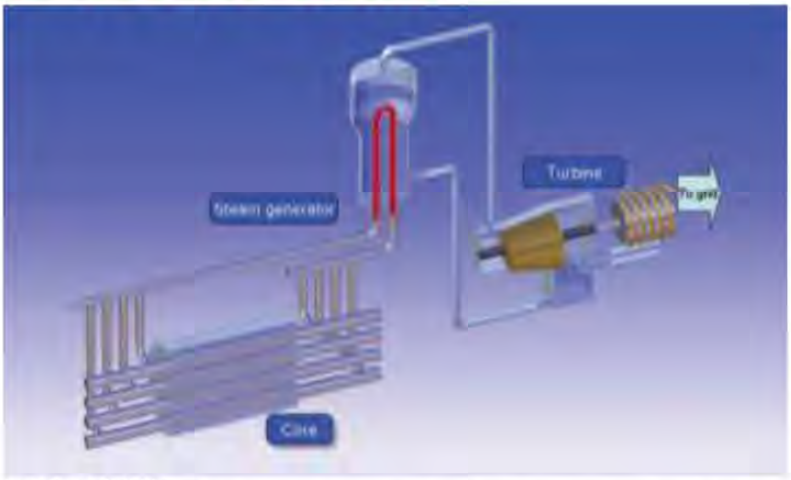


Image Source: Ali El-Jaby

CANDU reactors use natural uranium and have several layers of defense-in-depth that make the design unique. Worldwide, we get about 14% of our electricity from nuclear. In Ontario, it's over 50%!

Not Just about Energy

The DNA Dosimeter

Something that everyone in the nuclear power industry has to wear is a dosimeter, which measures the amount of radiation a person gets. This is one of the many safeguards in place to keep workers safe.

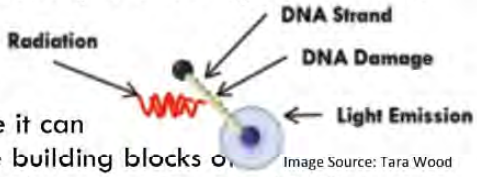


Image Source: Tara Wood

The reason radiation can be harmful is because it can damage DNA, the building blocks of life. A clever idea, however, is to use this damage as a way to measure how much radiation dose a person receives. Researchers have designed a detector made up of synthetic DNA which emits light when the DNA is damaged. The amount of light emitted tells us how much dose was received.

Space Radiation

Space radiation from the Sun (solar flares), from deep space, and trapped within the Van Allen belts make for an extreme environment that impacts orbiting satellites, astronauts on-board the International Space Station, and even airline pilots travelling between continents. Part of the research being done at RMC is to model the amount of radiation astronauts receive and also, to figure out how solar flares travel through the atmosphere and impact pilots. This is being done so that whether a pilot is flying to Paris, or an astronaut is orbiting Earth, both can stay safe!


Image Source: Wikimedia Commons

Making Jet Planes Safer!

Neutrons can be used to take images of the internal components of materials like aircraft wings. Just like taking an x-ray, neutrons can penetrate objects, and we can get images of the internal structure of objects. This technique is being used to maintain Canada's fleet of CF-18 jet fighters by finding corrosion and water ingress before serious damage is allowed. to occur.


Image Source: RCAF

Staying Prepared

Safety is taken very seriously in the nuclear power industry. Workers, engineers, and scientists are constantly on the lookout for problems, always trying to improve engineered safety and prevent accidents. But if an accident does happen, and if all of the containment barriers are breeched, radioactive material can spread through the air. By modeling this, we can better predict what areas will become affected, and take measures to ensure that the public is kept safe. Last year during the accident at the Fukushima Daiichi nuclear power plant, atmospheric dispersion models were used to predict where radioactivity would spread. This helped the response teams decide what areas needed to be evacuated.

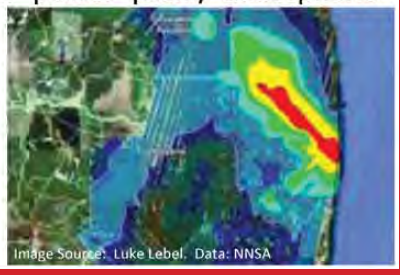


Image Source: Luke Lebel. Data: NNSA

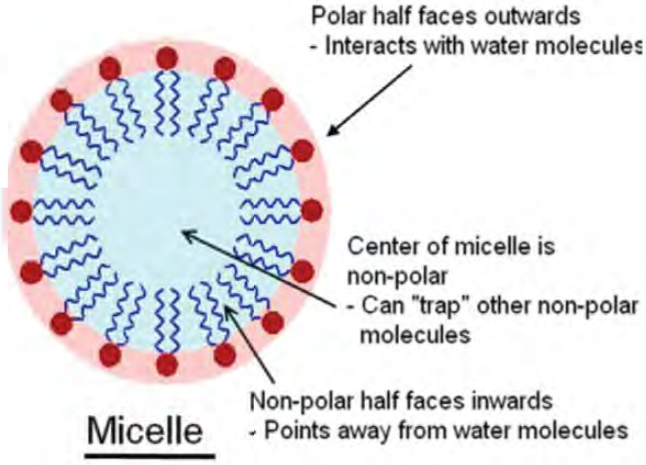
Cleaning up the Environment using Chemistry!

Environmental remediation is the process by which pollutants and contaminants such as oil, pesticides and industrial wastes are removed from the environment.

Unfortunately, many pollutants and contaminants such as Agent Orange (chemical warfare agent) and DDT (pesticide) are non-polar. This means that they cannot mix with water, making it hard for them to wash away.

Non-polar compounds do not mix with water. This makes them hard to remove from the environment

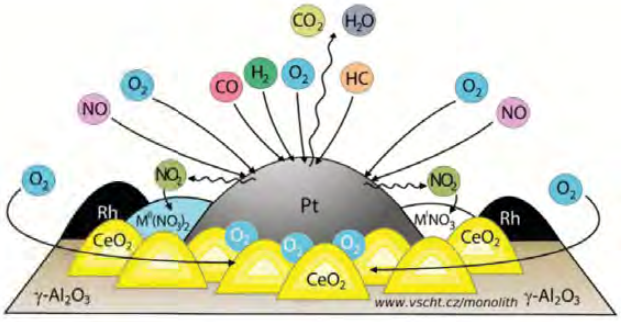
Surfactants can be used to help remove pollutants from the environment. Surfactant molecules form micelles (shown below), which can "trap" non-polar pollutants inside. The entire micelle (including the pollutant) can be washed away with water.



Surfactants allow the pollutant to "mix" with water, making it easier to remove them from the environment

Did you know: you probably use surfactants at home every day! Dish soap and laundry detergent are examples of surfactants. This allows them to dissolve and remove grease and dirt from your dishes and clothes!

Another way to remove contaminants from the environment is to use oxidizing agents and catalysts to help break down the pollutants into less harmful compounds. Catalysts can also be found in your car, where they remove harmful pollutants from the exhaust gas.



ROYAL MILITARY COLLEGE of CANADA

This module brought to you by the Queens University Faculty of Education and the Royal Military College Dept. of Chemistry and Chemical Engineering.

Special thanks to Dr. Jennifer Scott and Dr. Kela Weber (RMC) for their individual support

Queen's UNIVERSITY Faculty of Education Community outreach program

How Can We Help Save The Frogs?!

Reversing the Effects of Pollution on Amphibians

Frogs are a part of the complex ecosystem in which we live and they play an important role for humans but they are becoming increasingly endangered through the destruction of their habitats due to human pollution!

How Do Amphibians Affect Us?

Because the growth and development of amphibians depends so heavily on the environment in which they live, they are a good indicator species of the conditions of our ecosystems.

Did you know that certain species of frogs secrete chemicals from their skin that are studied in medical research for future advancements in disease prevention and treatment?

Amphibians also help regulate and control insect populations such as mosquitoes.

What YOU Can Do!

Prevent the destruction of their habitats.

Build a small pond behind your home or school.

Do not use pesticides.

Reduce, re-use, and recycle.

Bring expired drugs back to the pharmacy.

Reduce your ecological footprint by conserving resources.

Be informed and get involved!

Life Cycle of a Frog

Local Resources for You:

A great way to get involved in preservation of wildlife and natural habitats is to volunteer your time and support through the following non-for-profit charitable organizations right here in your very own city!

Kingston Field Naturalists

Ducks Unlimited Canada

Queen's University
Faculty of Education in association
With the Department of Chemistry and Chemical Engineering of the Royal Military College of Canada

Green Roofs

What is a Green Roof?

A green roof is the growth of vegetation on the rooftop of a man-made structure. Conventional roofs are usually made of asphalt concrete. Health and environmental issues are becoming of concern to society with the ever-increasing number of urban establishments taking over green space. Green roofs offer an innovative solution to alleviate many of these problems.

Vancouver Public Library[1]

The Science Behind Green Roofs

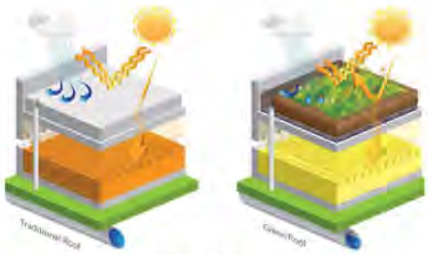
There are two main types of green roofs each with distinct features, which are summarized below:

Intensive	• deeper growing medium • supports a diversity of plant species • can be used for recreation or horticulture • more expensive to install and maintain
Extensive	• thinner growing medium (lightweight) • limited to local plants or those able to survive harsh environments • relatively inexpensive • requires less frequent maintenance

Layers of a Green Roof[2]

Green roofs aim to replace the vegetative land that has been lost due to urban development. Some benefits provided by this technology include:

- ***Storm Water Retention*** – traps rainwater that could otherwise cause flooding, sewage system overflow and habitat destruction, through retention in soil and evapotranspiration.
- ***Energy Efficiency*** – both intensive and extensive green roofs can help reduce energy consumption.



Green Roof Comparison[3]

Green roofs keep roofing membranes cool during the spring and summer and provide insulation during the winter months. This reduces the dependence on space conditioning for regulating indoor temperatures.

- ***Mitigating the Urban Heat Island (UHI) Effect*** – the UHI effect refers to the fact that major cities are usually higher in temperature than surrounding suburban areas creating "islands" of heat.

Things to Consider

Green roofs offer social, health and environmental benefits, however there are factors that need to be considered before initiating a green roof project.

- ***Cost of installation and maintenance*** – capital investment and yearly maintenance fees will vary depending on the type of green roof installed.

Enviro-Turf[4]

- ***Installing on new buildings or retrofitting*** – the construction material, rainwater retained and human activity are loads that put stress on the support system of a building. Thus, the design of a green roof that is to be constructed on an existing building (retrofitting) will be limited since there is little that can be done to alter the building's original structure. Incorporating a green roof in the structural planning of a new building allows for more flexibility in the roof design.

Queen's University

Queen's University Faculty of Education in association with the Department of Chemistry and Chemical Engineering of the Royal Military College of Canada

Contact: Dr. Kela Weber, kela.weber@rmc.ca, www.weberwetlandlab.ca

1 *Vancouver Public Library Monitoring Project*. Available from: www.bluestem.ca/pdf/GreenRoofPaper_pdf.pdf
2 Northwest EcoBuilding Guild, Assemblies, *Green roof project*. 2001. Available from: http://www.hadj.net/green-roofs/
3 *Green Roof Comparison*. Available from: http://www.greenroofguide.co.uk/benefits/
4 Bruce Hemstock, New Westminster B.C. *Environ-Turf on the roof of a garage*. Available from: http://www.bluestem.ca/enviroturf.htm

Phytotechnologies

Definition: the use of plants (phyto) to contain, sequester, remove or degrade organic (e.g. PCBs and DDT) and inorganic contaminants (e.g. arsenic and lead) in soil, sediments and water.

Pumpkins growing in PCB-contaminated site

Phytoextraction

- The use of plants **(pumpkins work great!)** to **mobilize contaminants**
- Accumulation of contaminants in the above-ground (shoot) material

Earthworm: *Eisenia fetida*

Biochar Soil Amendment

- Carbon rich, charcoal-like material capable of sorbing contaminants **i.e. demobilize contaminants**
- Also increases plant size and presence of earthworms in the soil

Pumpkin growing hydroponically @ RMC

Phyto- At-Home!

Grow your own pumpkin this summer…

1. Fill an old cup half full with soil and place 1 pumpkin seed (Howden variety) 15cm below the surface
2. Place in a sunny window-sill and water every few days
3. Once it's warm enough outside transfer the pumpkin seedling into your garden
4. Record its size, number of flowers and the presence of any earthworms near-by
5. Harvest your pumpkin and enjoy it for Halloween!*

Dr. Barbara Zeeb
Department of Chemistry & Chemical Engineering, The Royal Military College of Canada, zeeb-b@rmc.ca

*to avoid risk of human or animal consumption, at contaminated sites we do not let the fruit develop

Astronomy and Astrophysics

Department of Physics, Royal Military College of Canada,
PO Box 17000, Station Forces, Kingston, Ontario K7K 7B4

Upcoming Astronomical Events:

(many events are visible from your own backyard)

May 20 – partial annular solar eclipse
June 4 – partial lunar eclipse
June 5, 6 – transit of Venus across the sun (see below for more details)
June 20 – summer solstice
August 6 – Curiosity Rover lands on Mars
August 12, 13 – Perseid meteor shower
September 22 – autumnal equinox
November 17, 18 – Leonids meteor shower
December 3 – Jupiter at opposition (closest approach to Earth)
December 13, 14 – Geminids meteor shower

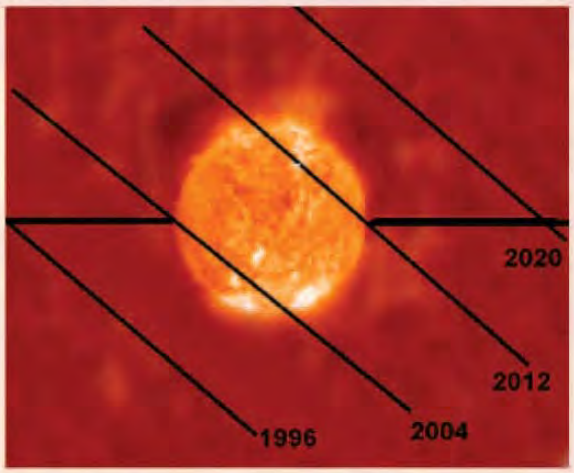
Science Rendezvous 2012:
Solar to the Max!

Astronomers will be on-hand to answer questions about astronomy and astrophysics while, weather permitting, visitors can use a solar telescope to safely observe the sun, sunspots and solar prominences at the maximum of the solar cycle.

Transit of Venus:

A transit of Venus occurs when Venus passes directly between the Earth and the Sun. This is similar to a solar eclipse (when the Moon passes between the Earth and the Sun), but is much more rare. A solar eclipse is visible somewhere on Earth once every year or two; whereas, transits of Venus occur in pairs, 8 years apart, but separated by over a hundred years. The last transit of Venus was in 2004. The next pair will not be until 2117 and 2125.

Transits are rare because Venus and Earth do not orbit the Sun in quite the same plane. If they did, such transits would be quite frequent, occurring approximately once every 1.6 years (Venus is closer to the Sun than the Earth so it orbits more quickly: a Venusian year is only 225 days). Since the Venusian orbit is inclined relative to the Earth, when Venus passes between the Earth and the Sun, it is usually a little above or below the solar disk.



In Kingston, Ontario the transit will begin at 6:04 pm on June 5th, 2012 and will be visible until sunset, when Venus is about halfway across the solar disk.

Make sure to wear proper eye protection when you watch!*

*Check out www.transitofvenus.org for more details.

The SLOWPOKE-2 Facility at the Royal Military College of Canada (RMCC)

The "SLOWPOKE-2" nuclear reactor at RMCC became critical in the fall of 1985. The Facility housing the reactor is located in the Department of Chemistry and Chemical Engineering at RMCC. The Facility is owned by the Crown and falls under the responsibilities of the Minister of National Defence. The reactor and associated laboratory equipment are used for the education of undergraduate and postgraduate students, for research and analytical applications, and for training and support of Canadian Armed Forces personnel. Specific capabilities include neutron activation analysis, neutron radioscopy and tomography, gamma spectroscopy, delayed neutron counting and liquid scintillation counting.

General Information

The SLOWPOKE-2 nuclear reactor was the first reactor of its kind with fuel elements based on 19.89%-enriched UO_2 pellets. It is estimated that this fuel will permit the operation of the reactor until 2020 before refueling is necessary. The SLOWPOKE research reactor is one of the very smallest operating reactors. For the past 26 years the reactor has been running on the original one kilogram of fuel. The reactor facility is equipped with a neutron radioscopy system based on an in-house designed neutron beam tube. This system is used for the periodic non-destructive examination of military aircraft components and ancient artifacts. Sample irradiations are done both inside the reactor container close to the reactor core and in the pool. Larger samples can be accommodated in the open pool. The SLOWPOKE-2 Facility has many kinds of detectors that measure different types of radiation for the purposes of research and also for ensuring worker safety.

Common Radiation Doses

Source	*Dose µSv*
Eating one banana	0.1
One dental x-ray	5
Normal daily background dose in North America	11
One Airplane flight from New York to LA	40
Living in a brick, stone or concrete building for one year	70
Normal yearly background dose in North America	4000
One Chest CT scan	7000

Do you have these at your house?

Brazil Nuts

Potassium 40 and Radium 226

Bananas

Potassium 40

Garden Soil

Natural Radiation and Cesium 137 from man-made sources

Smoke Detector

Americium 241

Granite Counter Tops

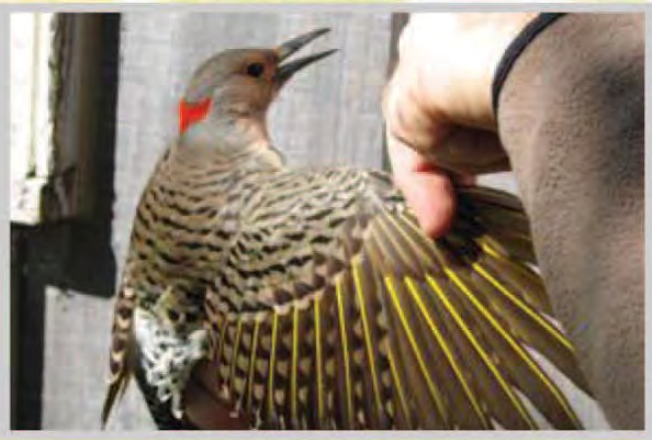
Natural Uranium

Contact Information

The SLOWPOKE-2 Facility at the Royal Military College of Canada

Who to contact: Kathy Nielsen, SLOWPOKE-2 Director

613-541-6000 ext. 6385



Yellow-shafted Flicker (Photo: Bruce Parker)

Blue-winged Warbler (Photo: Bruce Parker)

PRINCE EDWARD POINT BIRD OBSERVATORY

- Located along the eastern tip of Prince Edward County about 20 minutes southeast of Picton, Ontario in a National Wildlife Area
- Established in 1995 as a migration monitoring station
- Collecting information to study population densities, longevity and migratory routes
- Designated as a **Globally Important Birding Area (IBA)** in 1998
- Part of the **Canadian Migration Monitoring Network** since 1999

COME FOR A VISIT!

- **Free year-round birding trails**
- **Spring migration banding demonstrations (Apr/May) Dawn to noon**
- **Fall migration banding demonstrations (mid-Aug/Sep/Oct) Dawn to noon & evening owl banding in Oct**
- **School Programs**

SPRING BIRDING FESTIVAL

MAY 12 – 21, 2012

Guided walks, Workshops, Special Events

www.peptbo.ca

Prince Edward Point Bird Observatory
PO Box 6043
Picton, ON K0K 2T0

Kingston Field Naturalists

http://kingstonfieldnaturalists.org

Do you know these birds of our region? Find their names using the clues .

1

2

3

4

5

6

7

8

9

10

1- This bird lays blue eggs and the more intense the blue, the greater the male parent's effort to feed the young.
2- When an owl is close by, their warning calls alert other species as well as their own.
3- This type of bird can be recognized by their upward pointing tail.
4- Watch this one move down trees head-first looking for food.
5- They have been known to dip dry bread in a puddle to soften it up.
6- Stores food collected at feeders, in trees and other places, to eat it later.
7- Raises up to 6 broods a year, more than any other native bird.
8- Prefers to walk rather than fly but have been seen up in the trees at LeMoine Point.
9- After a successful dive the bird may flip its prey into the air and swallow it headfirst.
10- Size of a robin but preys on small birds, mammals and insects.
11 & 12- KFN logo birds. (scrambled letters: pacus and momocn nolo)

ANSWERS: 1.American Robin, 2.Chickadee, 3.House Wren, 4. White-Breasted Nuthatch, 5. Crow, 6. Blue Jay, 7.Mourning Dove, 8.Ruffed Grouse, 9.Kingfisher, 10.Shrike, 11.Scaup, 12.Common Loon

What is a Watershed?

Watersheds are place we call home. A watershed is an area of land that is drained by a river and its tributaries into a particular body of water such a pond, lake or ocean. Think about your local creek, river or stream. Where does it start? What types of landscapes does it pass through and where does it end up? All of the area covered is a watershed."

A Watershed Example

Our water that we use is 'recycled water.' Water exists on the surface of the earth, underground and in the air as humidity and precipitation. Through the water cycle, all of our water gets recycled from the earth to the air and back to the earth. Water conservation should not be just a choice, but a way of life.

What will do you do to conserve water?

CATARAQUI REGION CONSERVATION AUTHORITY
P.O. Box 160 ◆ 1641 Perth Road ◆ Glenburnie ON ◆ K0H 1S0
Phone: (613) 546-4228 Fax: (613) 547-6474
E-mail: crca@cataraquiregion.on.ca Website: www.cataraquiregion.on.ca

THE PUMP HOUSE STEAM MUSEUM & QUEENS UNIVERSITY FACULTY OF ENGINEERING AND APPLIED SCIENCE PRESENT

Water Works!

Pumps Move Fluid from Here to There

Everybody needs water everyday, but not everyone lives by a lake or a stream. Water is all over the earth, but sometimes it is below the surface. To bring the water to the people, sometimes you need to pump it out. Engineers use science to figure out how to solve the problem of getting water to people.

Pumps come in all different shapes and sizes, and work using different forces. You have probably seen a bicycle pump or a balloon pump that uses back and forth motion to provide the force. Other pumps use up and down motion, like water pumps. Still others use circular motion to get fluids moving.

You can find out about these pumps and more at the Pump House Steam Museum!

Pump House Steam Museum
23 Ontario St., Kingston
http://www.steammuseum.ca/

Are you interested in using science to solve problems? Think about a career in engineering.

Queen's Faculty of Engineering and Applied Science
http://engineering.queensu.ca/

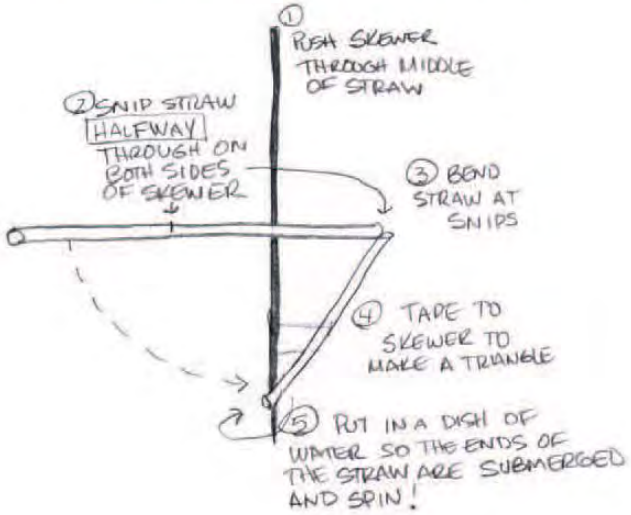
Make your own Fountain with a Centrifugal Pump!

A centrifugal pump uses the forces caused by spinning objects.

Poke a skewer through a straw in the middle.

Make two snips in the straw half way through.

Bend the straws at the snips, and attach to the skewer.



You have made a pump! To test your pump, put it in a dish of water, and spin!

HELP SAVE THE TURTLES

Over half of all the world's turtle species are now in need of conservation. Up to 54% of all turtle species are considered threatened and turtles are at a much higher risk of extinction than many other vertebrates. For some turtles it is already too late, as several species have already gone extinct, completely exterminated by the hands of man. Many more species are being pushed to the very brink of extinction.

For information on how you can help see:

www.turtleconservationist.com

Frontenac, Lennox & Addington Science Fair

Expo-sciences de Frontenac, Lennox & Addington

www.flasf.on.ca

The Frontenac, Lennox and Addington Science Fair (FLASF) is a regional science project competition that is run annually in spring in Kingston, Ontario. Named for the three original counties from which FLASF drew its student base, the regional fair is now in its 41st year of operation. FLASF provides an open, inclusive venue for public, separate, private and home-schooled students to report upon their investigations in scientific and engineering topics of personal interest, in a public forum. Students from Grades 5 to 12 are drawn from the schools within the regions served by the Limestone District School Board and the Algonquin and Lakeshore Catholic District School Board.

The regional fair is organized into various categories, including Human Health Science, Life and Earth Sciences (non-human), Physical and Mathematical Sciences, and Engineering and Computing Sciences. In each category, students compete for prizes and awards according to their school grade level at the primary (Grades 5 and 6), junior (Grades 7 and 8), intermediate (Grades 9 and 10) and senior (Grades 11 and 12) levels.

The FLASF is supported by Youth Science Ontario, a provincial organization that acts as a link between the 30 regional science fairs in Ontario. From a national perspective, FLASF is one of over one hundred science fairs in Canada that are affiliated with Youth Science Canada (YSC), an organization whose signature event is the Canada-Wide Science Fair (CWSF). FLASF sends its top projects each year to CWSF (up to 5 students accompanied by 2 chaperones) to compete at the national level. At CWSF, held at a different city every year, 600 students participate in a week-long celebration of their science activity and success, in a competitive format.

(l-r) Sydney Masaheb, Gregory Borschneck, Malak Elbatarny, Neel Sharma, Laura Dunne-Mucklow, at the 50th Annual Canada-Wide Science Fair, held in Toronto, May 14–21, 2011

Many students participate in the science fair at the regional level. For students that go on to CWSF, this becomes a once-in-a-lifetime experience. But for all students, the opportunity to pursue investigations in a field of interest can be life-altering, providing direction for their future studies and perhaps a career. FLASF provides students with just such an opportunity.

FLASF is a non-profit, registered charity that is run by a group of volunteers from the community to promote and encourage student activity in the sciences. It is supported by financial donations and in-kind services from local school boards, companies, educational institutions and provincial organizations. FLASF needs to raise about $16000 annually, which is used for fair promotion and operations, trophies and awards for the students, website maintenance and to send the students and chaperones to CWSF.

GreenCentre Canada

changing chemistry, changing the world

One way to be more environmentally friendly is to make simple cleaning products by combining natural ingredients that you already have in your house. Many of these items work by reacting with the dirt or grease so that the water can wash it away.

Homemade Dishwasher Detergent

1 cup washing soda (Sodium carbonate)
1 cup Borax
½ cup kosher salt
½ cup citric acid (food grade citric acid or unsweetened lemonade)

Mix ingredients together and store in a tightly sealed mason jar. Use 1 tablespoon per load. Add a bit of vinegar to the rinse dispenser for the best result.

Homemade Glass/Hard Surface Cleaner

½ cup vinegar
4L water

Mix ingredients together. Spray on area and wipe with a clean towel.

Homemade All-Purpose Cleanser

½ cup pure soap
4L hot water
¼ cup lemon juice

Mix ingredients together. Spray on area and wipe with a clean towel.

Dusting Spray

1 tsp olive oil
½ cup vinegar

Combine ingredients in a spray bottle.
Apply a small amount to a cloth to clean wooden furniture.

GreenCentre Canada is a member of the Ontario Network of Excellence (ONE), and is supported by the Government of Ontario. GreenCentre is a member of the Centres of Excellence for Commercialization and Research (CECR), and is supported by the Government of Canada's Networks of Centres of Excellence.

Green Chemistry focuses on the invention, design, and application of chemical products and processes that reduce waste, provide safer products, and minimize the use of energy and resources.

GreenCentre Canada | 945 Princess Street Kingston, ON, K7L 3N6 | Phone: 613-507-4700 | www.greencentrecanada.com

Funded by Canada Ontario

all bent out of shape

Why do twigs on a tree bend easily but become brittle when they get old? It's rheology! As the tree gets older, the wood dries out, and its properties change.

Rheology? what's that?

Rheology – the study of hard things going soft

Take a dry popsicle stick and try to bend it around your finger.
What do you observe? It breaks, right? Why?

Only some things that are hard - like a popsicle stick - become soft when heated or soaked in water. They are considered "soft solids" and the scientists that study them are rheologists. Mud is a "soft solid." The blood in your veins is another!

The rheology of wood

Wood's molecules stick tightly together when wood is dry and cool. This makes wood hard and stiff. Adding heat and water makes the molecules become unstuck. When the wood cools and dries out again, the molecules restick - this time in their new position. Lacrosse sticks and snow shoes are examples of things made by bending wood.

Play with rheology at home!

1. Bring an inch of water to a boil in a sauce pan and put in your popsicle sticks or tongue depressors – add a few more than you think you will need as some will break.
2. After 30 minutes of boiling, remove the sticks with tongs. Handle them wearing dishwashing gloves.
3. Quickly wrap the sticks around a form like a broom handle or the neck of a narrow glass.
4. Use tape to keep the stick tight around the form. Leave overnight to dry out.
5. By morning you will have a ring that you can use for any number of things, like a bracelet or a napkin ring.

Join us at the museum to see more fun ways that you can explore wood!

2993 highway 2 East, Kingston
t:613-542-0543

MacLachlan
WOODWORKING MUSEUM

How many stations did you visit?

Collect stickers, count them up, and enter to win a GPS!!!

let's talk science
inspiring discovery

SCIENCE Quest

Queen's ultrafast

enCentre
Canada
chemistry, changing the world

Pharmacology & Toxicology
Graduate Program
Queen's University
Botterell Hall
http://meds.queensu.ca/departments/pharmacology_toxicology

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Geology

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WOODWORKING MUSEUM

Graduate
Chemistry
Society

Human Mobility Research Centre

PATHOLOGY AND
MOLECULAR MEDICINE

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Mathematics, Science and Technology Education Group
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Esso Imperial Oil Foundation

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TD

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society of graduate & professional students
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AyVA
EDUCATIONAL SOLUTIONS

CANADIAN TIRE

Marine Museum of the Great Lakes at Kingston

RONA
Doing it right

Kelsey's

metro

Fort Henry

THE KEG
STEAKHOUSE + BAR

Novel Idea
Kingston's Independent Bookstore