The Alberta Science Teacher

Volume 27, Number 4 June 2007

Good old 3-D cell models

From the Editor

It has been an exciting school year. The science curriculum is being recharged, the first annual Iron Science Teacher competition took place and there have been many professional development opportunities in science.

One event I had the pleasure of recently attending was the Edmonton Biology and Chemistry Regionals Annual Conference on May 11, at the University of Alberta. The theme of the morning was climate change and its effects on the north. Did you know that the northern peoples rely on certain weather patterns for their economic and cultural survival? According to Dr Mark Nuttall, the Inuit speak of climate change as a friend who has gone crazy.

Throughout the afternoon, I took in the lectures on stem cell research, from the pros and cons (Dr Andrei Manolescu) to the possibility of cells having emotions and personalities (Dr Keith M Bagnall's discussion on adolescent idiopathic scoliosis). If you are in the Edmonton area while this annual conference takes place, it is definitely worth attending.

Speaking of annual, it is time for those year-end exams. In this last issue before summer, I have added a section devoted to ready-to-use lesson plans and ideas (Classroom-Ready Resources). This section is to ease the transition from teacher to vacationer (for those of you who actually take the summers off). I hope you will find a lesson that you can use to inspire your students before the summer months (or keep this issue on hand for the upcoming school year—you never know what assignment you might get).

I wish you all a safe and happy summer. Relax and enjoy the long, warm days.

Andi-Lynn Bender

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From the Council

Conference 2007 Update

"Planet Earth: Ours to Understand and Cherish"
November 16–18
Fantasyland Hotel, Edmonton

- All paid delegates will receive a free USB flash drive and a canvas tote bag at registration. Alberta Environment has generously donated the tote bags.
- Enter your name tag into a draw to win daily prizes.
- Sessions and workshops will be available for all grade levels. There will be no offsite sessions.
- All sessions and workshops will be listed on the website by September (www.atasc.ab.ca/conference).
- Four keynote presentations will be plenary so as not to conflict with other workshops or sessions. Check the website for keynote information.
- Friday night banquet tickets should be reserved and paid for with your conference registration—a steal of a deal at $10 per delegate. Seating is limited and tickets may not be available onsite.
- MacEwan College will be providing an entertaining chemistry demo following the dinner buffet.
- Delegates looking for entertainment on Saturday night can get a 25 per cent discount at the Jubilations Dinner Theatre production of "Desperate Households" (www.jubilations.ca). A block of great seats has been reserved. Phone Jubilations toll free at 1-877-214-2424 and ask for a reservation under Gillian (ATA Science Council). Reservations can be still be made with a 25 per cent discount after the block is filled up. The deadline for booking is November 7.
- Delegates attending the three-day conference will enjoy a free Sunday brunch. Get your tickets at registration on presentation of your conference receipt.
- Sixty exhibitors' booths will be close to the breakout rooms. Visit each booth for an exhibitor's stamp on your "Stampede card," and enter your completed card into a draw for great prizes.
- Choice Passes for the World Waterpark or Galaxyland will be on sale at registration. These passes are valid for six months and are a huge saving on regular prices (available to registered delegates only).
- Register online any time and pay by September 30 for a $50 discount on your registration fee. Visit www.atasc.ab.ca/conference.

Executive Positions Available

The Science Council is seeking nominations for the following executive positions:

- President-elect
- Secretary
- Treasurer
- Assistant conference directors
- Early childhood director
- Division IV director
- Physics director
- Technology director
- Postsecondary representative

To nominate someone, please fill out the online form at www.atasc.ab.ca/nominationsform.htm by **July 1**.

Education Updates

Alberta Education Update

Updates on curriculum, authorized resources, assessment, technology, special education, career initiatives and Aboriginal education are published in the *Connection: Information for Teachers* newsletter every October, January and May. The newsletter is available at www.education.gov.ab.ca/connection (English) and www.education.gov.ab.ca/connection/default.asp?language=f (French). Teachers can subscribe by clicking on Subscribe/S'abonner on the homepage and completing the two-step process. Look for science updates in *Connection* as well as in the Science Program Update found at www.education.gov.ab.ca/k_12/curriculum/bySubject/science/default.asp of the Alberta Education website.

Curriculum and Resource Update

Elementary Science

The first meetings to begin revisions to the K–6 science program of studies were held in March 2007. The working group is off to a strong start, and members have a good sense of the program directions and a desire to reduce the number of units from five to four to give teachers more time to teach key science concepts. The working group will meet again in late May to continue work on the programs. For more information, contact Caroline Nixon at caroline.nixon@gov.ab.ca or (780) 427-9593 or Bernie Galbraith at bernie.galbraith@gov.ab.ca or (780) 422-3218. For information on French language services, contact François Lizaire at francois.lizaire@gov.ab.ca or (780) 422-7992. To connect toll free within Alberta, dial 310-0000.

Senior High Science

The Biology 20-30, Chemistry 20-30, Physics 20-30 and Science 30 programs of study have been approved by the minister and are now available on the science homepage of the Alberta Education website. Implementation of the Biology 20, Chemistry 20, Physics 20 and Science 30 programs of study occurs in September 2007, followed by implementation of Biology 30, Chemistry 30 and Physics 30 in September 2008. Implementation of the revised programs before these dates is not approved. For information regarding programs, contact Caroline Nixon at caroline.nixon@gov.ab.ca or (780) 427-9593. For information regarding programs in the French language, contact François Lizaire at francois.lizaire@gov.ab.ca or (780) 422-7992. To connect toll free, within Alberta, dial 310-0000.

Workshops to support implementation were held across the province in February, March and May 2007. Workshops to support the French language programs are scheduled for August 2007 in Edmonton and Calgary. Video conferencing will be available. To register, contact Glenn Zacharuk at Glenn.Zacharuk@portagecollege.ca.

The first diploma examination to support the revised Science 30 program of studies will be administered in January 2008. The first diploma examinations to support the revised Biology 30, Chemistry 30 and Physics 30 programs of study will be administered in January 2009. Information regarding changes to the chemistry and physics diploma examinations will be communicated in the 2008/09 Subject Bulletins available at www.education.gov.ab.ca/k%5F12/testing/diploma/bulletins/default.asp. For information regarding diploma examinations, contact Ken Marcellus at ken.marcellus@gov.ab.ca or (780) 415-6120. To connect toll free within Alberta, dial 310-0000.

The English version of the basic learning and teaching resources for Biology 20-30, Chemistry 20-30 and Physics 20-30 have been authorized and are available at the Learning Resources Centre (LRC). The LRC will be able to deliver resources to schools by June for early-order-discount (EOD) orders that were placed by May 15. Basic learning resources for programs taught in French are presently being translated, contextualized and validated. It is anticipated that these resources will be available from the LRC at the end of August 2007, and EOD orders can be placed now through June 30. For information regarding English language resources, contact Vic Romanyshyn at vic.romanyshyn@gov.ab.ca or (780) 427-9593. For information on the French language resources, contact François Lizaire at francois.lizaire@gov.ab.ca or (780) 422-7992. For information regarding the LRC, contact Garry Sluchinski at garry.sluchinski@gov.ab.ca or (780) 427-5261. To be connected toll free within Alberta, dial 310-0000.

The Science 30 resources will be available in August 2007 and can be preordered now from the LRC. These resources include the textbook and an accompanying student CD, on which the distance learning component resources can be found, and the Teacher Resource Guide. These resources will follow a similar format to the Science 20 learning and teaching resources, which are already available for purchase from the LRC. These learning and teaching resources demonstrate the integrated nature of the Science 20 and 30 courses. The text portion uses a magazine format and interactive design to facilitate student engagement and discovery. The electronic component is designed to maximize instructional flexibility and to promote the evergreening of material. A digital copy of each of the Science 30 learning and teaching resources are downloadable in HTML and PDF formats free to all Alberta educators from the Tools4Teachers website at www.tools4teachers.ca.

Field-test versions for online courses are being developed for the Biology 20, Chemistry 20 and Physics 20 programs of study collaboratively by the Distributed Learning Resources Branch and partners in the online school community. The authorized version of these online courses and print distributed learning modules are scheduled to be available for September 2008. Development for the 30-level courses will follow a similar pattern with the field-test versions available for September 2008 and the corresponding authorized materials available in 2009. The course resources will be available through a number of sources:

- Alberta Education's Tools4Teachers website
- Alberta Distance Learning Centre
- Argyll Centre
- Calgary Board of Education

For information regarding distributed learning resources, contact Art Bauer at art.bauer@gov.ab.ca or (780) 674-8710 or Eldon Krikke at eldon.krikke@gov.ab.ca or (780) 674-8727. To be connected toll-free within Alberta, dial 310-0000.

CRYSTAL Alberta

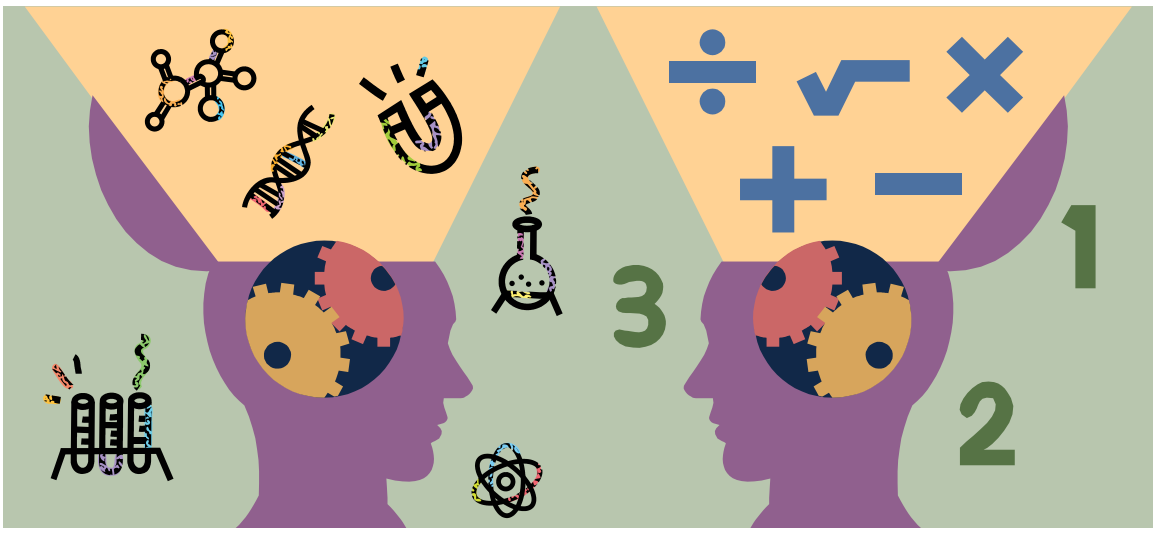
The Alberta Centre for Research in Youth Science Teaching and Learning (CRYSTAL Alberta) is a new centre for education research at the University of Alberta and King's University College. There are five CRYSTALs across Canada: Pacific, Alberta, Manitoba, Sherbrooke and Atlantique. This is a five-year pilot program of NSERC (the Natural Sciences and Engineering Research Council), Canada's largest research-funding agency, which normally does not fund K–12 education research. Collaborative research is required among faculty of education researchers, graduate students, schools and teachers. As well, each CRYSTAL has a number of research partners (for example, schools) and users (for example, science education NGO).

The research at CRYSTAL Alberta (led by principal investigator Dr Stephen Norris, in the U of A's Faculty of Education) involves about 10 scientists and mathematicians and 10 science and mathematics educators. The chosen focus of the research at CRYSTAL Alberta is mathematics and science reasoning; for example, what kind of reasoning is portrayed by scientists and mathematicians and what kind of reasoning can be appropriately expected of K–12 students. The research involves testing hypotheses concerning, for example, the practice of inquiry-based science education and of evidence- and logic-based reasoning by scientists and K–12 teachers and students.

The research is to result in text and visual prototypes (examples) that promote math and science reasoning. The prototypes could be used by teachers, publishers and assessment and curriculum developers to create classroom resources, instructional strategies, assessment items and curriculum outcomes to, again, promote math and science reasoning in the K–12 classrooms. These prototypes will be communicated and available for download from the CRYSTAL Alberta Outreach website, starting in September 2007.

Watch for more CRYSTAL Alberta news next fall in *The Alberta Science Teacher Newsletter* and at the Science Council Conference at West Edmonton Mall November 8–10, 2007. For more information, visit www.uofaweb.ualberta.ca/edpolicystudies/crystalalberta.cfm.

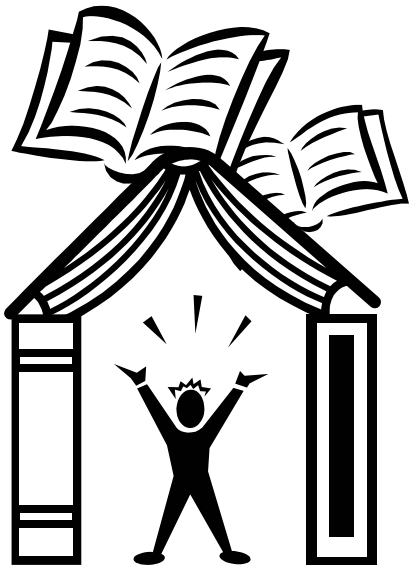
Frank Jenkins
Outreach Coordinator
fjenkins@ualberta.net



CMASTE

CMASTE (the Centre for Mathematics Science and Technology Education), which is located within the U of A's Faculty of Education, will (for the first time) be open during July and August. The summer hours are 10:00 AM to 3:00 PM each day, although, extended access is available from 8:30 AM to 4:30 PM each day through the Secondary Education office. CMASTE offers the following resources to meet the Alberta curriculum:

- Elementary science units and lessons for duplicating for your classroom (for example, buoyancy and boats; building and testing; flight; and climate change resources). See www.cmaste.ca for a complete list of classroom resources



- A Grades 1–6 tradebook library of about 300 fiction and nonfiction science books (classified by science grade and curriculum unit) that were selected for accuracy of science and for a modern view of the natures of science
- A Grades 1–12 tradebook library of fiction and nonfiction mathematics books that have been carefully evaluated for classroom use
- A pseudoscience and nature of science library and resource that helps to define science (especially for secondary science)
- Bibliographies for each of the libraries (for you to build your own for home or school)
- Online resources, for example, Grades 6 and 9 astronomy and high school physics (MAP)
- An online list of about 25 K–12 partners in science education with contact links to many more resources and services for Alberta classrooms

Library books for your professional inquiry and for school-aged children to read can be signed out from CMASTE for up to a month. These books are also available for classroom use during the school year.

CMASTE is located in Room 382, Education South, U of A. Parking is available in the Education parking complex. A get-out-of-jail-free (parking) card is available for summer visitors. Our contact information is cmaste@ualberta.ca, phone: (780) 492-0148; fax: (780) 492-0162. This may be the only summer that CMASTE is open, so come and see us.

Frank Jenkins and Bob Ritter,
CMASTE Codirectors

Schulich School of Engineering

Every year, the University of Calgary's Schulich School of Engineering closes the loop on a critical cycle: high school science and math teachers preparing students for university, university professors preparing students for the workforce, and engineers in the workplace preparing to accept new graduates.

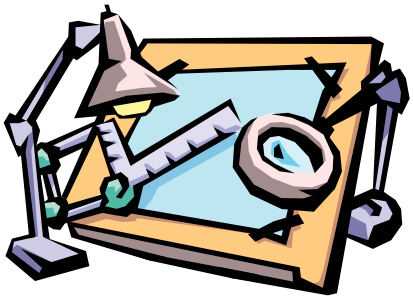
This *tricouncil* of linked interests is aimed at helping high school leaders, the first link in the chain, to excel at stimulating student interest in engineering careers. As part of this process, this meeting brings in current engineering students—many of whom the high school teachers recognize from their own classes—to reflect on the transfer from high school to university.

This year, seven Calgary students participated in a panel to share their best advice with former teachers. Each of these students were winners of a Schulich scholarship valued at $30,000 and had demonstrated outstanding academic or community service prior to entering university.

Tips from Top Students

Students presented some ideas for teachers to help prepare high school students for university life:

- Teach students to take tests quickly.
- Teach organizational and time-management skills.
- Encourage students to explore IB, AP and other specialty programs.
- Teach above the grade level or beyond the course requirements.
- Present ambiguity on occasion. At university, students aren't told about the appearance or length of assignments, or what the results will be.



Candid Facts About First-Year University Life

Students also talked about the most challenging or surprising aspects of first-year engineering studies:

- Balancing time has become an art.
- Determining which of several good opportunities (volunteer, clubs or teams) to get involved with is a challenge.
- Surprising to many was that there was a lot of support, tutoring help and warmth.
- They have made some great friends.

Get Involved

The Schulich School of Engineering highly values the role and recognition of teachers who cultivate science and engineering skills for the 21st century, and welcomes your involvement in its programs.

- To be notified of events that might be of interest to teachers, contact Jennifer Van Es at jenn.vanes@ucalgary.ca.
- Take part in the Engineering Education Summit. Engineering education may be changing, and teachers are invited to take part in the discussion of emerging needs and teaching approaches. For details, visit www.schulich.ucalgary.ca/summit.
- Assemble a team of three or four teachers and enter the national Iron Science challenge to find Canada's top (or at least most entertaining) science teachers, hosted this fall by the Schulich School of Engineering at the University of Calgary. Look for details in September.

Classroom-Ready Resources

Iron Science Teacher 2006 Winning Lesson

Squealing Gummi Bear

Grade Level: Any level

1. Science 9—Matter and Chemical Change
2. Science 8—Mix and Flow of Matter
3. Chemistry 20-30

Time Frame: five minutes

Materials

- Alcohol burner (Bunsen burner, torch, or any heat source will work well)
- Test tube
- Retort stand (or test tube clamps)
- Potassium chlorate ($KClO_3$)
- Gummi bear

Strategy/Focus for Lesson

(General/Specific Learning Outcomes)

- Combustion
- Oxidizers
- Chemical reactions
- Exothermic reactions

Students will observe an exothermic reaction taking place when the gummi bear ignites into flames and gives off heat.

Introduction

Make up a story about a gummi bear going to sit in a nice hot bath of $KClO_3$.

Procedure

1. Place a small amount of potassium chlorate ($KClO_3$) in a test tube.
2. Hold the test tube above the alcohol burner (or Bunsen burner) until the potassium chlorate ($KClO_3$) is liquefied.
3. Remove the heat source.
4. Drop the gummi bear into the test tube. Have a scupula or stirring rod nearby, because the gummi sometimes sticks to the sides of the test tube.
5. Observe as the gummi bear bursts into flames.

Closure

The potassium chlorate ($KClO_3$) is an oxidizing agent. The gummi bear is made of sugar and acts as a carbon source. The potassium chlorate ($KClO_3$) must be heated in the beginning to supply the initial energy (to produce oxygen). When the carbon source is added to the heated potassium chlorate ($KClO_3$), the heat sets the gummi bear on fire.

Assessment Questions

1. What reaction takes place in the test tube?
2. What purpose or function does each of the reagents have?
3. Why was it necessary to heat the potassium chlorate ($KClO_3$)?

Lamont High School,
Kristian Basaraba, Kara Ericksen,
Justin Mazur and Kristin Sawchuk

Making a Cold-Pak

What You Need

1 250-ml Erlenmeyer flask

2 scoopers

1 Styrofoam cup, one-quarter filled with ammonium thiocyanate (NH_4SCN) or other suitable ammonium salt (for example, NH_4Cl) and mark *A*

1 Styrofoam cup, one-quarter filled with barium hydroxide octhydrate ($Ba(OH)_2 \bullet 8H_20$) and mark *B*

The Experiment

Instruct the students to add three scoops of *A* to the Erlenmeyer followed by three scoops of *B*. Then have them swirl the flask vigorously by the neck (continuously).

They will observe (as the flask is passed among the group):

1. The solids changing to liquid.
2. Ammonia being given off.
3. The flask becoming ice cold.

Reaction

$2HN_4SCN + Ba(OH)_2 \bullet 8H_20 \rightarrow 2NH_3 + 10H_2O + Ba(SCN)_2$

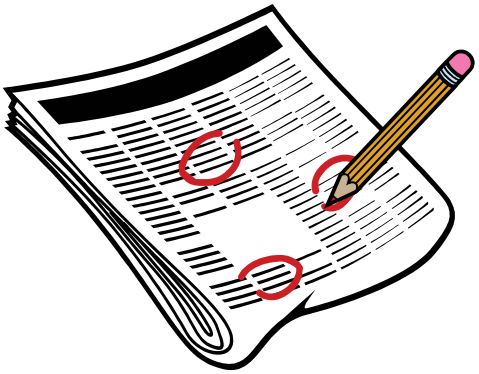
The H^0298 using ammonium thiocyanate cannot be calculated because of the value of ΔH^0_f for $Ba(SCN)_2(aq)$ is not available. The DH_{298} using ammonium chloride can be calculated, and it comes out to +63.6 kJ.

Dennis Oppelt,
Past President,
ATASC

Science 10: Organelle Seeking

In this activity, students pair up and choose an organelle found in either a plant or animal cell. In 15 minutes, the students are to compose a personal ad. If some students do not know what a personal ad is, read a few from the newspaper to them.

The ad must contain a minimum of 30 and a maximum of 50 words. The ad cannot contain the name of the organelle (hopefully, students will volunteer to read their ad to the class, and the class can guess the identity of the organelle). Some students may have to be reminded to keep it clean.



Another option is to have students research two or three organelles and, based on the results, write an ad for one of the organelles.

Here is a good example from a past student:

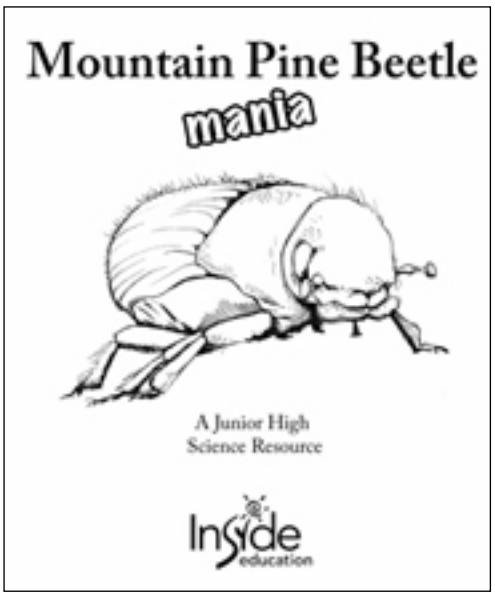
> I am seeking a hot, blond ray of sunshine to get me through the quiet, lonely, dark nights. My excitable nature is known to provide that special someone with lots of energy. In fact, if you look deep inside me, I will give you some sugar!
> Call me at 1-900-FOT-OSIN
> (chloroplast)

Have fun and be creative!

Rachel Toews,
Biology Director, ATASC

Mountain Pine Beetles

If you have been following the news, you may have heard of a very small (usually less than 1 cm long), yet very important insect: the mountain pine beetle, which is currently causing a lot of problems in BC and Alberta forests.The mountain pine beetle is a naturally occurring insect found in pine forests in the southern Rocky Mountains and in areas west of the Continental Divide. However, it has not historically occurred in the northeastern slopes of the Rocky Mountains. The following lesson is excerpted from the *Mountain Pine Beetle Mania: A Junior High Science Resource*. Developed by Inside Education for the Mountain Pine Beetle Strategic Direction Council, this resource will bring the biology and issues surrounding the mountain pine beetle into the spotlight for junior high science students in Alberta.



Student Instructions

Using the following definitions, on graph paper sketch the pattern the mountain pine beetle follows in becoming an epidemic in the forest. Your graph should have the population level of the mountain pine beetle (MPB) on the y-axis and time on the x-axis. Draw a line to represent the change in population level as the MPB passes through each phase, and label each section of the line on the graph where each phase is represented:

1. Endemic phase. Very low populations of beetles randomly attack weak and old trees throughout the forest. Volume growth of trees still exceeds the number of trees killed by the beetle.
   Timeline: This stage can last for decades. (For this example, use 10–20 years.)
2. Incipient phase. Increased migration of beetles from infested areas, favourable weather conditions (warm winters) and decreased effectiveness of natural controls (for example, bird predators) leads to more infested trees.
   Timeline: This stage can last for two to three years.
3. Epidemic phase. Usually only in areas with many mature host trees. Large population outbreaks of beetles cause wide-scale tree mortality.
   Timeline: This stage can last several years if there are enough hosts available.
4. Declining phase. A lack of host trees or unfavourable climate conditions (for example, cold winters) cause increased beetle mortality.
   Timeline: This stage can last a few (2–3) years and leads back to the endemic phase.

Choose one of the following to complete this activity:

Extension 1

Draw the same x- and y-axis labels on a new graph. Mark a vertical line along the x-axis representing a major fire in an area that wipes out most of the 60+-year-old pine during the incipient phase of a beetle epidemic cycle. Now redraw the stages of the MPB, showing how the beetle population will change because of the fire. How is this graph different from your first one?

Extension 2

Draw the same x- and y-axis labels on a new graph. Mark a few vertical lines along the x-axis representing several years of late fall or early spring –30°C or lower temperatures that kill off many of the larvae during the epidemic phase of a beetle epidemic cycle. Now redraw the stages of the MPB, showing how the mountain pine beetle population will change because of the weather during these years. How is this graph different from your first one?

Attention Teachers

There is more mountain pine beetle mania to be had! A free downloadable English or French version of the entire resource is available in the classroom resources section of the Inside Education website (www.insideeducation.ca). You'll also find sample student answers to the above exercise.

Source: Inside Education Society of Alberta

Floating in Air

Make a hot-air balloon in school! This experiment reinforces the concept of temperature and density.

What You Need

Tissue paper
Scissors
Glue
Flexible straws
Hair dryer

Procedure

1. Make a template in the shape of a long, narrow leaf.
2. Use the template to cut out eight pieces of tissue paper.
3. Using a small amount of glue, stick the edges of the tissue paper together to make a balloon shape. Make sure there are no gaps in the seams.
4. Use a hair dryer to fill the balloon with hot air. If the balloon flips upside down, glue the straws around the opening at the bottom of the balloon.

Explanation

When you heat the air inside the balloon, the air expands and some air escapes out of the bottom of the balloon. Now less air takes up the same space, so it is less dense. The upthrust (an upward force on objects) caused by the colder, heavier air outside of the balloon makes the balloon float up. When the air inside the balloon cools and becomes denser, the balloon comes down.

Andi-Lynn Bender

Sunset Mirage

This lab/demo is useful in reinforcing the concept of light refraction and water.

What You Need

Large plastic pop bottle
Pile of books (3/4 the height of the pop bottle)
Piece of paper
Marker pen

Procedure

1. Fill the pop bottle with water (to the top).
2. Place the cap on the pop bottle tightly (making sure there is no air bubble inside).
3. Lay the bottle on its side and place the pile of books in front of it.
4. Draw a large dot on the paper, just below the height of the books when the paper is stood on end.
5. Hold the paper behind the bottle and look along the top of the books. You should be able to see the dot through the bottle.
6. While keeping the paper in place, remove the bottle and look along the top of the books again. The dot should disappear.
7. Empty the bottle and follow procedures 2–5 again. Can you see the dot?

Explanation

The water in the bottle refracts the light rays that have bounced off the dot. The rays were bent to your eye so you could see the dot, in the same way distant mountains appear in a mirage. The effect does not work when there is air in the bottle, because air is less dense than water and does not refract light well.

Andi-Lynn Bender

Sweet Light

This mini demo is used to show that light sources can come from some surprising places.

What You Need

Sugar cubes
Rolling pin
Clear plastic bag

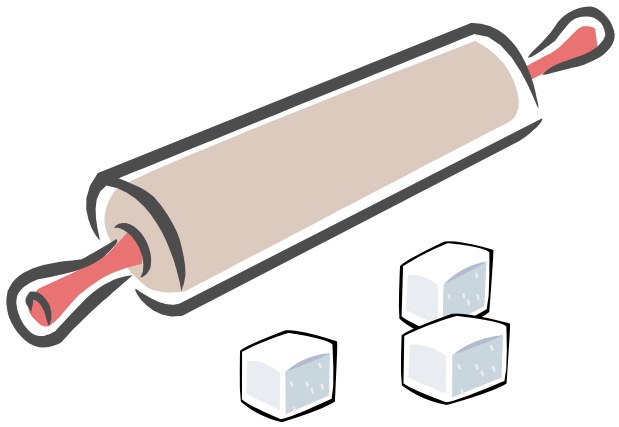
Procedure

1. Place the sugar cubes in the plastic bag.
2. Make sure you are in a very dark room and remain there for at least five minutes to let your eyes adjust to the dim light.
3. Use the rolling pin to crush the sugar cubes.

Explanation

When the sugar cubes are crushed, the atoms break apart. While this occurs, a blue light is given off. This is called triboluminescence.

Andi-Lynn Bender



How to Teach Climate Change

Teach Energy

A small group of Calgary teachers were treated to a prestigious education on teaching climate change this spring. Professor David Keith—named one of top five Canadians having the most influence on the climate change issue, keeping company with the prime minister, leader of the opposition and David Suzuki—met with just over 30 Calgary-area science teachers, counsellors and principals to look at *how* to teach climate change.

The Schulich School of Engineering professor was taking part in an annual meeting that closes the loop between high school teachers, university professors and professional engineers, all of whom are involved in the continuum of fostering global leaders in engineering at the University of Calgary.

Dr Keith tells teachers to start with the basics of the energy system. What happens when we turn on a light switch or when we step on an accelerator? Students need to appreciate the mine-to-lightbulb and well-to-wheels basics, says Dr Keith.

Students also need to understand some history, he says. For example, how has access to energy shaped the world? What are the biggest environmental impacts of our energy system?

Dr Keith is well suited to relay some advice to teachers—he is director of the Institute for Sustainable Energy, Environment and Economy (ISEEE), Canada research chair in Energy and Environment, and professor in the departments of Chemical and Petroleum Engineering and Economics.

Once the basics of the energy system are taught, Dr Keith suggests a focus on the climate, which he sees as the central environmental challenge of the century. He tells teachers to talk about weather and climate first; discuss the benefits as well as costs of climate change and the uncertainty around the issue; and use this discussion as an introduction to talking about the interface between science and public policy.

Dr Keith was a science source for a major feature on climate change in *Rolling Stone* magazine last year. His work focuses on the interface between climate science, energy technology and public policy. His technical and policy work addresses the capture and storage of CO_2, the economics and climatic impacts of large-scale wind power, the use of hydrogen as a transportation fuel, and the technology and implications of geoengineering. He serves on numerous boards and advisory committees. Dr Keith spent most of his career in the US, at Carnegie Mellon, Harvard and the National Center for Atmospheric Research. He returned to Canada in 2004 to build a research group on energy and environmental systems in Calgary.

Outreach Staff,
Schulich School of Engineering

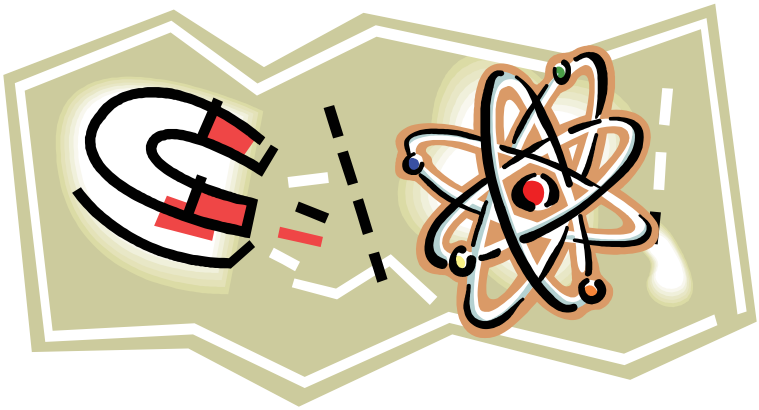
Professional Development

Third Annual Synchrotron Summer Workshop

The Canadian Light Source, Canada's only synchrotron, offers a variety of opportunities for students to engage in a cutting-edge research activity at the facility. Teachers and students can access posters explaining experiments, remotely participate in experiments and/or interview researchers through video conferencing, and directly participate in research through a new program that puts students on the beamlines working with CLS. Interested in putting your students on the beamline? The first step is to attend the Third Annual Synchrotron Summer Workshop for Teachers on August 13–15, 2007, in Saskatoon, Saskatchewan.

Previous workshops have allowed teachers to participate in synchrotron experiments; network with Canada Research chairs, CLS staff and users who share their experiences and enthusiasm for science; and explore the entire facility. One 2006 participant commented, "Getting to work on the beamline will be remembered for years to come. You can see pictures of how something works but that does not compare to actually seeing it work." The educational strength of Canada's only synchrotron is that it provides an exciting, real-life example for many of the science objectives taught in the classroom. The workshop gives teachers the knowledge and tools needed to use synchrotron research to stimulate student interest in science.

Thanks to NSERC PromoScience funding, up to $1,000 per province and territory is available to support national participation in this workshop, with further funding for classroom participation. Contact the educational outreach coordinator, Tracy Walker, at tracy.walker@lightsource.ca or (306) 657-3525. Watch for more details and registration information at www.lightsource.ca/education/teacherworkshop.



Women in Science

Aboriginal Women in Science

In September 2006, the Alberta Women's Science Network introduced the Aboriginal Women in Science project. On May 9, nine Grade 8 female Aboriginal students participated in the Operation Minerva–Calgary, a job shadowing experience with female professionals in science, engineering and IT. The students were from Ernest Morrow Junior High School's Aboriginal Pride Program, Senator Patrick Burns Junior High School, the Piitayis Family School and the Calgary Catholic School District. Operation Minerva took place in Calgary. The webpage for Aboriginal Women in Science is www.awsn.com/aboriginal.htm.

Engineering Her Own Destiny

Jessica Vandenberghe's engineering career has come full circle. Once a high school student who discovered her future career upon hearing a presentation on engineering, she now regularly stands in front of classrooms, helping kids to recognize their potential.

"Growing up, I wanted to be an artist," says Vandenberghe, 28. "Until one day, in Grade 10 or 11, this person came in and told us all about engineering. I had never even heard of the profession before, but it all sounded interesting. I was a fairly smart, a straight-A student, and realized that I could make a much better living in the field of science."

Vandenberghe did her undergraduate studies and later, completed a master's degree at the University of Alberta. Since 2003, she has worked as a research engineer at the Syncrude Research Centre, in Edmonton, in the industry of oil sands.

"One thing I like most about research is that the projects are smaller scale and you are able to carry things out from beginning to end. When you're a process engineer at a plant, your work involves more day-to-day troubleshooting. You don't always get to see things through to the end because there are so many things coming at you," she says.

Vandenberghe works in the bitumen production group, which focuses on the process areas from mining through to the end of extraction, before the oil is sent to upgrading to be refined.

"Our group looks at new technology and different technology that we could possibly apply to oil sands; we start testing it, either at a fundamental level or on a bench scale level, and then slowly scale it up. As it goes along, we dismiss it or figure out different ways to make it work, and then we move to a full-scale project and finally, implement it into the plant."

Vandenberghe is a big advocate of mentorship, both inside and outside of the workplace. In her department, she is currently working to implement a new mentorship program that will be under way within the next few months. Outside of work, she is an active volunteer for Alberta Women's Science Network (AWSN), Women in Scholarship, Engineering Science and Technology (WISEST) and the Edmonton Science Outreach Network (ESON), which sponsors her classroom visits to teach students and their teachers about the science of the oil sands.

"The last presentation I gave was for a Grade 5 class—that fun, inquisitive age," she chuckles. "Some of them have heard of engineering but most have no idea of what an engineer does."

As part of her classroom presentation, Vandenberghe conducts interactive experiments about scientific properties using everyday ingredients ranging from pop cans to popcorn kernels. She also does jar test demonstrations with real oil sand.

"We put a bit of oil sand in a jar with some water, shake it and then watch the bitumen float off. It's very easy for the students to watch what's happening as you explain that this is what our processes are based on; how the oil floats while the sand sinks," Vandenberghe explains, adding that by the expression on her captive audience's young faces, she can see that she is getting her message through to them.

"In Grades 4 and 5, they think the sky is the limit, but maybe they don't know how far that limit can go," she says. "Based on the questions that students of all ages tend to ask, they really don't know what's out there for them. So, having someone tell them what's out there and what they've experienced is helpful."

Vandenberghe says she feels fortunate that she did not feel any discrimination or gender barrier as she pursued her career, and that her teachers, family and friends were very supportive.

"I did my first year of college in Grand Prairie, Alberta, and made friends with the only other girl in the engineering class. We both went into chemical engineering and the two of us kind of stuck together," she recalls. "By university, we had a pretty good core group; six of us who studied and helped each other. We kind of felt our way together along the way."

Vandenberghe, who is Aboriginal but grew up in an adoptive German family, says that her post-secondary education and career path toward becoming the professional she is today, has brought her closer to her biological roots. In university, she volunteered in Native Students Services and later tutored at Edmonton's Amiskwaciy Academy. At the CCWESTT Conference last summer, she met Senator Lillian Dyck, a strong advocate of women and of Aboriginals, who has since become Vandenberghe's personal mentor.

"Lillian is half Native and half Chinese, so I thought her influence would help me get more in touch with my Aboriginal culture, since I grew up playing the accordion and eating sauerkraut," she laughs.

As much an eager mentoree as she is a passionate mentor, Vandenberghe says she often relies on the advice and experience of her trusted professional advisors.

"I do have some really good mentors right now. My team leader here at Syncrude is enthusiastic and helps me to visualize my future. He says, 'Well, here's where we're going and how we're going to get there.' That excitement really motivates me."

Barbara Chabai

Bridging the Gap: One Engineer's Story

Grande Prairie's Dunvegan Bridge connects the hilly banks on either side of the Peace River. Not only is it Alberta's only vehicle suspension bridge, but with an impressive span of 550 metres, it is also the fourth longest structure of its kind in Canada.

Laurie McCarron, 33, is proud to be among the small number of the province's engineers who are qualified to carry out work on the Dunvegan Bridge.

A bridge engineer with MPA Engineering Ltd's Grande Prairie office for the past six years, McCarron has had the opportunity to work on projects of all sizes.

"Our company does everything from inspection to design—building new bridges and repairing older ones," she says. "We work mainly on smaller, freestanding bridges, but I have been able to do certain types of work on bigger structures like the Dunvegan."

McCarron says that one of the things she enjoys most about her position is that there is always something new to learn.

"Learning new things can be a challenge to some people, but I find challenges to be part of the fun," McCarron says. "Every time I've gone to a new job, there's more to learn.

"For my job, it takes five years minimum to get the necessary training to work on bridges. Our office gets calls from guys who have been in the engineering business for 30 to 35 years who call us to ask questions about bridges. It's exciting that you can be part of this industry for that long period of time and still feel challenged by your work."

Growing up, McCarron was good at construction and design, but thought she'd probably end up working as a carpenter, not an engineer.

"When I was young, I remember that there was a couple who had a carpentry business set up in

the basement of a local church. I would go there after school and I learned to build tables and chairs and all sorts of crafty things. I think that's what got me headed in this direction."

Even in her first year at Grande Prairie Regional College, building bridges was not on McCarron's radar screen. In fact, she admits that she didn't know what an engineer was back then.

"I told my college counsellor that I liked math and science, but that I didn't want to be a biologist or go into the medical field," she recalls. "She recommended engineering and arranged for me to meet a couple of local engineers. If I hadn't gone to see my counsellor, I never would have chosen this career simply because I didn't know what it was about."

McCarron, the daughter of an electronics technician, finished her first year at Grande Prairie Regional College and then completed her engineering degree at the University of Alberta.

"My parents were always supportive. Their attitude was always, 'Do whatever you want to do,'" she says.

Upon graduating in 1996, McCarron started her career as an engineer at an oil company before going on to positions with the City of Grande Prairie and then to a surveying firm that built roads.

"One day, we were working on a road when we came to a bridge. So I asked who does this and how do they do it? The next thing I know, I'm working for this bridge company."

Although she is one of the very few Aboriginal women working in Alberta's engineering industry, McCarron says she has not encountered any significant discrimination.

"Before my current job, I rarely worked with any women but fortunately, I have never had any real problems with discrimination. There may have been the odd time, but it certainly hasn't been a dominant experience," she says.

Today, McCarron is in good company as one of three female engineers in an office of 20 people. She also appreciates working for a firm that is considerate of her needs as a busy, working mom.

"I have a two-year-old daughter and am now expecting my second child in June," she says. "MPA Engineering has been really great at accommodating my hours so that my schedule is flexible and I have some balance in my life."

Away from the office, McCarron enjoys spending time with her family, being outdoors, playing sports and, yes, doing some carpentry.

"I'd love to do more, but it's hard to find the time or the work space. So for the time being, my carpentry is limited to doing renovations around the house," she laughs.

When asked if she would recommend engineering to other young women, McCarron does not hesitate.

"I would definitely say 'go for it!' Don't let anything hold you back because there's really nothing to be afraid of," she says. "This is a great field to get into—it's good pay, stable employment, challenging work and it opens the door to unlimited opportunities. I can really go almost anywhere to work now, but my home is in Grande Prairie."

Barbara Chabai

Speaking of Science

Help fellow teachers solve the mysteries of teaching science. If you have a question about teaching science (or a science question in general), this is the place to ask. Send your questions to andilynn.bender@gmail.com. If you can help answer any of the questions below, please send in your response to the same e-mail address. You can remain anonymous if you prefer.

Excretory Failure

Teaching the excretory unit in Biology 20 has always been a challenge for me. How can I teach the kidney structure and function section to make the material more meaningful to students?

Outdated Scope

When teaching students about the microscope, I use the lower-case letter experiment to demonstrate how images move oppositely and appear different than when viewed by the naked eye. Is there a better way to teach this concept?

Tired of the 3-D Cell

It has been my experience that when students first learn about cell structure and function, they usually build a 3-D model. Could this material be taught differently and have the same effect on student learning?

Awards

Science Council Awards

The Science Council encourages everyone to nominate a colleague for one of the following awards.

Outstanding Science Teacher

The Outstanding Science Teacher award recognizes excellence in science teaching in Alberta. Strong consideration will be given to outstanding classroom teaching over an extended period of time, as well as contributions such as articles, workshops, curriculum development and other instances of professional development. Eligibility is limited to those currently teaching at least two-thirds of the time.

An annual plaque and a personal plaque to keep will be presented to the recipient at the annual conference banquet. Travel expenses to the conference and one night's accommodation and meals will be covered by the council. The recipient will be required to share his or her approach to science teaching either by writing an article for one of the council's publications or by being interviewed by the editor (or a designate).

Distinguished Service Citation

The Distinguished Service Citation recognizes a broad, extended contribution to science education in Alberta, including curriculum development, inservice, outstanding classroom teaching, professional publications and contributions to the greater community related to science education.

A large annual trophy and a personal trophy to keep will be presented to the recipient at the annual conference banquet. Travel expenses to the conference and one night's accommodation and meals will be covered by the council. An article describing the recipient's contributions will appear in a Science Council publication.

To nominate someone for either award, please fill out the online form at www.atasc.ab.ca/awnominationsform.htm. The deadline for nominations is **September 15**.

Good luck!

Wonderville.ca Science Challenge Winners Announced

Over 340 teams from schools across Alberta competed in the Wonderville.ca Science Challenge. Using the Alberta SuperNet, more than 1,000 Grades 7 and 8 students provincewide competed for fame and prizes for their school.

Organized by Science Alberta Foundation, the Wonderville.ca Science Challenge provides teachers with a fun, interactive, hands-on exercise to have students review specific science curriculum. The Challenge illustrates the link between classroom knowledge and real-world scenarios.

To complement the Structures and Forces curriculum, Grade 7 teams were required to design and construct an amusement park ride that would securely transport a marble "passenger." Grade 8 teams were tasked to build a Rube Goldberg machine, linking to the Mechanical Systems curriculum. Rube Goldberg machines are designed to be as complex as possible to accomplish the simplest tasks. Students were provided with a digital camera to record a one-minute presentation to share with judges from across the province.Go online to http://sciencechallenges.wonderville.ca to view the innovative winning submissions.

For more information, contact Kaya Konopnicki, Special Events and Development Science Alberta Foundation, at (403) 220-0077, ext 234; kayak@sciencealberta.org.

Prize Winners

Grade 7 Winners

AWARD	TEAM	SCHOOL	CITY
Best Overall Project	Re-BOCK	High Level Public School	High Level
Best Presentation	Scream Team	Terrace Ridge School	Lacombe
Most Creative Ride	Ozzfest	Hillcrest School	Edmonton
Best Blueprint	The Cobalt Assault	Westmount School	Edmonton
Longest Ride (DISTANCE)	Iron Piggies—Marble travelled 1016 cm	Timberlea Public School	Fort McMurray
Longest Ride (TIME)	Structure Maniacs—38 seconds	Clover Bar Junior High	Sherwood Park

Grade 8 Winners

AWARD	TEAM	SCHOOL	CITY
Best Overall Project	JAM'D	Crestwood	Edmonton
Best Presentation	Ultimate Extractor	Louis St Laurent	Edmonton
Most Creative Machine	The Poppin Smuckers	Louis St Laurent	Edmonton
Best Blueprint	The Euros	Elboya Junior High	Calgary
Longest Machine (TIME)	The Poolies	Elboya Junior High	Calgary
Most Number of Machines	Coltex Engineering Industries	Louis St Laurent	Edmonton

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