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## Here, There, Everywhere

At *Mining Matters*, we have a simple but big goal. We want to inspire Canadians—students, teachers, and the public—to get excited about Earth science. We want to instill a fascination with geology, geography, and similar studies, and also to show how relevant the mining and mineral exploration industry is to our daily lives. To get the message across we provide current information about rocks, minerals, metals, and mining, and offer exceptional educational resources that meet provincial Earth science and geography curriculum expectations.

We take our message in different ways to a multitude of venues. We conduct workshops with schools, mount intensive multi-day Earth science camps, and also connect with teachers, students, and members of the public at special events across the country.

### Teacher Workshops

When we reach out to teachers, demonstrating and distributing our educational resources, we get a major ripple effect. Not only do those teachers directly influence their students, but they also spread the word about the new resources they've "discovered" or volunteer to teach other teachers how to deliver our material. We've connected with an unprecedented number of teachers this last year. Through the delivery of 38 teacher professional development workshops and in-class workshops for students, we reached 657 teachers and an estimated 7,459 students. Here are a few examples of what we've done and where.

In Newfoundland and Labrador, working with the Department of Natural Resources, Geological Survey, we took valuable teaching resources and our passion for Earth science to eight rural communities. There, our interactive, hands-on workshops allowed students to fully participate in Earth science—experiencing the discovery learning process, working in teams, and trying lab work—while teachers observed model presentations.

In Québec, we found that teachers have very little in the way of Earth science student-centred learning resources. We hope to fill that gap. By meeting with teachers, science consultants, and education and industry stakeholders, we

learned that while our existing resources meet Québec curriculum Earth science objectives, they need to be supplemented with Québec-specific material. We hope to soon make that happen and to have a certified teacher in Québec with Earth science training oversee *Une mine de renseignements*, our Québec-oriented *Mining Matters* program. And, we plan to teach Québec teachers to deliver their own province-wide workshops.

Meanwhile, our two "Mining Makes It Happen" posters, *From Northern Lights to Urban Trails* and *Cutting Edge*, are now available in French: *De l'aurore boréale aux sentiers urbains* and *À la fine pointe*. And our annual newsletter, *groundWORK*, translated for the first time in 2010, will be available in French going forward. We also offer a French version of our learning resource for geographic information system (GIS) software.

We've been active in Manitoba for a few years, and now have teachers eager to pass on their enthusiasm for our resources to other teachers. Teacher-facilitator Garry Strick organized a workshop in the Prairie Spirit School Division, passing on his passion for good Earth science education. Participants rated the workshop and materials very highly for the scope of the presented content, the ease of its implementation in the classroom, and for the opportunities for active participation.

In Ontario universities, we conducted pre-service workshops for over 260 teachers, and for the Elementary Teachers' Federation of Ontario, we worked with 44 teachers in Brantford and Fergus. At the annual Prospectors and Developers Association of Canada Convention in Toronto and the Geological Association of Canada and Mineralogical Association of Canada (GAC-MAC) Convention in Ottawa, we treated 44 teachers to Earth science workshops, resources, and close-up introductions to the world of mining and mineral exploration.



## Aboriginal Outreach

This year, more First Nations youth than ever before in northern Ontario and Manitoba got the exciting opportunity to experience Earth science and learn about the minerals industry through *Mining Matters* Youth program. Our Aboriginal outreach program consists of professional development workshops for teachers and employment officers, in-class workshops for students, and community-based summer camps. This year, we provided programming for 162 teachers and employment officers with the potential to reach an estimated 1,937 youth. A total of 196 youth and adults participated in the 10 *Mining Matters* Youth Camps held during the summer of 2011.

## Public Outreach

May was a significant month for public outreach and Mining Week celebrations. In Winnipeg, Manitoba, we presented three *Mining Matters* outreach activities at a Mining Week event that attracted over 2,700 participants. In Sudbury, Ontario, at the Earth science centre Dynamic Earth, we helped facilitate MineOpportunity, a geology- and engineering-based game developed by Nicole Tardiff of Laurentian University and enjoyed by over 250 high school students. In Timmins, Ontario, we supplied educational resources and geology-related activities for the Timmins Mining Week Festivities, and in North Bay, Ontario, we provided learning resources for approximately 248 grades 3 to 6 students and 11 teachers that participated in a day of hands-on activities during North Bay Mining Week.

Also in May, we took part in two well-attended Earth science shows for the public: the Calgary Earth Science for Society show, where we delivered our popular activities to the over 2,000 students in attendance, and the M4S (Mining for Society) Montréal Show, where we hired over 50 staff to interact with the over 400 teachers and 6,000 students who attended.

So, if you've ever wondered what we do at *Mining Matters*, we hope that you now have some idea. We're a staff of four people, augmented by enthusiastic summer interns, volunteer university students, interested colleagues, and others who share our passion for Earth science. You'll read some of their stories in the following pages. Please dig in!

## New Home!

The *Mining Matters* office can now be found near the Ontario Science Centre (appropriately!) at Suite 904, 1200 Eglinton Avenue East, Toronto, ON M3C 1H9. Our phone number and e-mail address remain the same; however, we have a new Web site address: [www.MiningMatters.ca](http://www.MiningMatters.ca)

We now enjoy more office and storage space as well as closer proximity to the storage facility that houses our vast collection of materials for curriculum kits and more. Please come visit us if you are in the area.

# Teacher's Mining Tour at CEC

Contributed by Rob Millard, Notre Dame Catholic High School,  
Catholic District School Board of Eastern Ontario



Rob Millard

Professional development for teachers should be many things: applicable to the classroom; modifiable for various student and teacher needs; and engaging, delivered by motivated, knowledgeable people. These things drive teachers to use what they've learned. The 2<sup>nd</sup> annual Teacher's Mining Tour delivered them, and more.

I was one of nearly 30 teachers from all across Ontario, from all divisions, who participated in the fully sponsored tour August 15 – 19, based out of the fabulous facilities at the Canadian Ecology Centre (CEC) in Samuel de Champlain Provincial Park near Mattawa, Ontario. In professional development, I look for that one nugget to take back to the classroom. This tour delivered nugget after nugget—workshops, great activities, tours, guest speakers, networking opportunities, a canoe trip—more like a massive ore body of experiential education to incorporate into classroom teaching.

The tour covered aspects from all stages in the mining process, from prospecting through exploration, planning and evaluation, construction of mining facilities, extracting and processing ore, all the way to closure and reclamation. The organizers delivered the issues objectively, included multiple viewpoints, and used reputable sources. We talked with different types of geologists, a prospector, an environmentalist, an environmental scientist, company presidents, miners, mechanics, health and safety representatives, trainers, manufacturers, a software designer, educators, controllers, and supervisors.



For me, the personal highlights were the tours. Experiencing regional geology by driving, walking, or paddling to the rock or drill cores, while a geologist explained their significance, was like listening to a great story. Another highlight, one that made some on the tour nervous, was descending 1,480 m into the Xstrata Nickel Rim South mine. Being underground to a depth of five times the height of the CN Tower was as exciting as it was fascinating. A third highlight was walking through a scaled-down version of staking a claim with a prospector. It developed the idea that anyone with an interest can participate in some way in the mining process.

Like most teachers, I like to leave professional development with classroom-ready resources, or ones I can easily modify for my

Teacher Mining Tours are already organized for 2012, with two dates to choose from: August 6 – 10 and August 13 – 17.

Look for the application form at [http://canadianecology.ca/images/pdf/registration\\_form-mining\\_and\\_forestry\\_tour\\_2012.pdf](http://canadianecology.ca/images/pdf/registration_form-mining_and_forestry_tour_2012.pdf)

classroom. They help me to quickly implement some of my learning with confidence, allowing me time to develop ways to link other concepts and modify other resources. The Teacher's Mining Tour delivered. One gem, an EdGeo- and *Mining Matters*-sponsored workshop, featured *Mining Matters Deeper and Deeper* and *Discovering Diamonds* resources and gave every teacher a resource kit to use in their class. Another gem was a collection of books and career cards designed to help students identify education requirements and work expectations for careers in mining and related industries.

Every one of the fantastic meals, session breaks, and bus rides provided network opportunities with teachers and many presenters. Networking was even easier during a night at Windy Lake Provincial Park, where we hung out at the beach, in the dining pavilion, and around the campfire. The slow-paced canoe trip on the Mattawa River to explore the Talon Chutes encouraged networking and reflection on the tour, and also gave us time to develop games such as geological charades and pothole hide and seek.

In all, the Teacher's Mining Tour was an amazing experience—I will incorporate much of it into my teaching. Teachers, if you can, make it to next year's tour. What better professional development than a week with like-minded individuals, learning from motivated and knowledgeable experts in the industry? And to all of the sponsors, presenters, and organizers, thank you so very much for the experience. Please do whatever it takes to keep the tour running; it is well worth it.

## Field Trip Subsidies

*Mining Matters* offers a Field Trip Subsidy Program to enrich Earth-science learning. Teachers who have completed an in-service workshop and use a *Mining Matters* resource kit in the classroom may apply for the subsidy. We currently have a \$1,500 budget for applications, providing for three subsidies of \$500 each to help offset the cost of transportation and entrance fees to stone, sand and gravel, mining, and geoscience venues. Applications will be considered on a first-come, first-served basis. Teachers and students are asked to submit a summary of their experiences.

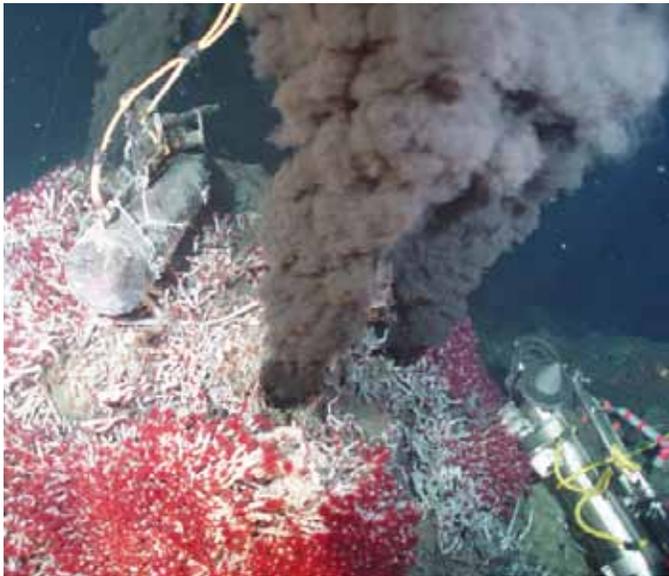
For further information, please call Janice Williams at 416-863-6463, ext. 322, or e-mail [jwilliams@pdac.ca](mailto:jwilliams@pdac.ca)

For field trip suggestions and to download an application form, go to <http://pdac.ca/miningmatters/pdf/field-trip-subsidy-application-form.pdf>

# Deep Sea Mining: A New Frontier

To learn more about hydrothermal vents, visit [www.divediscover.who.edu/index.html](http://www.divediscover.who.edu/index.html)

Through the centuries, explorers have trekked across continents and sailed the seven seas to find treasures such as gold, silver, and copper. With growing global populations and economies, particularly in Asian countries, the search has intensified and now goes to new depths, watery ones.



Black smokers. Photo credit: R. Hekinian

Oceans and seas cover approximately 71 per cent of the Earth's surface, a hidden surface that could potentially yield rich mineral deposits. Some minerals have been accessed to some degree, since mining companies have been trying to collect manganese nodules, containing cobalt and nickel, from the ocean floor since the 1960s. More recently, interest has zeroed in on "black smokers," chimney-like hydrothermal vents that spew black material and particles containing high levels of sulfides, such as copper, zinc, lead, silver, and gold. These emissions settle on the sea floor around the vents, creating rich mineral deposits that mining companies are now trying to figure out how to harvest.

In *Buried Treasure: Deep Sea Mining* (May 2011, [mining-technology.com](http://mining-technology.com)), Sarah Blackman looks at how companies are overcoming the challenges and speaks to experts to find out what the future holds for deep sea mining.

To read the entire article, visit [www.mining-technology.com/features/feature118480/](http://www.mining-technology.com/features/feature118480/)

Blackman spoke with Dr. Steve Scott, a geologist at the University of Toronto, who was the first ore deposits geologist to see a black smoker in person, in 1982. "There was no marine mining industry when I first worked on black smokers," Scott says, but he predicted that the world would someday mine for these deposits. Now, companies are motivated and technology has come a long way.

Canadian mining company Nautilus Minerals is one company that has taken up the challenge, preparing to mine the Solwara deposits, discovered by Scott, in the Manus Basin off the coast of Papua New Guinea. Blackman quotes Nautilus Minerals vice president for investor relations Joe Dowling as he explains that we need to look to sea-floor resources to meet the rising demand for metals. "We aim to be a leader in this process, demonstrating that this is an area that can be carefully and responsibly developed for the benefit of local and broader communities around the world."

Careful and responsible mining of the sea floor presents new challenges, one of the biggest being protecting the unusual marine biological communities that populate the area around smokers. Unique creatures such as giant tubeworms, anemones, giant red-fleshed clams, jellyfish, and blind white crabs thrive on the chemicals in the smokers' plumes rather than on sunlight and photosynthesis.

Duke University marine biologist Cindy Lee Van Dover, one of the first researchers to explore hydrothermal vents, examines how deep sea mining might disrupt these life forms. She has gone on research trips with Nautilus Minerals and is advising the company on conservation issues.

In an interview with *Yale e360*, Van Dover states, "Nautilus Minerals has been very active in thinking about out-of-the-box ideas, and they do it by engaging the scientists as well. They come to the scientific community and say, 'Well, what do you guys think we should do? How do we do this well?' And I think that's the attitude that they approach this with, and it's a very interesting thing to challenge the scientists and say, 'Well, okay, you want us to take care of your environment, tell us how to do it.'"

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"When I heard in 2005 that people were serious about wanting to mine hydrothermal vents, I just laughed. . . ."

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Scott is confident that Nautilus Minerals will find a viable way to make deep sea mining work. And if they do, he believes that other mining companies won't be far behind. Van Dover admits that the biology community has been surprised by how fast mining companies have ramped up their deep sea mining plans and technology, saying, "When I heard in 2005 that people were serious about wanting to mine hydrothermal vents, I just laughed. . . . We just didn't think mining was going to happen for decades. It just didn't even occur to me that it was feasible."

Now, she says, "I think there's no doubt that mining is going to happen. What we want to make sure is that the stakeholders are all talking to one another. The conservation community is a stakeholder, science research is a stakeholder, and mining is a stakeholder." She and other marine scientists are encouraging the International Seabed Authority to develop environmental management and conservation policies that will govern deep sea mining licences in the future.

# PDAC Convention

Get your students excited about Earth science by giving them the chance to get up-close and personal!

For the last four years, *Mining Matters* has introduced educators and students to the annual PDAC International Convention, Trade Show and Investors Exchange held in March in Toronto, Ontario. Our three days of programming—one for teachers and two for students—feature guest speakers, workshops, and visits to the Trade Show Floor.

For more information, contact *Mining Matters* Educator Janice Williams at 416-863-6463, ext. 322. To obtain a registration form, visit [www.MiningMatters.ca](http://www.MiningMatters.ca)

## Zinc for Life

When we think of precious metals, we tend to think of gold, platinum, or silver; zinc doesn't spring to mind. But perhaps it should.



Zinc Ore: Sphalerite

Zinc is widely recognized for its value to industrial and product applications—such as galvanizing steel to protect it from corrosion, producing alloys for the die casting industry, and producing brass and bronze—but less known for the essential role it plays in human, animal, and crop health.

Zinc is found in the Earth's crust as well as in our environment; it occurs in rock and soil, air, water, and the biosphere. Inadequate amounts of zinc in the soil can result in poor crop yields and quality. And, a diet deficient in zinc can be life threatening. In fact, nearly half a million children die annually from disorders related to zinc deficiency. An important micronutrient, zinc strengthens the immune system, enabling resistance to diarrhea-related diseases, which cause more infants to die than malaria, HIV/AIDS, and measles combined.

It was U.S. researcher Dr. Robert Black, chair of the Department of International Health at Johns Hopkins Bloomberg School of Public

Health, who discovered that zinc supplements could not only treat diarrhea, but prevent recurrence. His work has been credited with helping reduce childhood diarrhea deaths in developing countries to about one million in 2010 from 4.5 million as recently as 1990. In October, 2011, Dr. Black received the Canada Gairdner Award, one of the world's most prestigious medical honours, for his achievements.

Teck Resources, Canada's largest diversified mining, mineral processing, and metallurgical company, recently committed to raising awareness about zinc deficiency in children. Don Lindsay, President and CEO, says, "Not long ago, we learned from the World Health Organization that as many as 450,000 children under the age of five die each year as a result of zinc deficiency. When we learned this, we knew we had to help. As one of the world's largest producers of zinc we recognize we have the ability to make a difference. Teck is working to raise awareness about zinc deficiency with the goal of helping to save children's lives. I encourage you to learn more about Zinc Saves Kids and how you can get involved."

To find out about this important initiative, about how to get involved, or about zinc as an important micronutrient, go to [www.zincsavestives.com](http://www.zincsavestives.com)

You can also learn about the International Zinc Association (IZA) initiative in support of UNICEF at [www.zincsavestives.com](http://www.zincsavestives.com)

And, to learn more about zinc and its many uses, go to [www.zinc.org](http://www.zinc.org)

## Gem and Mineral Shows across Canada

**BC Gem Show:** April 13 – 15, 2012  
Ag-Rec. Building, Central Fraser Valley Fairgrounds,  
32470 Haida Dr., Abbotsford, BC  
[www.lapidary.bc.ca/gemshow.html](http://www.lapidary.bc.ca/gemshow.html)

**Toronto Jewellery, Gem, and Mineral Show:** April 27 – 29, 2012  
Don Mills Civitan Arena, 1030 Don Mills Rd., Toronto, ON  
[www.torontogemshow.com/civitan/index.html](http://www.torontogemshow.com/civitan/index.html)

**Calgary Rock and Lapidary Club 52nd Annual Gem, Mineral, and Fossil Show:** May 5 – 6, 2012  
West Hillhurst Arena, 1940 – 6 Ave. NW, Calgary, AB  
[www.crlc.ca/crlcshow.htm](http://www.crlc.ca/crlcshow.htm)

**Sudbury 30th Annual Gem and Mineral Show:** July 20 – 22, 2012  
Carmichael Arena, 1298 Bancroft Dr., Sudbury, ON  
[www.ccfms.ca/clubs/Sudbury/show.htm](http://www.ccfms.ca/clubs/Sudbury/show.htm)

**Nova Scotia Gem and Mineral Show and Sale:** August 17 – 19, 2012  
Lion's Recreation Centre, Western Ave., Parrsboro, NS  
<http://museum.gov.ns.ca/fgm/en/home/whattoseedo/gemmineralshow/default.aspx>

# The Great ShakeOut

On October 20, 2011, over 530,000 British Columbians practiced “Drop, Cover, and Hold On” in the largest earthquake drill in Canadian history. The Great ShakeOut began in Southern California in 2008 and has since spread to other states and other countries. Each drill is coordinated by regional organizations, which work together by sharing resources, best practices, and more. Here's what to do if you should be caught in an earthquake:

- **DROP** to the ground (before the earthquake drops you!)
- Take **COVER** by getting under a sturdy desk or table
- **HOLD ON** to it until the shaking stops
- **DO NOT** get in a doorway
- **DO NOT** run outside

Learn more at

[www.shakeoutbc.ca/downloads/Drop!Cover!HoldOn!.pdf](http://www.shakeoutbc.ca/downloads/Drop!Cover!HoldOn!.pdf)

And try playing *Beat the Quake*, an online challenge to make your house a safe place during an earthquake.

Go to [www.dropcoverholdon.org/beatthequake/game/](http://www.dropcoverholdon.org/beatthequake/game/)

Have you experienced an earthquake? You can help provide information about the extent of shaking and damage for earthquakes in Canada. The specific details you may provide will help determine how your area may respond to future earthquakes.

Report it here! <http://earthquakescanada.nrcan.gc.ca/dyfi>

# Earth Science Week

Earth Science Week (ESW) happened this year October 9 – 15, so is now long past, but it's worth noting that this annual international event is always scheduled for the second week of October. The American Geological Institute has organized it since 1998 to help people better understand and appreciate the Earth sciences and to encourage responsible stewardship of the planet. “Our Ever-Changing Earth,” the theme of ESW 2011, engaged young people and the public in learning about the natural processes that shape our planet over time.

Visit the Earth Science Week Web site, [www.earthsciweek.org](http://www.earthsciweek.org), to learn more about how to become involved, events and opportunities, the monthly Earth Science Week newsletter, highlights of past Earth Science Weeks, and how to order an Earth Science Week Toolkit. The 2011 Toolkit is still available (\$6.95) as well as some 2010, 2009, and 2008 kits (\$5.00). Each year features a different theme. Teachers in Canada can obtain the toolkit, but shipping charges of approximately \$19.75 apply.

[www.earthsciweek.org/materials/index.html](http://www.earthsciweek.org/materials/index.html)

At [www.earthsciweek.org/ncli/act.html](http://www.earthsciweek.org/ncli/act.html), you'll also find suggested Earth science activities for various grade levels, from K to 12. We're pleased to feature two of these activities in this newsletter.

# Technology in Action

It's like something out of Star Trek. A cross between a phaser and a tricorder, the amazing little black box that could tell our intrepid explorers exactly what was around the next corner as well as its entire chemical composition.

But this is real. It's a Thermo Scientific X-ray fluorescence (XRF) analyzer. Shaped like a ray-gun out of science fiction, it's an effective hand-held tool for geologists to determine the composition of a rock sample, a metal, an alloy, or drill core. The analyzer fires X-ray energy at the selected sample and reads the resulting fluorescent X-rays that are produced by the various elements the sample contains, telling our explorer its chemical composition. The analyzer can be used for geochemical exploration, mine mapping, ore grade determination, concentrates and tailings analysis, and environmental analysis. It provides information that allows decisions to be made in the field, without the delays or expense of shipping samples to off-site laboratories.

Why are we telling you about this incredible tool? Because, in the minds of many who aren't in the industry, mining and mineral exploration still conjures up old-fashioned images of pick and shovel, panning for gold, or men coated in black dust. They don't imagine the industry of today, one that uses cutting-edge technology throughout the process, from mineral exploration to excavating to refining. The XRF analyzer is just one small example of that technology.

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Mining is a major Canadian industry, contributing significantly to our economy.

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It's an exciting field to get into and one that requires tech-savvy workers. The Web site write-up for BCIT's Mining & Mineral Exploration Technology course states, “As one of the largest users of high-technology equipment and applications, the mining industry requires practitioners who have the skills necessary to keep up with advances. Virtually all technical jobs within mining and mineral exploration, including geology, engineering, mineral processing, environmental assessment, and surveying, require post-secondary education.”

Mining is a major Canadian industry, contributing significantly to our economy. And we are a world leader in mineral exploration and mining; our expertise is exported around the world to help discover, develop, and operate mines. It's an industry that offers a world of opportunity.



# Geological Treasures

Whether you live on Canada's East Coast or are planning a trip there, you'll find excellent opportunities to explore geological treasures, among them Nova Scotia's Fundy Geological Museum, Cape Breton Miners' Museum, and Joggins Fossil Cliffs and Centre (featured in *groundWORK 2008*), as well as New Brunswick's Quartermain Centre and Stonehammer Geopark (featured in *groundWORK 2010/2011*).

## Fundy Geological Museum

The Fundy Geological Museum is the world centre for experiencing geological history interpreted from the unique features of Nova Scotia's Fundy region. Established in December 1993, the museum features an exhibition gallery, lab space, a multi-purpose room, and gift shop. It reveals ancient Nova Scotia, as it was 200 million years ago when dinosaurs roamed, and it showcases collections of local minerals as well as some of the oldest dinosaur bones in Canada.



You'll find the museum in Parrsboro, a beautiful region along the Bay of Fundy's northern shore that boasts of the world's highest tides, breathtaking vistas, and opportunities for active outdoor adventure.

The museum offers a variety of high-quality, educational, and fun school packages. Educational programs vary from one to four hours in length and can be geared specifically for particular age-groups and curricula. Students learn about rocks, minerals, fossils, and the Bay of Fundy, and can explore the shore with a guide who will identify their treasures.

For more information about this interesting site, go to <http://museum.gov.ns.ca/fgm/en/home/default.aspx>

## Cape Breton Miners' Museum

Coal mining began on Cape Breton over 250 years ago, when coal was extracted from exposed seams along cliffs. In 1720, the first coal mine was officially opened at Cow Bay, or Port Morien, as it is now known.

Now, in Glace Bay, Cape Breton, the Cape Breton Miners' Museum pays tribute to the region's rich history of coal mining. The exhibit area focuses on the geological development of Cape Breton's coal field. Learn about the various types of coal mining and mining techniques, see a vast display of equipment, and listen to the stories of miners, the companies they worked for, their unions, and their



families. Retired coal miners conduct underground tours of the Ocean Deeps Colliery, a coal mine located beneath the museum building, and next to the museum, the Miners' Village tells the story of life in a coal-mining town.

The museum is also home to a famous choir of working and retired coal miners from the island of Cape Breton—Men of the Deeps. During the summer, they perform their distinctive music in the Men of the Deeps Theatre.

To learn more about this interesting destination, go to [www.minersmuseum.com/index.htm](http://www.minersmuseum.com/index.htm)

## The Quartermain Centre

Opened in October 2011, the Quartermain Centre is the showcase for Earth sciences teaching, research, and outreach at the University of New Brunswick in Fredericton, N.B. The Centre highlights the beauty and excitement of geology and is accessible for viewing by the general public as well as school and other groups.

To book a class or group tour, contact the Centre's curator Dr. Adrian Park at [apark@unb.ca](mailto:apark@unb.ca) or 506-458-7205.

You can take a video tour of the Centre at [www.youtube.com/user/MassiveGraphics?blend=14&ob=5#p/u/6/hAhasysDdgE](http://www.youtube.com/user/MassiveGraphics?blend=14&ob=5#p/u/6/hAhasysDdgE)

# Geoscience at the Edge



In May 2012, at the Joint GAC-MAC meeting in St. John's, Newfoundland and Labrador, *Mining Matters* will partner with EdGEO to deliver interactive, hands-on workshop(s) to junior, intermediate,

and senior teachers, showing how to effectively deliver Earth science concepts and topics. Participating teachers will receive teaching resources with the tools required to continue to deliver their Earth science curriculum with confidence, year after year.

EdGEO, a Canadian Earth Science Teacher Workshop Program coordinated by the Canadian Geoscience Education Network (CGEN) of the Canadian Federation of Earth Sciences (CFES), started in the early 1970s and supports local workshops on Earth science for Canadian teachers. EdGEO workshops provide teachers with enhanced knowledge, classroom resources, and increased confidence.

EdGEO's statement of purpose is to provide educational opportunities for today's teachers and, through them, their students, to cultivate a heightened awareness and appreciation of our planet. The expected result is an improved capacity to understand the Earth and to make wise decisions, especially with regard to the use of its mineral and energy resources, the maintenance and remediation of the environment, and response to geological hazards.

Learning activities will be developed in collaboration with EdGEO, CGEN, *Mining Matters*, the Department of Education, and experienced geoscientists and educators from across Canada.

To learn more, go to <http://stjohns2012.ca/public-outreach/outreach-and-education/>

## WHERE Challenge Winners

In 2010, we replaced our Ontario-based Junior Miner Competition with the WHERE Challenge, a national contest that promotes awareness of non-renewable Earth resources. It asks young Canadians aged 9 to 14 "What on Earth is in your stuff?" and "Where on Earth does it come from?"



Endorsed by the Canadian Federation of Earth Sciences, and assisted by wonderful volunteers, we ran the Challenge from October 1, 2010 to March 1, 2011, offering up to \$16,500 in regional and national prizes. The 2011 WHERE Challenge received 58 individual entries and 71 group entries, engaging nearly 1,600 students from coast to coast. Our judges awarded 6 national, 15 regional, and 3 school prizes.

"I was so impressed with the creativity and energy that the students brought to the projects,"

said Challenge judge Jane Wynne, a geologist with Natural Resources Canada (NRCan). We congratulate all our participants for their efforts and creativity. National winners are listed to the right; however, all national and regional winning entries can be seen on the contest Web site at [www.earthsciencescanada.com/where](http://www.earthsciencescanada.com/where)

"I believe my students' ideas about the world we live in changed as a result of participating in this contest," said Suzanne Wernli-Roy, a B.C. elementary school teacher whose grade 5/6/7 class won close to \$1,000 by making a video following a visit to an aluminum smelter in Kitimat. "Even if we hadn't won a prize, we still would have won. We came out of the adventure with a better understanding of the world, the marvels of industry, and the challenges up ahead."

We thank the Canadian Society of Petroleum Geologists (CSPG) and the Prospectors and Developers Association of Canada (PDAC) for their generous contest sponsorship in 2011.

### National Winners: 12 – 14 years

**Best Overall:** Has Anyone Seen My Bicycle? (\$1,000)  
Alana Krug-MacLeod, Saskatoon, Saskatchewan

**Best Creative:** (Two-way tie): Spin and Align: The Ingredients of a Combination Lock (\$750)  
Grace Wijaya, Calgary, Alberta

**Best Creative:** (Two-way tie): Iron Dylan (\$750)  
Terava Groff, Saskatoon, Saskatchewan

**Best Research:** The Stovetop Kettle (\$750)  
Harrison Pope, Oakville, Ontario

### National Winners: 9 – 11 years

**Best Overall:** Not from a Gum Tree (\$1,000)  
Julie Krug-MacLeod, Saskatoon, Saskatchewan

**Best Creative:** Aluminum Crane (\$750)  
Mme. S. Wernli-Roy's Grade 5/6/7 Class, Hazelton, B. C.

**Best Research:** Pennies: Copper in Your Pocket (\$750)  
Carson Asmundson, Yellowknife, Northwest Territories

Teachers whose classrooms have participated in past WHERE Challenges say the contest offers students, teachers, and even parents something unique—an engaging project that's as entertaining as it is educational.

Challenge 2012 launched on September 6, 2011, and runs until March 1, 2012. Winners will be announced on May 8, 2012. Entries are welcome in French and English. To learn more about the WHERE Challenge, go to [www.earthsciencescanada.com/where](http://www.earthsciencescanada.com/where)

## Resources

### Web Sites

#### The Dirt on Soil

Do you know more about the planets in our universe than about the Earth under your feet? Discovery Education provides an interactive medium for teachers to engage and excite students about the underground world and its occupants.

<http://school.discoveryeducation.com/schooladventures/soil/index.html>

#### Schoolyard Geology

Turn your schoolyard or nearby playground into a rich geologic experience! Three lessons help students realize that geology affects the world around them.

- Mapping Your Schoolyard
- Rock Stories: Describing Sedimentary Rocks
- GeoSleuth Schoolyard

Lessons are independent or can work together as a thematic unit. Documents are available online, downloadable as PDF files, and suitable for printing.

<http://education.usgs.gov/schoolyard/index.html>

### Teachable Moments: Seismic Phenomena of 2011

Incorporated Research Institutions for Seismology Consortium (IRIS) has developed a set of teachable moment resources on seismic phenomena. [www.iris.edu/hq/retm](http://www.iris.edu/hq/retm)

### Stone, Sand and Gravel: The Hole Story

Learn about stone, sand and gravel (also known as aggregate); who uses it; and how much we use each year. See how it figures into our lives—whether in the city, the suburbs, or rural areas. Discover how quarries in Ontario have been rehabilitated for a wide range of end uses: wildlife habitats, wetlands, recreational parks, forestry, or agricultural lands. [www.theholestory.ca](http://www.theholestory.ca)

## Publications

### The Polar Bear in the Rock: Two Windows on the World

This bilingual book, in English and Labrador Inuttut, created by the Labrador Institute and Derek Wilton, P. Geo., tells the Inuit legend of the polar bear shape seen in the rocks above Nain, Labrador.

[www.gac.ca/publications/view\\_pub.php?id=206](http://www.gac.ca/publications/view_pub.php?id=206)

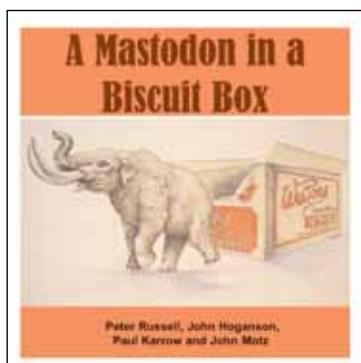
### Fine Wine and Terroir: The Geoscience Perspective

Explore the geoscience aspects of the physical environment of *terroir*, a French word representing the integration of climate, soil, geology, and other factors shaping the character and quality of wine. This collection of articles, mainly from the quarterly journal *Geoscience Canada*, covers a wide range of topics in more than a dozen viticultural regions on three continents.

[www.gac.ca/publications/view\\_pub.php?id=144](http://www.gac.ca/publications/view_pub.php?id=144)

### A Mastodon in a Biscuit Box

Shirley Fenton found a box of unusual objects in her family's attic. Peter Russell, curator of the Earth Sciences Museum at the University of Waterloo, identified them as mastodon teeth and a lower tusk. Read the Highgate Mastodon story in this new book by Peter Russell, John Hoganson, Paul Karrow, and John Motz.



[www.gac.ca/publications/view\\_pub.php?id=214](http://www.gac.ca/publications/view_pub.php?id=214)

## Earth Magazine

Free online archive going back to 2008. The June 2011 edition features the Stonehammer Geopark in New Brunswick.

[www.earthmagazine.org/earth/article/455-7db-6-6](http://www.earthmagazine.org/earth/article/455-7db-6-6)

## Videos

### Secrets in Stone

This 35-minute video presents the role of paleomagnetism in the evolution of plate tectonic theory.

<http://online.wr.usgs.gov/calendar/2004/jul04.html>

### Living Rock: the Earth's continental crust

Take your students on a one-hour global tour of geologic processes, narrated by USGS scientists.

[http://media.wr.usgs.gov/movies/index.html?id=living\\_rock](http://media.wr.usgs.gov/movies/index.html?id=living_rock)

## Career Info

We're always on the lookout for information that encourages studies in Earth sciences. Check out the following Web sites.

### Dragonfly TV

Introduce students to career choices; see over 60 career profiles, of which approximately half are examples of females in science-related fields of study. [www.pbskids.org/dragonflytv/scientists/index.html](http://www.pbskids.org/dragonflytv/scientists/index.html)

### Mining Industry Human Resources Council

Look at the Mining Industry Human Resources Council (MiHR) Web site to learn about Canada's mining industry and the kind of employment opportunities it offers. [www.mihr.ca](http://www.mihr.ca)

### Career Crate

See eight new videos about careers in the Earth sciences, brought to you by the Canadian Geoscience Education Network and funded by the Geological Survey of Canada.

[www.careercrate.com/group/cgen/videos/24](http://www.careercrate.com/group/cgen/videos/24)

### STEM Careers

Want to know more about careers in science, technology, engineering, or math? Browse through detailed information on over 100 careers to discover what scientists really do!

[www.sciencebuddies.org/science-fair-projects/science\\_careers.shtml](http://www.sciencebuddies.org/science-fair-projects/science_careers.shtml)

### Explore for More

Look at career information products developed by the Mining Industry Human Resource (MiHR) Council that showcase careers in the mining industry. Students can search for Canadian training and educational programs and find links to employer Web sites and job banks.

Testimonials and profiles of people in a variety of mining-related jobs serve to put a human face on this industry. [www.acareerinmining.ca](http://www.acareerinmining.ca)

# Activity:

## Make Your Own Compass

Adapted with permission from the National Oceanic and Atmospheric Administration from Discover Your World with NOAA: An Activity Book.

Grade Level: 6–8

In ancient times, sailors found their way by observing stars and other celestial bodies—when they were visible through the clouds, that is. Thus, one of the most important improvements to ocean navigation was the invention of the compass. There is some disagreement about who should get credit for this invention. It's pretty clear that the Chinese knew about magnetism as early as 2637 BC, but the first written description of a compass for navigation didn't appear in Europe until 1190. Why did it take so long? After you do this activity, you may have at least one good answer!

### Procedure

**First, some warnings:** Needles, scissors, and knives are sharp—be careful! Also, magnets can damage cards with a magnetic stripe (credit cards, library cards, school IDs, etc.) and some electronic devices. Keep magnets away from these things.

1. Rub a magnet over the needle a few times, always in the same direction. This action magnetizes the needle.
2. Cut off a small circle from one end of the cork, just over .5 cm thick. Lay the circle on a flat surface.
3. Using a pair of pliers, carefully poke the needle into one edge of the cork circle and force the needle through so that the end comes out the other side. Push the needle far enough through the cork so that about the same amount of needle sticks out each side. Be careful not to stick yourself!
4. Fill the cup about half full with water and put the cork and needle assembly on the surface of the water.
5. Place your “compass” on a flat surface and watch what happens. The needle should point towards the nearest magnetic pole—north or south, depending upon where you live.
6. Try placing a magnet near your compass and watch what happens. How close does the magnet have to be to cause any effects? Try this again with a nail or other steel object. You can see why it's important to keep metal objects away from compasses on ships!
7. Imagine you are on the deck of a ship tossing back and forth on the open ocean. How well do you think your compass would work? When the cork floats on the water, it creates a sort of low-friction bearing. This kind of bearing is essential to allow the needle to rotate in response to Earth's magnetic field\*. But a cup of water probably wouldn't last long on the deck of a rolling ship! The need for a sturdy low-friction bearing was one of the reasons that it took a long time for mariners to use compasses at sea, even though the basic principles had been known for centuries.

\*Magnetic fields are areas that contain a force created by moving electrical charges. Earth produces a magnetic field. This field is very weak, but it is sufficient to align magnetized objects—such as your needle—that are free to rotate. By floating the needle on the cork, you allow it to rotate freely so the needle aligns with Earth's magnetic field, and points toward the North or South Pole of the planet.

### Materials

- Sewing needle two to four centimetres long
- Small bar magnet or refrigerator magnet
- Small piece of cork (corks from wine bottles work well, but not the plastic stoppers)
- Small glass or cup of water to float the cork and needle
- Pair of pliers
- Pair of scissors or knife (to cut cork)



## New “Mining Makes It Happen” Poster

With climate change becoming a major concern in our lives, we've called on science to develop alternative energy sources that can help us reduce or even eliminate our gas and oil guzzling habits. A number of alternatives are out there, from wind turbines to nuclear plants, some more Earth-friendly than others, but all of them efforts to produce cleaner energy.

In a new *Mining Matters* “Mining Makes It Happen” poster, we'll show how metals and minerals are key components in alternative energy technology. As well, we'll show what the mining and mineral exploration industry is doing to keep their operations as Earth-friendly as possible. Look for the new poster in spring 2012.

# Activity:

## Find Your Bearing: Mapping

Grade Level: 7–12



Geologists, cartographers (map makers), and surveyors use compasses to make maps and determine where they are. Hikers use compasses to find their bearing in the wilderness in hopes that they won't get lost. Sailors used to use compasses to find their way across the ocean and explore new territories.

Many people now use a Global Positioning System (GPS), but it is important to know how to use a compass because there are still many applications of compasses, and not everyone can afford a GPS. Mapping is also a very important tool for Earth scientists. Maps can show everything from roads and buildings to the rock layers beneath the surface of the Earth. In this exercise, students will make a map of the school's campus.

### For the Teacher

Prior to conducting the activity, the teacher should create a handout of predetermined bearings and paces between bearings. Give a copy of the handout to each student, along with a pencil and a plain sheet of 8.5" x 11" white paper. Show students how to use a compass to get bearings. A bearing is simply a direction in degrees on a compass. For example, 0 degrees is due north, 180 degrees is due south, 90 degrees is due east, and 270 degrees is due west. Any bearing between 0 and 90 degrees is a north-easterly direction, and so on. Ask for volunteers to use the compasses.

### Procedure

1. Use your compass to determine the direction you must walk the number of paces specified on the handout. For example, if the first bearing from a designated starting point is 75 degrees and 25 paces, hold the compass at eye level and turn in place until the north arrow is pointing to 75 degrees. Then walk in a straight line for 25 paces along that bearing. Continue to the next step.
2. After you complete the exercise and reach your final destination, draw a map of the school campus. Create the map in such detail that a new student would be able to easily find his or her way around. Items to include are buildings, trees, tables, blacktops, playing fields, and surrounding roads. Also, important map components are scale, legend, a north arrow, and the title of the map.
3. Use your compass skills to make your map more accurate in scale and more realistic. For example, you can turn paces into actual measurements. Maybe your pace is about 0.3 metres. If you walk 102 paces along a wall of the school holding your compass at a bearing of 90 degrees, you could determine that  $102 \text{ paces} \times 0.3 \text{ metres} = 30.6 \text{ metres}$ . Therefore, your map must include a line representing a wall that is 30.6 metres long, running from east to west (because the bearing is 90 degrees).

## Your Ideas Matter

Do you have something to share—a novel manner in which you used a *Mining Matters* resource, an exciting activity you developed, or a suggestion for our newsletter? Please tell us—we really want to hear from you! Use our contact information on the back page to mail or fax us your contributions, or e-mail *Mining Matters* Educator Janice Williams at [jwilliams@pdac.ca](mailto:jwilliams@pdac.ca)

### Materials

- Compass or several compasses (Nothing too fancy, just a simple plastic compass will do. However, it's best to have a compass with azimuth readings instead of quadrants. An azimuth compass goes from 0 to 360 degrees. A quadrant compass has four quadrants of 0–90 degrees each.)
- A handout with predetermined bearings, a starting point, and paces between four and six bearings for each student (for samples, go to [www.earthsciweek.org/ncli/edact/BearingSamples.pdf](http://www.earthsciweek.org/ncli/edact/BearingSamples.pdf))
- A site marker or prize for the end of the exercise
- Sheets of standard 8.5" x 11" white paper for each student
- Pencils



# An Unforgettable Experience

Contributed by Mark Walden, *Mining Matters* Aboriginal Youth Outreach Program Assistant



I am a third-year Geological Engineering student going into my final year at Queen's University in Kingston. This summer I worked as the program assistant for the *Mining Matters* Aboriginal Youth Outreach Program, which teaches about mining, geology, and Earth science using fun, interactive, and hands-on activities.

My summer started off with a month in Toronto with Barbara Green Parker organizing the week-long camp program that we would deliver over the next two months in Aboriginal communities in northern Manitoba and Ontario. The communities we visited were usually near active mining or exploration sites, which was why we were invited to put on the program. Being close to those sites provided us with the opportunity to take students on tours of the facilities and also gave me the chance to network with and learn from many of the company employees. I now have a better idea of the kind of work I would like to do upon graduation, as well as the companies that I would like to apply to.

The Aboriginal Youth Outreach Program is really something to marvel at. Besides offering two months of ongoing camps, travel, logistics, and work, the program caters to a wide range of age groups: anywhere from 7 to 14 years of age in Geraldton to adults up to about 70 years old in Fort Frances. However, I found the material easily adaptable for any age group and extremely informative and fun for both adults and children. I have to say though, that the program could not be what it is without Barbara's enthusiasm, leadership, determination, and experience.

One of the highlights of my summer—and there were many—was my very first underground mine experience. A HudBay Minerals employee arranged an underground tour at Triple Seven Mine in Flin Flon, Manitoba. It was incredible to actually see and touch a high-grade VMS (Volcanogenic Massive Sulphide) deposit underground as it had naturally formed.

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The experience I gained over the summer was not something that I was expecting, and words don't really do it justice.

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*Mining Matters* has given me an unforgettable experience that has had a significant impact, not only on my life, but also, I believe, on the lives of the students we taught. Exposing them at a young age to geology—a field that many people don't consider at all—opens their eyes to possibilities and could even change their lives.

The experience I gained over the summer was not something that I was expecting, and words don't really do it justice. My education prepared me in part for the trip, as I knew a lot about Earth science, mining, and geology; however, I did not expect the amount that I would learn or the terrific people I would meet along the way. The two months of travel have been demanding, exciting, and experiential, but most of all, a tremendous addition to my education. *Mining Matters* certainly benefits a lot of people; I hope to see the organization continue to expand and flourish in the coming years.

## Contact Information

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*Mining Matters* creates exceptional educational resources to meet provincial Earth science curriculum expectations. Since 1994, this charitable organization has reached more than 450,000 teachers and students through resources and events that promote awareness of the importance of rocks, minerals, metals, mining, and Canada's geology. *Mining Matters* prides itself on building long-term partnerships with teachers by providing relevant, accurate, and authentic Earth science resources for the classroom, designed by teachers for teachers.

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