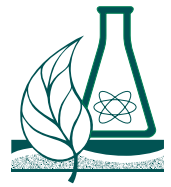


# The Alberta Science Teacher



Volume 29, Number 1

October 2008





# From the Editor

**W**elcome back to a new school year! This summer I was very busy teaching Biology 20 in summer school, taking a brief fishing trip, supervising diploma exams, and taking the trip of a lifetime to Ireland and Scotland.



I currently work at a school that was built in the early 1900s. I used to think this was old, until I went to the UK. There you find buildings dating back to 3200 BC, including the old settlement Skara Brae, in the Orkneys (pictured on the cover in a photo I took in Scotland). What amazed me the most was how these buildings could survive in spite of thousands of years of weathering. Of course, their condition is not perfect, but to be able to see structures standing that were built thousands of years ago is an amazing thing, especially considering that many homes here in North America are lucky to see 60 years.

What is most astounding about structures built to last is that most of them come from nature. Stones, not brick, were used to build Skara Brae. Nature is amazing in itself (take a look at all the natural beauty around you), and has the ability to fulfill all of our needs.

One major goal of the new science programs of study is to relate science to real life. What better way to explain weathering than to look around and see the effects? The theme of this issue of the *Alberta Science Teacher* is the new programs of study in biology and chemistry. You will find new resources and updates for the new programs.

Where else can you find new and exciting resources? The annual ATASC Science Conference! This year the conference will be held in Calgary, from November 13 to 15. Check out

the website for registration and session information: [www.atasc.ab.ca/conference](http://www.atasc.ab.ca/conference).

I hope you find this issue of the *Alberta Science Teacher* useful and informative. If you have any questions or suggestions, please e-mail me at [andilynn.bender@gmail.com](mailto:andilynn.bender@gmail.com).

I hope your school year is filled with opportunity and excitement!

Andi-Lynn Bender

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# From the Council

## President's Message

“Science in the real world.” It’s the theme of our upcoming conference in Calgary, but more than that, it’s the theme every day in all of our classrooms. Science *is* the real world. The world around us is full of science. Science abounds in our newspapers and our online news. Our students are surrounded by science every minute of every day of their lives. Our jobs are so exciting because we get to teach our students about their world and help them not only to make sense of what is happening around them, but to find ways to improve their world. It’s a challenge, for sure, but one that Alberta science teachers are living up to magnificently. Our students rank among the top in the world in their understanding and application of science, and they have you to thank.

The Coalition on the Public Understanding of Science ([www.copusproject.org](http://www.copusproject.org)) has declared 2009 to be “the international year of science.” I challenge schools to host science events in 2009

to make science and scientific issues more accessible to students and their families.

We can also focus on making science more accessible to students in our classrooms. My school district, along with many others in the province, has moved very strongly in the direction of assessment for learning (AFL) in the past couple of years. I have made some minor changes in my classroom that I believe have made a major difference to my students’ understanding and mastery of the classes I teach. I’ve set up my mark book according to the units that I teach, rather than by date range. Now, the human homeostatic systems unit is actually worth 25 per cent of my Biology 30 course work, for example. Parents and students can see the marks by unit, and students can focus on their areas of weakness for their review.

I have also begun each day with a grouped quiz on the previous day’s subject. I have little whiteboards in my room, and students are grouped in pods of four. Each pod has to draw a structure or compose an answer to a question or two every day. The amount of teaching and learning that

happens every day during those first few minutes is incredible. I can tell at a glance what concepts my students have mastered and which are proving difficult, and which student groups I need to spend more time with. I love having my students in pods. They become little teams who work together on almost everything. Having



them sit together makes transitioning between individual and group work seamless and instant. Honestly, I'm not sure how I ever taught rows of individual kids!

Finally, I've also begun to rethink my rewrite policy for exams. I used to believe that allowing rewrites on exams and quizzes fostered irresponsibility. In a professional learning community (PLC) meeting, however, Stephen McMaster, a new transfer into my school, told us about a method that he and a colleague at his former school had created. A student who wishes to rewrite an exam must fill out an application form outlining what went wrong on the first try and how he or she intends to correct it, and have a parent sign it. Then, the student must spend an hour after school with the teacher going over the exam. Finally, the student can rewrite (a new exam, of course) at a date and time set by the teacher. It's quite a process, but it allows students to master the content and prove their mastery. Stephen says that only a few students take advantage of the process on any exam, but their marks significantly increase, showing a much greater understanding. I love this idea, because it doesn't take any time away from the classroom setting; it still encourages responsibility and awareness of consequences, but gives students an opportunity to really learn and master the content as well.

When I came back from maternity leave last year, I didn't think that I was going to be into "all this AFL stuff," as I called it. I took a huge leap of faith when I rearranged my classroom into pods, and I was hooked within days. AFL strategies really do make a difference, which is why our 2008 conference committee is focusing on AFL for an entire day of the conference. The program for the conference looks incredible—please take a minute to go to [www.atasc.ab.ca/conference/](http://www.atasc.ab.ca/conference/) to check it out. I look forward to learning more about science, AFL and, most important, how to use AFL in my science classroom. Exciting times, for sure. I look forward to seeing you all there.

Colleen Yoshida

## Aha! Moments: A Personal Story

By the time you read this, it will be well into the school year. I hope things are going well for all of you. This will be my last article as Division III director, because I am stepping down after the conference this year. It's been an honour and pleasure to serve on the ATA Science Council. In my judgment, the council does vital work in helping teachers in Alberta better serve their students, so please continue to support the council.

In this issue, I'd like share a few Aha! moments that I've noticed since I moved to Division III. I'd like to issue a challenge to you as a result of one of these moments, especially to those who have never taught in Division IV. I'll give you some background before the challenge.

In my first 14 years, I taught every high school science course at least once, except for Biology 20/30. For the past two years, I've been teaching junior high. What a change, to say the least! It was an interesting evolutionary experience for me to deal with the hormones and energy level of these kids.

### Aha! # 1

I finally realized the gift I bring to my students. Knowing what is in store for them in Division IV, I can better prepare them for high school. I know what to emphasize and when I can back off in prepping them for the higher grades. But this emphasis doesn't mean teaching beyond the program of studies. My gift is also to the high school teachers—these kids will be better prepared. One example is how I really stress the difference between mass and force and, related to that, how important units (kg, N etc) are.

So my challenge to you is to really get to know the program of studies for science, chemistry, biology and physics in Division IV. The junior high program doesn't really make the links to the

higher grades very well, so *you* find them and make them. I also urge you to talk with your high school colleagues, especially the Grade 10 teachers. Ask them what are the common weaknesses their students bring from junior high. Hey—at the conference in Calgary, go to some of the high school sessions and find some Division IV teachers to talk to. That’s a perfect place to do that. Teachers’ Convention is another terrific place to do it. If it fits your district, you might even be able to access some AISI money to take a half-day to collaborate with a Division IV teacher.

## Aha! #2

As I was going through the first day of introduction to science this year, it also dawned upon me that we are really the servants of the students. We are always in *give* mode. That puts us into the servant role. I told the kids that, but I was quick to point out that *servant* does *not* equal *slave*! The students seem to be a bit more comfortable asking questions now. In fact, the level of questioning in the first week has been better than I’ve ever experienced—from any grade level I’ve taught.

## Aha! #3

I have always tried to make science relevant to everyday life as much as possible. I made a special effort to make that really clear at the beginning of this year and even gave a couple of examples. This

year, I had one student tell me after the first day of science that he appreciates that I’m going to tie as much of the course as possible directly to their lives. He’s one that put up his hand when I asked who didn’t like science or didn’t do well in science. Now he’s open to the idea that science might be useful, interesting or maybe even fun. He happens to be the son of a colleague of mine. The dad pulled me aside and said, “Whatever you’re doing, keep it up. My kid is coming home telling me about what he learned in science, and he’s never done it with such enthusiasm before.”

## Aha! #4

I touched upon this in a previous article but I think it’s really important for all teachers, not just science teachers. Our reality is created solely by us—nobody else. We really do have freedom of choice. We can be miserable because of a disruptive kid, a colleague, the government etc, or we can be unreasonably happy. I ask you, what feels better? If one chooses the happier reaction, then life gets better and the experience of freedom is enhanced. So I’ve just decided to issue challenge number two: make choices that will allow you to experience more freedom. You choose: misery or happiness. You choose: make this your best year of teaching or not.

Namaste.

Corey Karvonen-Lee





**Science Council Conference 2008**

# **SCIENCE IN THE REAL WORLD**



**Doing Science in the 21st Century Classroom**

**Telus Convention Centre Calgary**

**November 14 – 15, 2008**



For Conference Details Visit Our Website [www.sc.teachers.ab.ca](http://www.sc.teachers.ab.ca)

Registrar: Dilys Halford PH: (403) 283 – 1292 ([dhalford@atasc.ab.ca](mailto:dhalford@atasc.ab.ca))

*Early Bird Discount – Save \$100.00 by Registering By September 30, 2008*

# Science Teacher News

## Iron Science Invitation



To all Alberta math and science teachers—on the eve of Iron Science Teacher 2008, please join us for a dinner reception cohosted

by the Schulich School of Engineering and the Faculty of Science.

November 20, 2008

7–9 PM

ICT Building, Second Floor  
University of Calgary  
856 Campus Place NW  
(northeast corner of campus)

## AGENDA

Welcome to Calgary area science and math teachers

- Jay Ingram, science writer and broadcaster, and host of Iron Science

Special presentation: “Science Education Research Trends”

- Leslie Reid, Tamaratt Teaching Professor, Faculty of Science, University of Calgary

Introducing the finalists in Iron Science 2008!

- Calgary teachers, please welcome 20 brave science teachers from across Canada to our city to compete in the annual science teaching challenge, Iron Science.

Space is limited. RSVP is required. Please register at [www.schulich.ucalgary.ca](http://www.schulich.ucalgary.ca).

## Treat It Right! Program Update

The programs below launched last November. They are focused on science and integrated with language arts, social studies, and mathematics as appropriate to content and grade level.

“Treat It Right! Wastewater” (Grade 4) links to the personal action concepts of Science 4, “Waste and Our World.”

“Treat It Right! Stormwater” (Grade 5) links to the Wetlands section of Science 5.

The programs are teachers’ guides and are composed of four lessons, exercises, readings, take-home activities, games, word searches etc. They come complete with a colourful flow chart. The programs are distributed to Edmonton teachers and are also available online at [www.edmonton.ca/drainage/education](http://www.edmonton.ca/drainage/education).

Last spring, we launched a presentation/tour of the constructed wetlands for Grade 5 teachers in Edmonton. This was a pilot project, and we are planning to run the program again this year. Edmonton teachers should check our website, [www.edmonton.ca/drainage/education](http://www.edmonton.ca/drainage/education), for information by early January.

We are also working on translation of the elementary programs to French.

As well, our new Grade 8 program is being developed, and we plan to launch it early in the new year.

Watch for additional new offerings in the “Treat It Right!” programs.

**Janice Dewar**

*Janice Dewar, BEd, MDE, is an education officer with the strategic planning office of the City of Edmonton’s Drainage Services division, in Edmonton, Alberta.*



# CMASTE and Alberta Ingenuity Collaborate

This past summer, the Centre for Mathematics Science and Technology Education (CMASTE) and Alberta Ingenuity Research Centres at the University of Alberta hosted six science educators who developed lessons for high school and junior high school students about the work conducted in the research centres. Research scientist Dr Chris Cairo, who works in the Alberta Ingenuity Centre for Carbohydrate Sciences (AICCS), commented that he valued the knowledge that teachers brought to the project. He indicated that research scientists don't know where their knowledge fits into what students are studying, nor do they know how it builds on previous learning. Unlike a number of other summer programs where teachers attempt to do the work of researchers, this program takes advantage of the knowledge teachers bring to the project. Teachers do not attempt to become researchers, but bring their expertise to the project by developing lessons. Dr Frank Jenkins, an experienced science educator and science author, worked in the Centre for Oil Sands Technology this past summer. Frank commented on how much he learned working in an environment dedicated to oil sands research. He also commented on how the scientists valued teacher knowledge and respected what educators brought to the project. Mark Haak, working for his second year in the Alberta Ingenuity Centre for Carbohydrate Sciences, indicated that it was the best professional development he had ever experienced. Mark commented about how the chemists he worked with valued his work and the importance of the project. Robert Bechtel, who has an MSc and is currently a PhD candidate in education, commented on his learning curve in the Alberta Ingenuity Centre for Machine Learning. Robert indicated that although members of the

research team thought they had simplified what they were doing, more explanation was required to make it student friendly. One of the researchers commented that teachers' questions, descriptions and explanations helped the researchers refocus and check their own assumptions. The challenge is in making the materials relevant and readable without oversimplifying concepts and distorting either the scientific knowledge or the nature of the research process.

The teacher-writers are currently field-testing the drafts and getting presentations ready for the ATA science and mathematics conferences in the fall. The lessons developed by this project will be posted on the CMASTE site and made available to teachers by mid-November. Although the CMASTE website is currently under construction, last year's projects are available on the AICCS website—go to [www.carbohydratecentre.ualberta.ca](http://www.carbohydratecentre.ualberta.ca), click on Media Centre, select AICCS-CMASTE Outreach Program and select Teaching Materials.

CMASTE and Alberta Ingenuity plan to expand the program even further next year. Teachers who are interested in applying for a position next year are encouraged to visit us at the CMASTE booth at the ATA Science Council conference, in Calgary, November 13–15. Application forms for work in July 2009 will be available on the CMASTE website in February 2009.

## Information about Alberta Ingenuity Centres

### Alberta Ingenuity

The Alberta Ingenuity Fund supports science and engineering research of the highest calibre, to create a prosperous future for the province. It draws funding from a \$1 billion endowment established and managed by the government of Alberta to build the capacity for innovation, especially in areas with long-lasting social and economic impact. For more information, go to [www.albertaingenuity.ca](http://www.albertaingenuity.ca).

### *Alberta Ingenuity Centre for Carbohydrate Science (AICCS)*

The Alberta Ingenuity Centre for Carbohydrate Science (AICCS) comprises a team of highly motivated researchers whose interests span a multidisciplinary array of biological processes and technologies specific to carbohydrate research. The fields of chemistry, biology, medicine and engineering are dynamically integrated as experts in areas such as carbohydrate synthesis, protein-carbohydrate interactions, glyco-engineering, drug discovery, vaccine development, mass spectrometry and X-ray crystallography work together to explore carbohydrate science. For more information, go to [www.carbohydratecentre.ualberta.ca/index.cfm](http://www.carbohydratecentre.ualberta.ca/index.cfm).

### *Alberta Ingenuity Centre for Machine Learning (AICML)*

The Alberta Ingenuity Centre for Machine Learning (AICML) supports and promotes curiosity-driven machine learning research and leading-edge scientific and commercial applications in a wide variety of areas, including the bioinformatics and interactive entertainment industries. AICML research is strongly tied to current machine learning and artificial intelligence problems. Work is conducted with researchers internationally respected in their field, and carried out in cooperation with graduate students and postdoctorate fellows interested in real world problems. For more information, go to [www.uofaweb.ualberta.ca/aicml](http://www.uofaweb.ualberta.ca/aicml).

### *Imperial Oil–Alberta Ingenuity Centre for Oil Sands Innovation (COSI)*

The Imperial Oil–Alberta Ingenuity Centre for Oil Sands Innovation (COSI) has a mission to generate breakthrough technologies that will revolutionize the productivity and sustainability of oil sands operations. COSI's groundbreaking research will ensure that extraction and upgrading processes contribute fully to social, economic and environmental excellence now and for future generations. For more information, go to [www.engineering.ualberta.ca/COSI.cfm](http://www.engineering.ualberta.ca/COSI.cfm).

**Bob Ritter**

## **Alberta Ingenuity Centre for Carbohydrate Science (AICCS) Project**

Jane Dyke, from Ross Sheppard High School, and Mark Haak, from W P Wagner High School (both in Edmonton, Alberta) spent their 2007 summer working with researchers from the Alberta Ingenuity Centre for Carbohydrate Science (AICCS), in the Faculty of Science, and the Centre for Mathematics, Science and Technology Education (CMASTE), in the Faculty of Education, at the University of Alberta, to develop individual lessons for high school students on carbohydrate chemistry. The lessons were developed for students in Chemistry 30 (Unit C: Chemical Changes of Organic Compounds) and Biology 20 (Unit C: Human Physiology). Ten student lessons, along with teacher notes, were developed. Student lessons included laboratory investigations, case studies, profiles of scientists and the exploration of science-related social issues. Because the student activities were written by teachers under the guidance of research scientists, the activities are scientifically accurate and reflect many of the latest advances in carbohydrate research while being sensitive to classroom time and prerequisite student knowledge. By design, teachers may choose one or a number of lessons in any order to enhance their program as they see fit. The lessons were field tested in fall 2007, and the first drafts were presented at the 2007 ATA Science Council conference in November. Following the conference, the student activities were posted on the CMASTE website—go to [www.cmaste.ca](http://www.cmaste.ca) and select Publications from the left-hand menu; the lessons are listed under Alberta Ingenuity Centre for Carbohydrate Science.

**Mark Haak**



# IRON SCIENCE 2008

Under the spotlight and in front of a cheering crowd, talented science educators from across Canada are competing for the 2008 "Iron Science" teacher title.

### TEACHERS!

Visit [www.ironscience.ca](http://www.ironscience.ca) for entry guidelines. Deadline for entering is the third week of September.

### IRON SCIENCE SEMI-FINALS

Science World at TELUS World of Science	Vancouver	Oct 24
Canada Science and Technology Museum	Ottawa	Oct 24
Discovery Centre	Halifax	Oct 31
TELUS World of Science	Edmonton	Nov 5
Manitoba Museum	Winnipeg	Nov 6

### IRON SCIENCE FINALS

Friday, November 21  
Mac Hall, University of Calgary, Alberta  
10:30 am - noon MST  
**Watch live on the Internet!**

### STUDENTS!

#### DOES YOUR SCIENCE TEACHER DESERVE AN HONOURABLE MENTION?

Hey, we know that everyday science teaching is not an entertainment contest. So, tell us about your favourite science teacher, in 200 words or less. Deadline is November 1.

Enter at [www.ironscience.ca](http://www.ironscience.ca)

[WWW.IRONSCIENCE.CA](http://WWW.IRONSCIENCE.CA)

# Resources

## Scientific Reasoning— From CRYSTAL–Alberta

Science and mathematics reasoning is the topic of research and development for CRYSTAL–Alberta, the Centre for Research in Science Teaching and Learning. For example, inductive and deductive reasoning are common in both science and mathematics. Inductive reasoning arrives at answers by using specific observations or events to create generalizations or hypotheses; eg, measuring  $F$ ,  $m$  or  $a$  multiple times and creating Newton’s second law,  $F = ma$ . Deductive reasoning answers questions by using generalizations or hypotheses to provide a specific answer; eg, using Newton’s second law ( $F = ma$ ) to solve for  $F$ ,  $m$  or  $a$ . We often claim that the content in math and science curricula is presented for the purpose of teaching and learning valid reasoning. However, the oft-used indirect approach to reasoning may not meet this purpose.

CRYSTAL–Alberta’s website, [www.crystal-alberta.ca](http://www.crystal-alberta.ca), provides direct information about reasoning for students and teachers. Definitions and concepts are presented through text and visuals to assist students with exercises provided online and in downloadable files. Use this information to promote valid scientific reasoning in your classroom practices, and to meet one of the real goals for science education and scientific literacy.

See us at the ATA Science Council conference, in Calgary, in November.

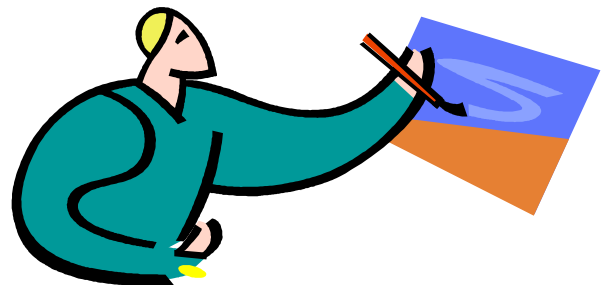
Frank Jenkins  
CRYSTAL–Alberta

## Sign Here! A New Game at the Space Place

The Spitzer Space Telescope has given us many spectacular images of the infrared universe. Stunning spiral galaxies, colourful clouds of glowing gas and dust, star nurseries never seen before. The Spitzer mission team wants to display these beautiful images, so they have given the NASA Sign Here! factory a big order for signs to label their pictures. Your job is to paint the signs by typing the words as the blanks pass by on conveyor belts. They start out slow, but as you get better, the signs speed up and pass by in both directions. See how high you can score—the game ends when you have missed ten signs. Curious about what some of the words mean? You can check them out on the Sign Here! glossary. To start painting, go to <http://spaceplace.nasa.gov/en/kids/spitzer/signs>.

Nancy J Leon

*Nancy J Leon is outreach coordinator for the New Millennium Program of the National Aeronautics and Space Administration’s Jet Propulsion Laboratory, in Pasadena, California.*



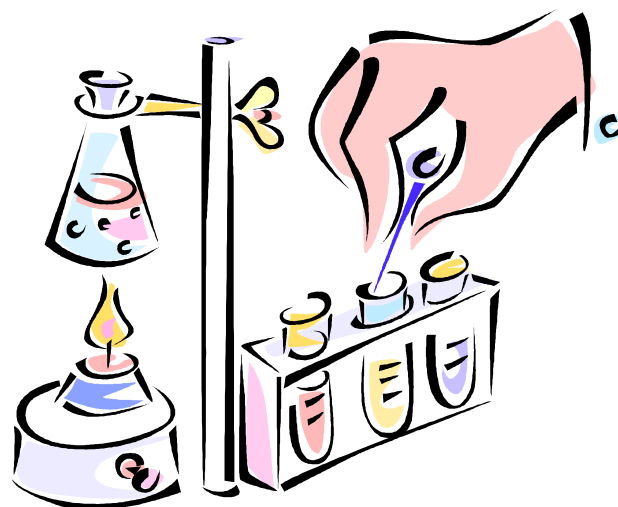
# Chemistry on Campus at NAIT

The Chemical Technology Program at NAIT has received funding from the Imperial Oil Foundation to run its Chemistry on Campus sessions for students in Grades 9 through 12 for the next five years. Students do a three-hour lab on our campus and gain some experiences that may not be available to them in their school labs.

We will be offering a choice of the following four labs:

- **Synthesis and Analysis of ASA**—Students synthesize acetylsalicylic acid (ASA) from acetic anhydride and salicylic acid, then analyze it using HPLC (high Performance Liquid Chromatography), melting point and FTIR (Fourier transform infrared spectroscopy) to determine its purity and identity. When time permits, students tour our instrumentation and oil labs. (Maximum 25–30 students)
- **Chemical Reactions of Copper**—Students convert copper to copper(II) hydroxide, copper(II) oxide, copper(II) sulphate and back to copper again. The work involves filtering, transferring liquids, using the balances and oven drying, and includes a tour of our instrumentation labs and oil lab. (Maximum 25–30 students)
- **Plastics**—Students decompose a plastic and synthesize a second plastic. Students work with specialized organic distillation equipment. (Maximum 20 students)
- **Ferrofluid**—Students synthesize a ferrofluid and examine its properties. (Maximum 18 students)

Later this semester, we will be piloting a new lab that involves the analysis of a freshwater sample for pH (using pH paper and a pH meter), conductivity (using a conductivity meter), alkalinity and dissolved oxygen (by titration). I will let you know when this lab is ready for your students. We



are hoping to provide you with the opportunity to test your own freshwater samples.

The sessions take three hours and are free of charge. Your only financial responsibility is the cost of transportation to NAIT. It is also expected that a teacher or other school official will be on hand to chaperone the students. Students are provided with lab coats and safety glasses. They are required to wear pants and closed-toed shoes.

Lab slots are available on Monday afternoons, Tuesday mornings and afternoons, and Friday mornings, until the middle of December. I won't know the lab availability for January until sometime in November because that is a new semester for us at NAIT. Lab sessions will continue through the first week of June. [Editor's note: The author has advised that since she submitted this article, all pre-Christmas sessions have been booked, but registrations are being accepted for sessions in the new year.]

In order to reserve a lab session or if you have any questions, please send e-mail to [cindyr@nait.ca](mailto:cindyr@nait.ca) or call me at 780-471-7762. Please share this message with your chemistry colleagues.

**Cindy Rothwell**

*Cindy Rothwell is an instructor in the chemical technology program at the Northern Alberta Institute of Technology (NAIT), in Edmonton.*

# Science-In-A-Crate



Looking to inject a little excitement into your next science class? Science Alberta Foundation has a simple and engaging solution!

Our curriculum-linked Science-In-A-Crate uses highly visual, hands-on, minds-on activities to illustrate how science is used in everyday situations and to help you bring science to life in your classroom. The activities are innovative, engaging, and directly linked to Alberta Education's curriculum for science and mathematics.

The following crates have been developed specifically for junior high and high school:

## Team Aquatica: Fresh and Saltwater Systems

*Grade 8*

Available in French and English. Explore all aspects of aquatic ecosystems by diving deep into fresh and salt waters with a wacky group of colourful superheroes. From collecting and interpreting data found in glacial core samples to determining the potability of drinking water, students will use scientific principles to investigate fresh and salt water systems and processes.

## Made to Measure

*Grade 8*

What do adventure, history, the outdoors and your own backyard all have in common? Math! Use problem-solving skills and other math concepts to explore Alberta's past and present through the eyes of a land surveyor.

## Environmental ER

*Grade 9*

What happens when there is a breach in an oil pipeline? Discover the importance of science during an emergency response to an oil spill by becoming a specialist in disciplines including chemistry, wildlife biology, aquatic ecology, hydrogeology, soil sciences, environmental toxicology and oil recovery. Use this knowledge to decide on the best options for cleanup and long-term study of this oil spill.

## Extreme Alberta Challenge

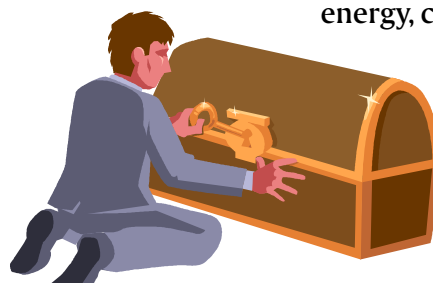
*Grade 9*

Available in French and English. Students discover the variety of life living in unique Alberta habitats and analyze how the Extreme Alberta Challenge, a multi-leg adventure race, may affect plant and animal species en route. Students help perform the necessary environmental assessments and analyze the outcomes. Activities showcase real-life examples of field research techniques, species at risk in Alberta and species/habitat management practices.

## E-Factor: Understanding Common Energy Conversions

*Science 24*

From finding out about alternative energy and fuel efficiency to counting calories and comparing chemical reactions, E-Factor examines all aspects of energy in our everyday lives. Using a series of magazine articles, students tackle topics that include budgeting their energy use, experimenting with generation of alternative



energy, calculating their maximum daily caloric intake needed, measuring fuel efficiency of cars and

inventing a unique energy-saving appliance. Each article also showcases two career choices in that field.

### **Collision Scene Investigation**

*Grade 10*

The CSI crate provides an introduction to the techniques involved in collecting and evaluating evidence left at the scene of a collision. Through seven hands-on inquiries, students assume the role of a collision reconstructionist, employing the scientific principles and mathematical practices used at present-day collision scenes. After evidence has been collected and analyzed, students will answer questions that challenge them to make interpretations based on the data obtained.

### **You're Hired!**

*Grade 11*

Discover if your students have what it takes to run a financially successful recording company. In this crate, participants apply their understanding of mathematical concepts in the areas of number operations and finance to compete in seven challenges relating to a real-world scenario. The team who makes the best overall business decisions has bragging rights and inherits the title of Heir to the fictional Siren Records.

Book Science-In-A-Crate online at [www.sciencealberta.org](http://www.sciencealberta.org) for only \$25—fast, easy and delivered directly to you! A listing of all Science-In-A-Crate titles is now available in the 2008/09 *Program Guide*. Please send e-mail to [crates@sciencealberta.org](mailto:crates@sciencealberta.org) to receive a copy.



## **Teacher Tube Videos**

I have posted 11 demonstrations on the Teacher Tube website, [www.teachertube.com](http://www.teachertube.com). Each video is about three minutes long, and most are designed to help students understand earth science concepts such as convection, latent heat, salinity/density, etc. To view them, go to [www.teachertube.com](http://www.teachertube.com) and type *Rod Benson* into the search box.

The video titled “Latent Heat Captured on Video” might be of special interest to those who teach in communities that experience chinook winds.

**Rod Benson**

*Rod Benson teaches earth sciences at Helena High School, in Helena, Montana, USA. His home page for earth science teachers is [www.formontana.net/home.html](http://www.formontana.net/home.html).*



## Oil Sand Investigations for Chemistry 30

Through the sponsorship of the Alberta Ingenuity Centre for Oil Sands Innovation (COSI) and the administration of the Centre for Mathematics, Science and Technology Education (CMASTE), oil sand investigations and other oil sand career and STS (science, technology and society) lessons have been prepared. Although written specifically for the new Alberta Chemistry 30 curriculum, the investigations and lessons could be used in other places in the science and social studies curricula.

Specific to the oil sand investigations, Word and PDF files have been prepared with

- five investigations to be completed by separate groups in one class period in a research-team approach—illustrating how research labs really work;
- a teacher's edition file that includes pedagogic purposes, laboratory material lists, preparation procedures, curriculum outcomes (general and specific) and sample lab reports (including photos);
- a PowerPoint presentation for teachers and laboratory technologists—to help in the preparation of vials with oil sand, water and air;
- student blackline masters (BLMs) for open-entry labs that require students to complete the purpose, design and materials for their pre-lab work (including space to write);
- student lab exercises—like the BLMs above but with the evidence provided (including photos); and
- a PowerPoint presentation with both procedure and evidence slides—to illustrate expected results and (while still waiting for materials to do the actual investigations) to substitute for doing the actual (wet lab) investigations.

The files are available for download from [www.cmaste.ca](http://www.cmaste.ca) (the Centre for Mathematics Science and Technology Education). Other links are [www.engineering.ualberta.ca/COSI.cfm](http://www.engineering.ualberta.ca/COSI.cfm) (Centre for Oil Sands Innovation) and [www.albertaingenuity.ca](http://www.albertaingenuity.ca) (Alberta Ingenuity).

Frank Jenkins  
Codirector, CMASTE

## Safe Drinking Water Foundation and Alberta High School Chemistry and Biology

As teachers develop and teach new units and activities to align their courses with new curricula, it is always helpful to have some lessons available that are relevant to students' lives, align with the new curricula and include links to the new curricula. The Safe Drinking Water Foundation (SDWF) offers a variety of such lessons, all available free of charge. Operation Water Drop (OWD) and Operation Water Pollution (OWP) programs involve kits to help teachers engage their students in hands-on activities. Currently, a limited number of sponsored OWD and OWP kits are available through the Green Street website ([www.green-street.ca](http://www.green-street.ca)), thanks to generous sponsorship from Green Street. Also, thanks to generous sponsorships from many TD Friends of the Environment Foundation chapters, sponsored OWD and OWP kits are available for schools in various areas of Alberta. Teachers can send e-mail to [info@safewater.org](mailto:info@safewater.org) to find out if a kit sponsored through the TD Friends of the Environment Foundation is available for their school.

OWD high school kits allow students to perform 13 different analytical tests (alkalinity, ammonia, arsenic, colour, copper, heterotrophic plate count, iron, manganese, nitrate, pH, total chlorine, sulphate and total hardness) on samples of their community's water, rural water, urban water and raw water, and to compare these samples to a control sample. The students are placed in cooperative learning groups and each group conducts some of the analytical tests. Then, the groups share what they have learned with the class. Students learn that Canada does not have *regulations* regarding components in drinking water, but *guidelines*, which are not legally



enforceable; students must contemplate the implications of this information. This program fits nicely into the new Biology 20 course, in Unit A: Energy and Matter Exchange in the Biosphere; the new Chemistry 20 course, in Unit C: Matter as Solutions, Acids and Bases; and the new Chemistry 30 course, in Unit D: Chemical Equilibrium Focusing on Acid–Base Systems.

The OWP program guides students through an examination of water pollution issues. OWP kits include digital pH meters and TDS (total dissolved solids) meters that can be reused in schools for at least two years. Students begin the program by developing definitions of polluted drinking water that serve as the foundation for the other lessons in the program. The digital TDS and pH meters allow the students to measure the TDS and pH levels of polluted water, and the TDS and pH levels of the water after it has been filtered through filters that they themselves have constructed. The construction of the water filters and the provided case studies help students to learn about the cost of clean water and the realities that exist in rural and First Nations communities. Through a variety of activities and cooperative learning strategies, the students explore the causes, effects and sources of water pollution in the world and in North America. The students discover how water



pollution is reversed and what they can do to effect change in their community with regard to water pollution. This program fits nicely into the new Biology 20 course, in Unit A: Energy and Matter Exchange in the Biosphere and Unit B: Ecosystems and Population Change; the new Chemistry 20 course, in Unit C: Matter as Solutions, Acids and Bases; and the new Chemistry 30 course, in Unit D: Chemical Equilibrium Focusing on Acid–Base Systems.

The SDWF is also updating the Alberta Biology 20, Biology 30, Chemistry 20 and

Chemistry 30 curriculum links for its other environmental education programs; these updated curriculum links will soon be available on the website. As always, SDWF also has a lot of information on its website that supports its education programs in the form of fact sheets, an increasing number of which are available in

French. Both the OWD and OWP programs are also available in French.

More information about these programs and other environmental education programs offered by the Safe Drinking Water Foundation can be found by visiting its website, [www.safewater.org](http://www.safewater.org), or contacting the Safe Drinking Water Foundation at 306-934-0389 or [info@safewater.org](mailto:info@safewater.org).

Nicole Biederbeck  
Safe Drinking Water Foundation

# Professional Development

## MEd Specializing in Elementary Mathematics and Science Education

A cohort of nine teachers from urban and rural Alberta began their MEd (Elementary Mathematics and Science Education) program in July 2008. The teachers completed two courses (Physical Science for Elementary Teachers; Number and Algebra in the Elementary Classroom) on campus during the first three weeks of July. The courses were designed to help the teachers develop science and mathematics subject matter knowledge. Participants reported that they valued meeting other teachers who shared their interest in mathematics and science and that they very much enjoyed working with hands-on materials and discussing how to implement course ideas in their classrooms. The teachers will enrol in two online courses for fall/winter 2008/09 and meet again on campus for three weeks during July 2009. They are scheduled to complete all 30 credits of their MEd program by December 2010.

With the success of this current cohort, the University of Alberta is considering offering another similar cohort commencing in July 2010 or 2011. To receive further information about these cohorts, contact Dr Brenda Gustafson ([brenda.gustafson@ualberta.ca](mailto:brenda.gustafson@ualberta.ca)) or Dr Lynn McGarvey ([lynn.mcgarvey@ualberta.ca](mailto:lynn.mcgarvey@ualberta.ca)).

## Space Buoys

Congratulations! You're an oceanographer and you've just received a big grant to investigate the Pacific Ocean. Your task: map the mighty Pacific's wind and waves, monitor its deep currents, and keep track of continent-sized temperature oscillations that shape weather around the world. Funds are available and you may start immediately.

Oh, there's just one problem: you've got to do this work using no more than *one* ocean buoy.

"That would be impossible," says Dr Guan Le of the Goddard Space Flight Center. "The Pacific's too big to understand by studying just one location."

Yet, for Le and her space scientist colleagues, this was exactly what they have been expected to accomplish in their own studies of Earth's magnetosphere. The magnetosphere is an "ocean" of magnetism and plasma surrounding our planet. Its shores are defined by the outer bounds of Earth's magnetic field and it contains a bewildering mix of matter-energy waves, electrical currents and plasma oscillations spread across a volume billions of times greater than the Pacific Ocean itself.

"For many years we've struggled to understand the magnetosphere using mostly single spacecraft," says Le. "To really make progress, we need many spacecraft spread through the magnetosphere, working together to understand the whole."

Enter Space Technology 5.

In March 2006, NASA launched a trio of experimental satellites to see what three buoys could accomplish. Because they weighed only 55 pounds each and measured not much larger than a birthday cake, the three ST5 [Space

Technology 5] microsattellites fit on board a single Pegasus rocket. Above Earth's atmosphere, the three were flung like Frisbees from the rocket's body into the magnetosphere by a revolutionary microsattellite launcher.

Space Technology 5 is a mission of NASA's New Millennium Program, which tests innovative technologies for use on future space missions. The 90-day flight of ST5 validated several devices crucial to space buoys: miniature magnetometers, high-efficiency solar arrays and some strange-looking but effective microantennas designed from principles of Darwinian evolution. Also, ST5 showed that three satellites could manoeuvre together as a constellation, spreading out to measure complex fields and currents.

"ST5 was able to measure the motion and thickness of current sheets in the magnetosphere," says Le, the mission's project scientist at Goddard. "This could not have been done with a single spacecraft, no matter how capable."

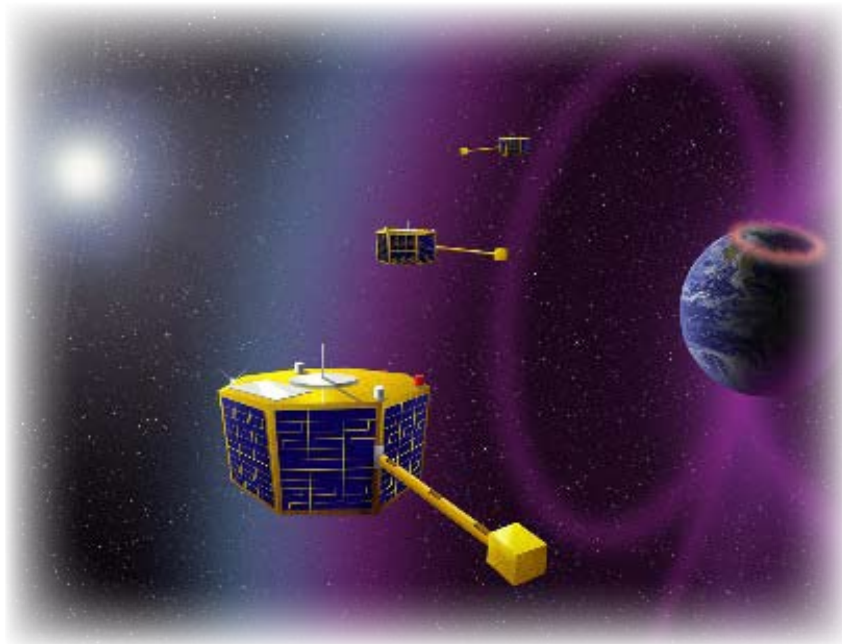
The ST5 mission is finished, but the technology it tested will be key to future studies of the magnetosphere. Thanks to ST5, hopes Le, lonely buoys will soon be a thing of the past.

Learn more about ST5's miniaturized technologies at [nmp.nasa.gov/st5](http://nmp.nasa.gov/st5). Kids (and grown-ups) can get a better understanding of the artificial evolutionary process used to design ST5's antennas at [spaceplace.nasa.gov/en/kids/st5/emoticon](http://spaceplace.nasa.gov/en/kids/st5/emoticon).

**Tony Phillips**

*Tony Phillips is production editor of Science@NASA, the science news website of the USA's National Aeronautics and Space Administration (<http://science.nasa.gov/>).*

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration. Minor changes have been made to spelling and punctuation in accordance with ATA style.*



*The Space Technology 5 microsattellites proved the feasibility of using a constellation of small spacecraft with miniature magnetometers to study Earth's magnetosphere.*

# Women in Science

## Promoting the Positive

*Reprinted with permission from the Alberta Women's Science Network. Minor changes have been made to spelling and punctuation in accordance with ATA style.*

We need to pass on a better understanding of who we are and what we do. Programs like Operation Minerva give girls a sense that we're not all Dilbert.

—Josephine Hill

**W**ith national statistics showing a decline in students enrolling in engineering, and with the number of women in the field slowly dwindling, it's up to engineers to cast a positive light on their profession, says Dr Josephine Hill.

Hill, an associate professor in the Department of Chemical and Petroleum Engineering at the University of Calgary and recipient of the Alberta Women's Science Network's 2008 Minerva Mentoring Award, says engineers can help spread the word by emphasizing the many ways engineering affects society.

"We need to talk more about engineering because people don't realize what it is that we do," she says. "Unfortunately, there are no TV dramas that feature engineers in the way they do doctors or lawyers or police forensics. So it's up to us to get engineering out there."

The Zandmer/Canada Research Chair in Hydrogen and Catalysis, Hill is involved in researching catalysts with applications to fuel cells and heavy oil upgrading, including ways to cleanly convert heavy oil resources into hydrogen and other useful products. Although chemical engineering is Hill's discipline, she is keen on promoting "the big picture" so that people realize how their lives are touched by engineering.

She cites the commercials by the chemical company BASF, which touts its products as the ingredients that contribute to the finished products consumers use daily. "You've heard their ads that say 'We don't make the cell phone, we make the cell phone better'? Well, I think that's a lot like engineering. It's an enigma, and people don't understand all that goes on with it."

This past year, Hill had an opportunity to share her message with a young but nonetheless appreciative audience. "I went to my son's Grade 4/5 class and did some science experiments with them—making a balloon blow up with Alka Seltzer, creating slime and bouncy balls to give them an idea of how much fun science can be," she says. "But I also wanted to paint a general picture of what engineering is about. So I asked, 'Where did your breakfast cereal come from? Ever wonder who made it? Who made your toothbrush? Who made the car you came to school in? Who made the roads you drive on to get to school?' It all comes back to engineering."



As a past chair of the University of Calgary's Gender and Diversity in Engineering Committee, Hill is also committed to ensuring a more diverse population in the field. "Women are every bit as technically competent in engineering as men. I know this fact from working with my colleagues and teaching students. I also know that although women and men may be equally competent, they are not the same," she says. "Women tend to be less good at marketing themselves and, for this reason, we need programs aimed at promoting women in the fields of science and engineering."

Hill has long been an ardent supporter of and participant in Operation Minerva, which takes Grade 8 girls under the wing of a female mentor who is established professionally in science, engineering or technology. "For women engineers especially, we need to pass on a better understanding of who we are and what we do. Programs like Operation Minerva give girls a sense that we're not all Dilbert," Hill says.

She is quick to add that students are not only eager to study what engineers do, but seem to find comfort in knowing that their mentors have

well-rounded lives outside of work as well. "One of my undergraduate students recently commented to me that it was nice to have a female professor that has a family," she says. "When I thought about it, a lot of the female professors I had didn't have a family. I think that as role models, it's important for us to show that we're about more than what we do at work. That it is possible to build an engineering career while maintaining a healthy work-life balance."

Hill was recently able to combine work commitments with family fun. She was planning to attend an engineering conference in Australia, when she and her husband decided the trip would be a great opportunity for a once-in-a-lifetime family vacation as well. "It's certainly one of the positive aspects of this job—how many people can say they get to go to Australia on a conference for work?" she says. "This is just a small example of the many ways we can get the word out about engineering, share our enthusiasm for what we do and make sure the impression we are giving people is a positive one."

**Barbara Chabai**

## Introducing Cybermentor

Cybermentor, an online mentoring program aimed at girls aged 11 through 18, is being launched in Alberta.

This is a formative stage in a young girl's development. Research shows that young women, in particular, start to lose interest in science and math starting in the junior high school years, and that positive interventions can play a critical role in maintaining interest so their future career options are not limited. This program matches girls with women who have chosen careers in science, math, engineering or technology. Together they explore careers and questions about life as a scientist or engineer. These matches officially last for a school year (September–May). In this safe online community, girls and their mentors engage in conversations once a week on a variety of topics.

The program is developed on the success of the beta program (SCiberMENTOR) launched in 2001, and uses technologies that young girls are familiar with and comfortable using. The program's success is in its curriculum and year-end mingle events where the participants get to meet other participants and, perhaps, even their mentor (depending on where they both live). Cybermentor has almost 400 student participants from around the province exchanging and sharing ideas and career advice with their mentors.

Applications are now being accepted. For more information on how your class can have a member of the Cybermentor team make a presentation to a group of your students, please contact Julia Millen, Cybermentor program director, at [administrator@cybermentor.ca](mailto:administrator@cybermentor.ca) or 403-220-8283. For more information about the program, visit [www.cybermentor.ca](http://www.cybermentor.ca).

**Julia Millen**



*A young protégée and her mentor share a love for ecology and seal a friendship that we hope will last a lifetime!*

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