2015

groundWORK

And the Winner Is...

When it comes to learning, all students are winners when they are encouraged to let their natural curiosity guide them. When that learning fuels their enthusiasm for exploring further, all the better. Contests provide educators with ideal tools to fan the flame of that curiosity, to promote that enthusiasm for learning. They give students the chance to combine classroom learning with real world relevance, curiosity with practical research, and creative ideas with production technology, resulting in project entries that never cease to amaze.

For many educators, teaching Science, Technology, Engineering and Math (STEM) courses can pose a real challenge. Sticking to the textbook doesn't necessarily ignite curiosity and creativity, but designing unique approaches takes time, something in short supply for busy teachers. Original, relevant curriculum supports, easily accessible, can make all the difference.

Enter contests. Contests allow teachers and students to explore "flipped learning," where students access information and then share it with others while teachers steer the learning journey. Teachers guide rather than instruct as students make project choices, conduct research, design entries and explore presentation media. Contests motivate individual students, teams or whole classes to get creative, and while doing so, develop core competencies such as collaboration, digital literacy, critical thinking, problem-solving and effective communication. With a world of information and technology available to them, 21st century students learn how to explore ideas and expand their awareness of global issues, whether social, environmental, economic, science or health related.

Mining Matters invites educators to take advantage of online contests that promote STEM learning. We focus on online contests because they combine old-fashioned creativity with modern technology and expand students' world views.

To begin with, we highlight our very own **WHERE Challenge**, a national contest endorsed by the Canadian Earth sciences community that motivates students ages 9 to 14 to explore the fields in which geoscientists work: Water, Hazards, Energy, Resources and the Environment. Students discover and creatively tell us why non-renewable resources are so important in everyday life. The Challenge allows for cross-curricular collaboration and thematic teaching; art, English, social studies, technology, and science departments can all get involved. Up to $10,000 in regional and national prizes is available. earthsciencescanada.com/where

With its **So You Think You Know Mining Video Contest**, the Ontario Mining Association challenges Ontario high school students to create a short original video that profiles the benefits of mining to society. Over $40,000 in prizes wait to be awarded. oma.on.ca/en/contestpages

The **"Mining Rocks" Video Contest**, sponsored by the Mining Association of Nova Scotia, invites the province's junior high school and high school students to make a short video or 30-second commercial about any aspect of mining or quarrying. Participants could win $1,500 and $500 for their school. notyourgrandfathersmining.ca

Saskatchewan students can enter the **Digging Deeper Challenge**, put on by the Saskatchewan Mining Association. Participants create a short video that explains what mining will look like in Saskatchewan over the next 50 years, thinking about what resources are currently being mined, what drives the demand for new resources and how new technology will affect the way we mine. Prizes total $2,250. saskmininged.com/winners.html

The **Canadian Geographic Challenge** offers two contest levels to Canadian students: Level 1 for grades 4 to 6 and Level 2 for grades 7 to 10. Younger grades focus on fundamental geographic facts and skills, while older students expand their geographic knowledge and apply geographic thinking skills. Competitions begin in the classroom and progress to naming a School Champion. Level 2 Champions go on to compete at the provincial/territorial level, and possibly at the Nationals. Prizes include certificates, medals and Canadian Geographic subscriptions; the top three National champions receive cash scholarships. canadiangeographic.ca/challenge

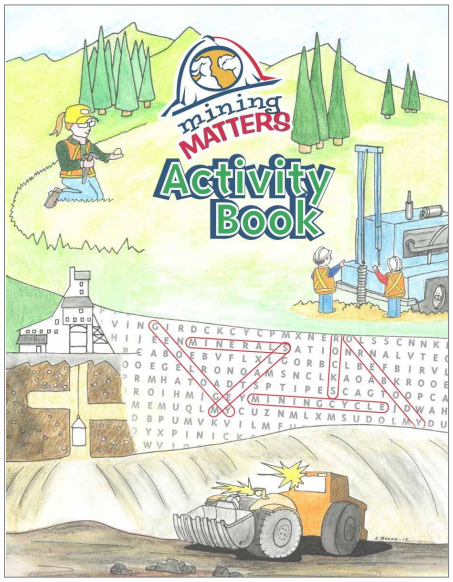
The **Canada Wide Virtual Science Fair** is an online science and technology contest open to all Canadian (and other) students in grades K to 12. Students are asked to do a science project and then build a website to display their work. The contest goal is to provide direction and motivation for students and teachers to make the very best use of computer/Internet technology while developing positive attitudes towards science and technology. Cash prize amounts are determined by the sponsors each year; in 2013 they amounted to $15,000. virtualsciencefair.com

Science fairs and contests have been around a long time, and the ever-popular vinegar and baking soda volcano might always be a fun way to spark interest, but 21st century educators can do so much more. With a plethora of resources available to them, including easily accessible contests, they can make STEM studies engaging, exciting and relevant, and encourage students to become 21st century learners: creative, independent and entrepreneurial thinkers, the innovators of our tomorrow.

New Mining Matters Publications

Mining Matters Activity Book

Mining Matters newest publication, designed for youth ages 9 to 13 years, is now available. Packed with puzzles, the *Mining Matters Activity Book,* available in English and French, includes codes to crack, things to spot, word searches, crosswords, Sudoku and more! These activities encourage kids to learn about rocks, minerals, metals, mining and careers in the minerals industry. This activity book has been generously sponsored by Kinross Gold Corporation. For copies, email info@miningmatters.ca or download a copy from our website.



Rocks and Fossils of Ontario

Mining Matters has collaborated with the Ontario Ministry of Northern Development and Mines to create non-technical, user-friendly resources to generate excitement and curiosity about the land beneath our feet from an Ontario perspective. *Rocks of Ontario* and *Fossils of Ontario*, designed for readers ages 6 to 86 years, feature vivid images and bright colours, consistent with geological map standards.

Rocks of Ontario features rocks commonly found in Ontario and illustrates the processes that shaped them. Each rock has an image, is colour coded to its type (igneous, sedimentary or metamorphic) and has a short description to aid in its identification in the field. The formation processes are correlated to a geological time scale showing several major events that shaped the world, and in particular, Ontario. In addition to representing the processes and rocks, the guide identifies fossils and glacial features often seen in Ontario.

Fossils of Ontario, which includes input from the Royal Ontario Museum, depicts fossils commonly found in Ontario, paying specific attention to those found in the James Bay Lowlands. It captures the reader's interest through impactful images, fascinating facts and connections between extinct animals and their modern relatives.

Both resources, available in English and French, can be downloaded at tinyurl.com/roc-fos-ont.

Contents

groundWORK

Museums of Quebec

Mineralogy and Mining Museum of Thetford Mines

Mining surrounds the daily life of every inhabitant of Thetford Mines in Quebec. Part of the cultural heritage since 1876, when asbestos was discovered in the area, the mining industry has forged the citizens' way of living and shaped the community throughout the years, as evidenced by such things as tailings landscapes, mining professional school training, mineralogy clubs and more.

The Mineralogy and Mining Museum of Thetford Mines celebrates its community and shares its heritage, as well as precious mineralogy and mining knowledge, with all who visit. The museum had its beginnings in 1976, during centenary celebrations of the asbestos discovery, and moved into its dedicated new building in 1997. The education centre offers dynamic school programming and local mine field trips, adapted for students from preschool to secondary school. It displays a breathtaking mineral collection featuring local and regional mineral pieces. In addition to the new permanent exhibition, the museum offers temporary exhibits and a "Museum at School" workshop for all Earth science fans. From "The Miner's Outfit" to "Mineral Show," educators will find activities to satisfy their pedagogical needs.
museemineralogique.com

Redpath Museum

In the heart of Montreal's McGill University campus lies the Redpath Museum, an historical education centre belonging to the university's Faculty of Science. Built in 1882 by sugar baron Peter Redpath for McGill University to honour geologist and prominent Canadian educator John William Dawson, it is the oldest museum building in Canada. Researchers, university students and school groups work and study side by side in this extraordinary science learning facility.

John William Dawson originated much of the museum's natural history collections and displays. Along with a full-size dinosaur skeleton, ancient organisms and unique anthropology artifacts, visitors will discover an exceptional mineral collection, maintained and updated by an in-house senior geologist. Quebec's geological heritage and minerals form the backbone of the museum's mineralogy exhibition, but countless specimens from around the world will inspire many "Wow!" moments for both primary and high school students. "Minerals Rock!" identification kits and volcanic-themed activities can be borrowed from the museum for use in the classroom.
mcgill.ca/redpath

Sherbrooke Nature Science Museum

The Eastern Townships in Quebec boasts a treasure of a museum that won Quebec's Grands Prix du tourisme Lauréat Or prize in the "Tourist Attraction – under 50,000 visitors" category in 2004, only two years after it had officially been created. For over 120 years, until 2002, the Sherbrooke Nature Science Museum was a school-based museum. Having expanded into the renovated space of a former textile mill in downtown Sherbrooke, the museum now promotes collections from various natural heritages to spark the passion and interest in science amongst visitors. Canadian dinosaur and trilobite fossils are a few steps away from colourful rocks and minerals. A must see with your students!
naturesciences.qc.ca

René-Bureau Geology Museum of Laval University

In Quebec City, hidden on the fourth floor of the Geology Department of Laval University, René-Bureau Geology Museum features mineralogy and paleontology exhibitions. The museum holds some of the largest geological collections in Quebec, amazing visitors with its variety of common fossils, gigantic mineral samples and fluorescent specimens. From colours and crystal shapes to lustres, the museum's assortment astonishes even the most knowledgeable geologist. Each display offers viewers a complete learning experience with clear, concise theory and concrete examples. One visit will not be enough!
tinyurl.com/musee-de-geologie

Having a BLAST!

An important part of our work at *Mining Matters* Teacher Training and School Programs (TTSP) is producing teacher resource kits, which include Canadian rock and mineral samples. However, those samples don't simply appear on our desks, ready to be sent to teachers and students across Canada. TTSP staff members have to first collect them.

Last summer, we made several interesting trips to restock our supply shelves. One trip took us to Coe Hill to gather quartz and mica. Mr. John Wotton granted us access to his now-closed property and showcased his amazing collection, generously donating several samples for our education and outreach programs. Next, in Tweed, we visited Pamela Sangster and Peter LeBaron at the Ministry of Northern Development and Mines and gladly accepted gabbro and marble samples.

The team was privileged to enjoy three guided tours of facilities prior to sample collection. The first, at Hanson Brick's Burlington location, was an eye opener. Patrick Kelly, P.Eng. and Director Quality Systems at Hanson Brick, openly shared his knowledge of shale extraction and

Visiting the Clay & Glass Gallery

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. The subsidies, up to $500 each, are intended 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. *Mining Matters* appreciates the support of the Canadian Securities Exchange toward these subsidies.

To learn more, email schoolprograms@miningmatters.ca. To access an application form, go to tinyurl.com/field-trip-subsidies.

introduced us to the brick production process. Shale samples in the kits help students realize the significance of this rock in the construction of their own homes and schools.

The second tour, at the Carmeuse Lime & Stone Ingersoll quarry, was made memorable by Regional Environmental Manager Christopher Martin. Also, Dean Desbois, Production Supervisor at Carmeuse, shared his passion for his occupation, as well as his attention to safety practices throughout the quarry tour, which included witnessing a blast. That experience will allow our TTSP facilitators to share with teachers first-hand knowledge of the origin of some everyday products: from a quarry rock face to a sample-size rock ready for production. BOOM!

Lastly, our tour at Dufferin Aggregates' Acton Quarry, with Robert McDougall, was exceptional. The collection of dolostone samples turned into a quest for fossils, ensuring our teacher resource kits will continue to be equipped with high-quality specimens for student exploration. In addition, the site's rehabilitation efforts complement the adjacent landscape, providing yet another example of successful environmental initiatives that TTSP facilitators can share with educators.

Mining Matters programs benefit greatly from the generosity of the mining industry and from the time and knowledge shared by its members. Their assistance allows us to pass on real-world materials and experience to teachers and students.

Sudbury a place for another beginning... reclamation, environmental and technological innovations

Sudbury: A Place of Beginnings

When you live in a city like Toronto, you take for granted certain aspects of life. Food comes from grocery stores, roads are paved, and stainless steel is used for barbecues. You see the end products of agriculture, construction and manufacturing, often without thinking about their beginnings.

It is easy to tout the virtues of a "clean," technologically advanced society when we only look at the end, but what about the beginning? Enter Sudbury, a community that knows something about beginnings. Sudbury was first established as a temporary work camp for the building of the Canadian Pacific Railway westward expansion in 1883. Upon the discovery of rich mineral deposits in the area, workers stayed on in new careers: the beginnings of a more permanent and vibrant community.

Being at the beginning of the mineral extraction process, Sudbury has faced challenges. As a mining community, it has learned about the environmental consequences of mineral extraction through trial and error. However, science and engineering have improved practices and, again, made Sudbury a place for another beginning. Reclamation, environmental and technological innovations are begun in Sudbury annually, as the city continues to remake itself. What was once called a moonscape is now an ecosystem, and where miners once used picks and shovels, they now use robotically controlled hydraulic equipment. Just as our stainless steel begins its life as ore found in the Sudbury basin, the City of Greater Sudbury begins by teaching the world's mining industry about what it means to stay at the forefront of responsible mineral extraction.

Sudbury has tackled the challenge of teaching the nation about the new face of mining by initiating Modern Mining & Technology Sudbury (MMTS), previously Sudbury Mining Week. Even the name suggests the start of something new and exciting. *Mining Matters* has been on the ground talking to local Sudbury residents and industry during MMTS, involved in events such as the Career Fair, the Mine Opportunity Mining Games, and the professional development workshops for elementary teachers.

Speaking to residents of the Sudbury area, visiting the exhibits at Dynamic Earth, taking a walk along the Jane Goodall Reclamation Trail, these experiences all send a clear message; Sudbury is always at the beginning of something new. New jobs, new exhibits, new trees and new environmental projects all contribute to a greater beginning.

Minerals provide the beginnings for the manufacturing of a wide variety of products. You may have heard the saying "Start with the end in mind," but perhaps, the next time you pick up your fork, you might want to consider the "end with the beginning in mind."



Outreach: Bridging the Gap

Earth science outreach is an important component of the *Mining Matters* mandate. In conversations with our partner organizations, we agreed that, throughout Canada, those involved in Earth science outreach consider it a bridge between school curriculum and real life. Sarah Laxton, at the Yukon Geological Survey, said outreach is important because it can "connect Canadians with their geosciences heritage."

We also agreed that, when involving school groups and students, we begin with the curriculum, planning organized and purposeful activities. In many provinces and territories, Earth science appears in the curriculum only a few times, with multi-year gaps in-between. Outreach can help keep the spark alive by connecting with students and the public during those gaps. Says Lesley Hymers of the Ontario Mining Association, outreach becomes a way to "connect school and the real world and school and industry."

Most outreach involves hands-on components. Jeff Young, at the University of Manitoba, says, "Geology is a very visual science," and Susan Michaels, Outreach and Special Projects Coordinator at the Manitoba Geological Survey, adds, "We need more hand-on experiences for the kids." That is what outreach is all about: providing opportunities to learn more about Earth science through fun and engaging events that can support and enhance what is being taught in schools. These include hands-on activities at gem and mineral shows; geology tours with school groups; special mining events and conventions; community days and events; career days and presentations; and contests that engage learners, just to name a few.

Outreach also serves to correct outdated misconceptions. For example, it spreads the word about Canada's Green Mining Initiative, which has mining companies making significant efforts to mitigate environmental impact. Activities reveal that seemingly natural locations that people visit are actually reclaimed mine sites, like Fort Whyte in Winnipeg, Manitoba, a former clay pit, and Butchart Gardens, near Victoria, B.C., an old limestone quarry. People learn that many of the everyday products they rely on so heavily are a product of mining, so often surprised to discover that "if it can't be grown, it must be mined."

Outreach helps bridge many gaps. It engages and builds on what people already know, it connects people to the world around them, and it can correct misconceptions. Earth science outreach is a powerful teaching tool, one that we hope helps to ignite a love of Earth science and keep it burning.

Mining Matters everywhere!

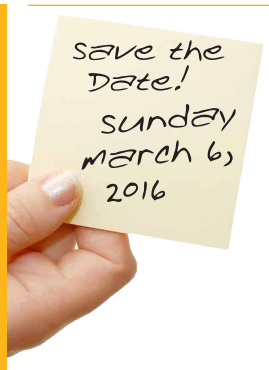
Above photos left to right: Newfoundland and Labrador, Yukon, Quebec, New Brunswick

Mining Matters School Programs at the PDAC Convention

Since 2007, *Mining Matters* has presented a two-day, hands-on learning school program for elementary and secondary students at the Prospectors and Developers Association of Canada (PDAC) International Convention, Trade Show and Investors Exchange in downtown Toronto, Ontario. The four-day annual convention, held at the Metro Toronto Convention Centre, is the world's largest annual mineral exploration convention.

This learning opportunity, generously sponsored by IBK Capital Corp., is beneficial to all students, but might appeal most to those interested in geology, engineering, geography, natural resource management, mining, and environmental practices related to land use. Students will visit the Trade Show and chat with some of over 1,000 exhibitors, exposing them to the immense scope of the mineral exploration and mining industry.

Teachers that use *Mining Matters* resources in their classroom and would like to give their students this unique opportunity are encouraged to write an email stating interest to *Mining Matters* Manager of Teacher Training and School Programs at schoolprograms@miningmatters.ca.



Mining Matters Annual Teachers' Day at the PDAC Convention
Sunday, March 6, 2016

The 2016 theme, "Mining our Business," will have teachers exploring two important areas in the fields of education and industry: safety and skills development.

Visit miningmatters.ca for more information.


Sharing Knowledge

When it comes to sharing Earth science knowledge, *Mining Matters* is a leader. In 2001, we launched into Aboriginal education support, delivering a one-week program to 18 students from Cambridge Bay, Nunavut, and outlying areas. In 2007, the Ontario Ministry of Education mandated that Aboriginal students should have the knowledge, skills, and confidence they need to complete their elementary and secondary education in order to pursue post-secondary education or training or to enter the workforce. Already equipped with experience and teaching resources, *Mining Matters* was ready to help teachers and students meet that mandate. However, keeping in mind that teaching is an ongoing learning experience in itself, we have stayed ahead of the game, constantly developing new ways to present Earth science and promote awareness of Canada's geology and mineral resources to the Aboriginal population.

Today, *Mining Matters* offers a comprehensive Aboriginal Education Outreach Program (AEOP), made up of our *Mining Rocks* Earth Science Programs, teacher workshops, language appropriate resources and outreach events. Our AEOP facilitators travel across Canada, including remote northern areas, to deliver programs specifically tailored to Aboriginal communities, their relation to Earth science and to the mining and mineral exploration sectors. With sensitivity to their important role in resources stewardship, management and development, the programs offer these communities unique teacher workshops, camp and school programs, and community engagement events.

Mining Matters takes care to align programs with a community's culture, recognizing that Aboriginal people are tied to the land. Our programs extend to that land. We provide current information about rocks, minerals, metals, mining and the diverse career opportunities in the mining and mineral exploration industry. We stress the importance of education while showing where it can lead, providing youth with hands-on activities, field experience and connections with industry.

Skills acquired from activities such as Compass Challenge and Explore with GPS can be used in traditional hunting, trapping or fishing and give participants an in-depth understanding of the technology they use. Participants can then connect their traditional skills with potential careers in industries that operate close to home.

Throughout the years, *Mining Matters* has collaborated with industry partners and other programs to share knowledge. Industry mentors from various fields participate in the programs. For example, during the New Gold Program, industry mentors led an in-depth discussion of plans and future employment possibilities, and participants visited the site of future operations. Overall, this program was extraordinary, reaching multiple generations, including ages 9 to 87.

Mining Matters has a long-standing relationship with the First Nations Natural Resources Youth Employment Program (FNNRYEP). Each year, *Mining Matters* delivers a one-week program during their summer-long program that trains youth in skills applicable to mining industry careers. During that week, we arrange for youth to experience prospecting first-hand with a prospector and to meet with local industry. In 2014, Henry Wetelainen, President of Bending Lake Iron Exploration Camp and a Métis from Northwestern Ontario, shared his story: an excellent example of how available opportunities utilize the skills and knowledge many participants already possess.

For the past two years, *Mining Matters* has had the honour of attending Nibinamik First Nation's Annual Youth Retreat, held at the Breathing Grounds, where youth learn about Earth science, the environment and traditional practices in a large communal setting. Much of the community attends, along with visitors of all ages from surrounding communities. Communal cooking offered traditional foods such as moose and smoked fish. During the day, sessions taught traditional practices such as beading and food preparation, Earth science and prospecting, and modern practices of using a GPS and environmental monitoring.

Mining Matters constantly strives to share knowledge and awareness of Earth science and Canada's geology and mineral resources, often achieving that goal and more. However, we have learned that the sharing works both ways. With reaching out to Aboriginal cultures comes an extraordinary exchange of knowledge. It is difficult to say who learns more, the students or the teachers, but reaching out, sharing and listening in return, truly creates an exciting and engaging experience for all.

A great example of sharing knowledge occurred during the Kivalliq Science Educators' Community (KSEC) Science Culture Camp in Rankin Inlet, Nunavut. Youth from seven communities in the Kivalliq region took part, camping on the land for four nights. They participated in sessions about rocks and minerals, first aid, fishing and fisheries, Arctic plants and berries and sewing. Two elders joined the evening sessions to teach singing and dancing. The sharing continued with cooking local fish, tuk tuk (caribou) cut with ulus and a bannock baking contest. Overall, the critical importance of cultural teachings was incorporated into the program.

Learning outside the Classroom

For Teachers

Since 2007, *Mining Matters* has coordinated a special event for teachers at the **Annual PDAC International Convention, Trade Show and Investor's Exchange**, held in March, in Toronto, Ontario. The program for the day features guest speakers, workshops and visits to the Trade Show Floor. For more information, contact *Mining Matters* Teacher Training and School Programs at schoolprograms@miningmatters.ca.

The Canadian Ecology Centre offers its **FREE 6th Annual Teachers' Mining Tour**, giving teachers a chance to learn about and experience the modern mining sector. Sustainability, safety, technology and the "world of work" are the themes. Meet professionals in the field and go "down under" in a working nickel mine (Glencore's Nickel Rim South). Space is limited to 30 participants per tour. Workshops and resources are included. Tour 1: July 27 – 31, 2015; Tour 2: August 17 – 21, 2015. tinyurl.com/CEC-mining-tour

Smarter Science is a framework for teaching and learning science in grades 1 to 12 and for developing the skills of inquiry, creativity and innovation. It evolved from a need to make the Ontario elementary science and technology curriculum and the secondary science curriculum come alive for students, with classroom activities that reflect the investigative, creative and social nature of science. smarterscience.youthscience.ca

The Canada Science and Technology Museums Corporation offers a **Summer Institute for Elementary Teachers**, a three-day professional learning workshop for primary and junior teachers from across Canada. The program shares innovative teaching strategies for integrating science, technology, engineering and math into classroom lessons. teachinst.techno-science.ca/index.php/en

In August, 2015, the Saskatchewan Mining Association (SMA) offers **Rock'n the Classroom GeoVenture**, giving educators an opportunity to explore the diverse aspects of mining operations throughout the province and their links to the Saskatchewan education curriculum. GeoVenture includes a half-day introductory workshop, followed by field stops at

underground and surface potash mines, uranium mines and milling operations, coal mines, the Potash Interpretative Centre and more. Free relevant curriculum teaching resources are provided to participants. The SMA pays for all travel, accommodation and meals during the trip so that the tour cost per accepted candidate is only $50; however, out-of-province teachers should confirm that they are eligible to apply. tinyurl.com/sask-geo

Ashbury College, in Ottawa, Ontario will host a 5-day NACE workshop for teachers, focusing on material science and corrosion, from July 6 – 10, 2015. NACE (National Association of Corrosion Engineers) works to develop corrosion prevention and control standards, certification and education. The camp will offer a diverse curriculum of interest to teachers of chemistry, physics, industrial arts, art and technology. The workshop is free but limited to 30 participants. Includes room and board for those from out of town. summer.ashbury.ca/nace

Join Alberta's **Inside Education** for action-packed Teacher Professional Development programs and enhance your understanding of water, forest and energy topics through behind-the-scenes tours, activities and in-depth discussions with experts in the field. Explore multiple perspectives of the issues related to natural resources and the environment. Some offerings may be available only to Alberta educators. insideeducation.ca

For Students

Each year, across Canada, **Let's Talk Science** mobilizes thousands of university and college students and science, technology, engineering and math (STEM) professionals. Trained volunteers visit elementary and high school classrooms, libraries, community events and more to deliver meaningful, exciting hands-on/minds-on STEM learning experiences to children and youth free of charge. outreach.letstalkscience.ca

Youth Science Canada (YSC) nurtures the scientific impulse in youth, encouraging them to get their hands dirty and develop scientific and technological knowledge and skills through project-based science. YSC holds an annual Canada-Wide Science Festival that brings together Canada's top 500 young scientists in grades 7 to 12, and their projects, as selected at over 100 regional science fairs in every province and territory (listed on the YSC website). The finalists compete for awards, prizes and scholarships valued at nearly $1 million. youthscience.ca

In Burnaby, B.C., **Simon Fraser University's Earth Sciences** lab offers hands-on activities for school-aged children (K – 12). For elementary-aged students, workshops focus on mineral and rock identification. Older groups can look at a higher-level mineral and rock identification workshop, or explore geologic time and fossils. Another workshop focuses on strata (layered rock) and the deformation of strata, including hands-on modelling of faults and folds. tinyurl.com/sfu-outreach

For All

Canadian Institute of Mining, Metallurgy and Petroleum (CIM) M4S shows across Canada educate the public about Mining, Minerals, Metals and Materials. M4S features eight interactive pavilions exploring a wide range of activities representing the full mining cycle: from exploration, mining and processing to product fabrication, safety, sustainability and education, and space and deep sea mining. M4S demonstrates the importance of the mining industry in our daily lives and showcases some of the exciting career opportunities in the mining industry. With an estimated 140,000 jobs to fill in the mining and minerals sector by the year 2020, educating and training the future workforce about the wide variety of professions related to the sector has become more important than ever.

The **CIM Convention**, including M4S, is held annually in May, with locations alternating between Vancouver and Montreal until 2023. cim.org

The **MeMO 2015** (Maintenance, Engineering and Reliability, and Mine Operators) convention, including M4S, will be held at the Shaw Conference Centre in Edmonton, October 4 – 7, 2015. memo2015.cim.org

Festival Eurêka!, a three-day celebration of science for all ages, happens each June at the Old Port of Montreal. More than 88,000 visitors visited in 2014. Going into its eighth year in 2015, the festival has long included *Mining Matters*. This year, we can be found at the Natural Resources and Energy kiosk, hosting French-first hands-on activities.

One festival day is dedicated to school groups who can register to visit for free. They can spend anywhere from two hours to the full day conducting scientific experiments, de-mystifying technological innovations and exploring careers in science and technology. eurekafestival.ca

During summer months, the **Burgess Shale Geoscience Foundation** conducts Earth science educational hikes to the Burgess Shale Mount Stephen Fossil Beds and the Walcott Quarry, as well as a Climate Change and Landscape guided hike on the Iceline Trail in the Yoho Valley. Content covered falls under three themes: History of Life on Earth, Rocks and Mountain Building, and Climate Science and Landforms. burgess-shale.bc.ca

The ROM offers **Rock, Gem, Mineral, Fossil, and Meteorite Identification Clinics** to visitors with rocks, minerals, gems, fossils, or suspected meteorites. These free special ID clinics are held six times a year, one Wednesday every second month between 4:00 and 5:30 p.m. tinyurl.com/rom-clinic

The American Geosciences Institute (AGI) has chosen **"Visualizing Earth Systems"** as the theme of **Earth Science Week 2015**, October 11 – 17. This year's event will promote awareness of the many ways scientists monitor and represent information about Earth systems, including land, water, air and living things. Find educational resources for teachers and students. earthsciweek.org

Earth Science across Canada

The **Quartermain Earth Science Centre**, in Fredericton, New Brunswick, showcases Earth sciences teaching, research and outreach at the University of New Brunswick. It is accessible by the general public as well as school and other groups. quartermainearthsciencecentre.com

The **Cape Breton Miners' Museum** in Glace Bay, Nova Scotia pays tribute to the region's rich history of coal mining, telling stories of miners, their families and the resource that helped build a nation. minersmuseum.com

The **Fundy Geological Museum** in Parrsboro, Nova Scotia, interprets geological history from the unique features of Nova Scotia's Fundy region. fundygeological.novascotia.ca

At the **Joggins Fossil Cliffs and Centre**, in Parrsboro, Nova Scotia, exposed layers of rock reveal the world's most complete fossil record of life in the "Coal Age," 300 million years ago. The centre features an extensive fossil specimen collection, exhibits and displays. jogginsfossilcliffs.net

In Ottawa's **Canadian Museum of Nature**, the **Vale Earth Gallery** showcases dazzling minerals and rock and explains how geological forces have shaped our planet. Interactive games and simulations bring Earth science to life. tinyurl.com/earth-gal

A National Historic Site of Canada, **La Cité de l'Or**, located in Val d'Or, Quebec, invites people to see what gold mining was like through tours of the now-closed underground Lamaque Gold Mine and its main buildings as well as the Bourlamaque historic mining village. An interpretation tour of the village includes a video about its history. La Cité de l'Or is the only gold mine in Quebec that takes visitors down to 91 metres underground. Guided visits are available daily from June 21 to Labour Day, and groups (10 or more) are welcome by reservation in low season. citedelor.com/en-ca

The **Pacific Museum of the Earth**, part of the University of British Columbia in Vancouver, has over 17,000 rock and mineral specimens and a significant collection of ore minerals from across Canada. The fossil collection contains over 20,000 specimens, ranging from recent shells to 500-million-year-old stromatolites. Also featured are Weather, Oceanography, Earthquake and Globe Projection Displays. eos.ubc.ca/resources/museum

The **Royal BC Museum**, in Victoria, British Columbia, highlights B.C.'s fossil sites, which include an astonishing diversity of past life spanning the entire interval of complex organisms on Earth. Some of the oldest fossils in the RBCM collection are over 550 million years old. tinyurl.com/RBCM-coll

Gold: King of Metals

Gold fascinates us. Considered a "king of metals," gold was once associated only with royalty, power, the gods and immortality. As worshippers of the sun god Inti, the Inca called it "sweat of the sun" and designated its use for temples and royalty. Ancient Egyptians valued gold for its durable beauty in their hot climate and called it "the skin of the gods," specifically the sun god Ra. They used it to make significant spiritual objects such as statues, death masks and obelisks, as well as jewellery and ornaments for kings and priests.

Gold, a transition metal and symbol Au on the Periodic Table, was likely the first metal worked by humans. From a cemetery find of pure gold objects in Varna, Bulgaria from over 6,500 years ago to 4,000 year-old golden finery discovered in Peru, prehistoric human love for the metal is verified around the world. Easily found in alluvial deposits, and discovered to be malleable, ductile and resistant to tarnish, nuggets were hammered and worked into beautiful golden objects. Egyptians went further, seeking out deposits to mine. The Romans advanced the mining process by mining underground.

Gold coins were first struck around 550 BC in Lydia, (now a part of Turkey). Eventually, gold became the basis for monetary systems around the world. While most nations stopped using the gold standard during the 20th century, many still hold substantial gold reserves.


R.Weller/Cochise College

More than Glitter

Today, uses for gold have gone far beyond temples and palaces. About half of annual world gold production goes into jewellery and ornamentation, but demand for it grows in electronic, environmental, aerospace and medical technology.

With excellent conductivity and resistance to corrosion, gold figures widely in electronic circuitry, from laptops, cell phones and cameras to hybrid cars. In the electronics of tomorrow, gold nanotechnology hold great promise, one example being conductive nanoparticle ink for plastic electronics.

To help the environment, researchers have found that palladium-coated gold nanoparticles help cleanse groundwater of contaminating solvents. Gold nanoparticles also improve solar cell efficiency and improve electrical conductivity and corrosion resistance in fuel cells.

Gold's biocompatibility proves valuable in medicine. Used in dentistry for more than 4,000 years, it has more recently proved useful in diagnosing and combating disease. Gold nanoparticles help to treat cancer and diagnose malaria and show promise in detecting HIV/Aids and prostate cancer.

In space, gold coats astronaut visors to reduce glare, and gold films protect equipment from temperature variations. On a space telescope due for launch in 2018, mirror segments feature gold coating to reflect infrared light.

Back on Earth, the 14,000 windows of Toronto's Royal Bank Plaza wear 70 kg of pure gold, helping to keep the building cool in summer and warm in winter. Since its construction in 1976 – 1977, buildings around the world have incorporated gold-coated windows to reflect heat radiation.

The list of uses for gold goes on. All the gold ever produced still exists, in some form or another, but melted down, it would take up the space of only 21 metres cubed. Desire for its beauty, monetary value, and amazing properties keep the search for the king of metals ongoing.

For more about gold, go to gold.org. For interesting nuggets of information, look at gold.org/history-and-facts/facts-about-gold.

Medals over the Heart

At the TORONTO 2015 Pan Am and Parapan Am Games, athletes from 41 countries will compete in 825 medal events to win one of 4,259 coveted gold, silver and bronze medals. The focus will be on the athletes, the sports and podium medal moments, but the medals themselves have stories, about mines of the Americas, the people who work at them, and the creative process of designing in metal.

Barrick Gold Corporation, a Canadian mining industry giant, will provide the metals for the medals: gold from their Hemlo Mine in Canada, silver from their Pueblo Viejo Mine in the Dominican Republic, and copper from their Zaldívar Mine in Chile.

Juan Carlos Morales, mechanic at the Zaldívar Mine, knows his work will be represented at the Games. He says "When I found out our metal will play a role in the games, I was so proud. It's a piece of our hard work that will forever be placed over their hearts." Others who work at those mines talk about their pride in work and being part of the Games at barrick.com/toronto2015.

The Royal Canadian Mint produced the medals, designed in collaboration with Métis artist Christi Belcourt and weighing in at 350 g each. Gold medals will be gold-plated silver medals. The beautiful design, on a disc the size of a softball, builds on the Pan Am motto, United We Play, incorporating the concepts of participation, excellence and inclusion, along with three forms to represent North, South, and Central America with the Caribbean countries. Including an ancient Japanese technique of fusing alloys, mokume gane, the design further signifies the

coming together of nations, yet makes each medal unique. For the first time ever, braille will be on all Pan Am and Parapan Am medals. Learn more about the making of the medals at mint.ca/to2015.

"When an athlete has a medal hung around their neck, it is a beginning not an end. As they go through life, people will want to see it, touch it and feel the weight of it," said Elisabeth Walker-Young, Team Canada's chef de mission for the TORONTO 2015 Parapan American Games. "The medals that are given out at the Games will hold pride of place in homes, hearts and memories throughout the Americas for decades to come. Through the design of the medal, the unity and joy of the Games live on."

Mining Matters wishes all athletes at the upcoming games the best of luck. As they cherish their medals, we hope that they will also think of the people who helped make them possible.

Resources

Websites

Dig into Mining is an interactive program for grades 6 to 8 that uncovers the use of transition metals such as copper, gold and molybdenum in our everyday life, and provides students a deeper understanding of today's hard rock mining industry. Dynamic resources—including a virtual field trip, interactive digital learning tools, and school-to-home connections with career exploration activities—are designed to give students a front row seat to nature's geological wonders and inspire further exploration of the world around them. digintomining.com

This Dynamic Planet: A Teaching Companion offers a collection of classroom exercises specifically geared to an existing U.S. Geological Survey (USGS) plate tectonics map and booklet. This resource is intended to assist in teaching Plate Tectonics, primarily for grades 6 to 12. Through several workshops, dozens of teachers from across the country worked with USGS Menlo Park Centre geologists and other experts to develop the classroom activities. tinyurl.com/usgs-dynamic

Written by USGS scientists and originally published as weekly features in *The San Francisco Chronicle*, ***Earthquake Science Explained*** comprises 10 short articles for students (middle school or higher), teachers and parents. This U.S. Geological Survey (USGS) General Information Product presents some of the new understanding gained and scientific advances made in the century since the Great 1906 San Francisco Earthquake. pubs.usgs.gov/gip/2006/21

Follow *Mining Matters* on Twitter twitter.com/mmschoolprogram and see what we have to offer on slideshare.net/MiningMatters.

Start creating, sharing and exploring great visual content today at visual.ly. Take a look at the following:

The Periodic Table of Elements: visual.ly/periodic-table-elements
Diamonds: visual.ly/diamond-birthstone-april

The **Burgess Shale Geoscience Foundation** offers virtual tours of the Walcott Quarry, Mount Stephen Trilobite Beds and other locations that are of importance to the Burgess Shale fossil discovery. youview360.ca/BurgessShale

Read the Burgess Shale history book, available at burgess-shale.bc.ca/discover-burgess-shale.

Browse through dozens of **Geology e-Books**, free online viewing and/or download e-booksdirectory.com/listing.php?category=243.

Science Objects are two-hour online interactive inquiry-based content modules that help teachers better understand the science content they teach.

Flow of Matter and Energy in Ecosystems: Nothing Matters without Energy is the third of three Science Objects in the Flow of Matter and Energy in Ecosystems SciPack. It explores how energy flows through an ecosystem in one direction, from photosynthetic organisms to herbivores to omnivores and carnivores and decomposers. tinyurl.com/science-flow

Energy: Thermal Energy, Heat, and Temperature is the third of four Science Objects in the Energy SciPack. It provides a conceptual and real-world understanding of the relationship between thermal energy, heat and temperature. tinyurl.com/science-thermal

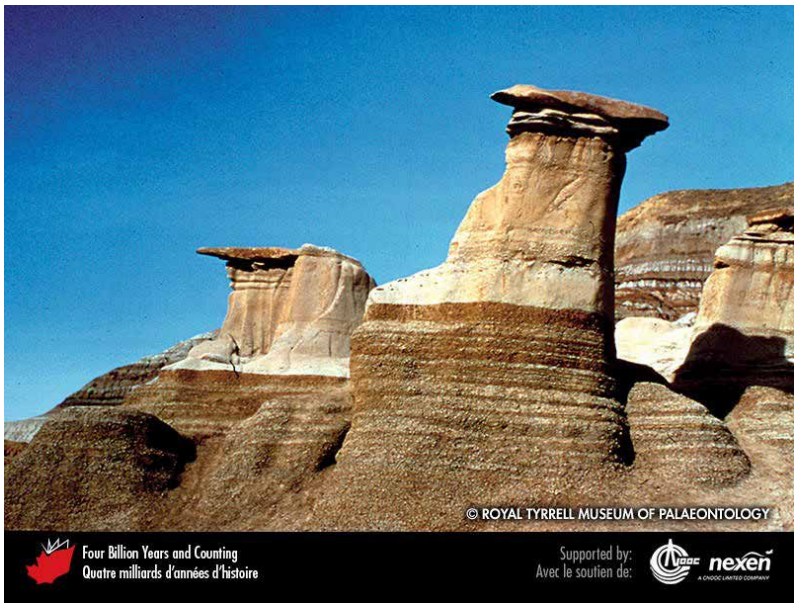
Ducksters introduces Earth science to kids, explaining basics from rocks to mountains to volcanoes and offers a glossary of geologic terms. ducksters.com/science/earth_science

Kids Earth Science has explanations and fun activities for kids to explore. It also offers a free newsletter that kids can sign up for. kids-earth-science.com

NeoK12 features 30 short YouTube videos explaining various Earth processes and phenomena. neok12.com/Earth.htm

Publications

Four Billion Years and Counting: Canada's Geological Heritage



A long-awaited Earth science publication was released in October 2014. Accepted as one of Canada's principal contributions to the International Year of Planet Earth (concluded in 2009), *Four Billion Years and Counting: Canada's Geological Heritage* takes you on an epic journey of discovery. The book looks at the ever-shifting drama of the building and dismantling of continents and the opening and closing of oceans, explaining the basic concepts of rocks, plate tectonics, geological time and fossils, using Canadian examples. It shows how these topics are foundations for economic and social issues—such as the environment; water, energy and mineral resources; and climate change—that impact our lives every day.

Written for a general audience, this multi-faceted story includes over 500 colour photographs and diagrams to enhance and supplement the text. The visuals are available to download for educational and non-profit purposes at the book's accompanying website, fbycbook.com, and are meant to be used with the book, in which the context for individual illustrations is evident.

Four Billion Years and Counting: Canada's Geological Heritage features contributions from some 100 specialists, including members of the Canadian Earth science community representing academia, government and industry. It is jointly published by the Canadian Federation of Earth Sciences and Nimbus Press. tinyurl.com/nim-4byac

Catch the Wind / Catch the Sun

By Anne Johnson

With the help of educators in 2008, Mortenson Construction's Renewable Energy Groups developed the award-winning book *Catch the Wind*, authored by Anne Johnson. In 2013, they published *Catch the Sun*. The two books teach children about wind and solar energy through the adventures of an inquisitive young boy, Nels, whose father works in renewable energy construction.

The books introduce many topics, making them a good basis for interdisciplinary lessons. The stories can be broken into small chunks focusing on the different ideas. They look at renewable energy, energy conservation, and energy use at home and school. They explore past uses of wind and sun power as well as modern technology, and lay out how to build a wind turbine and a solar power plant, including geographical considerations, the parts needed and construction instructions. Safety and careers are also covered.

Catch the Wind and *Catch the Sun* get students thinking about their own energy use and ways to conserve energy. Accompanying activity packages focus on paper and pen knowledge and understanding tasks. tinyurl.com/mort-renewables

The books are well complemented by *Mining Matters* poster *Power to the People* and its accompanying activities, which explore the materials that go into a wind turbine, solar power plant and other renewable energy generating technology. slideshare.net/MiningMatters

Geology Rocks, 50 hands-on activities to explore the Earth

By Cindy Blobaum

Design, build and test quake-proof houses; perform scratch, streak, cleavage and "perc" tests, just like real geologists; go on a geological scavenger hunt; create models to observe the effects of water, erosion and acid rain. Kids are challenged to consider geology in relation to things they use and their daily decisions.

An Astronaut's Guide to Life on Earth

By Chris Hadfield (2013)

Anne Collins, publisher of the Knopf Random Canada Publishing Group, says, "Chris might be the best witness we've ever had to the wonders of space, the fragility and beauty of our planet, and the necessity to keep pushing the envelope of space exploration."

Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook. From 2014 to 2024, the mining industry's projected hiring requirements exceed 120,000 workers—nearly two-thirds of the current workforce. This publication, published in 2014 by the Mining Industry Human Resources Council (MiHR), looks at human resources issues in the mining industry. tinyurl.com/mihr-forecast

Canadian Institute of Mining Metallurgy and Petroleum (CIM) National, its branches, as well as the CIM Foundation (CIMF), offer numerous annual scholarships, bursaries and financial awards. Scholarships are awarded to deserving students pursuing a career in particular facets of/or related to the mining industry. tinyurl.com/cim-schol

Teachers Helping Teachers

Tell us where you find supplemental Earth science resources (e.g., school level, board level, regional teachers associations, governmental agencies, local universities and/or NGOs such as *Mining Matters*, Let's Talk science, EdGeo, etc.) and let us share the information with others.

Give us the heads-up at schoolprograms@miningmatters.ca.

WHERE challenge

Discover the science around you!

The *Mining Matters* WHERE Challenge is a national contest that promotes awareness of non-renewable Earth resources. WHERE stands for Water, Hazards, Energy, Resources and Environment, the fields in which geoscientists work.

The contest challenges students, ages 9 to 14, to consider "What on Earth is in your stuff?" and "Where on Earth does it come from?" igniting curiosity about the origins of everyday items. It encourages them to see their world in new ways and to explore the mining, energy and environmental sectors for possible career opportunities.

Teachers will find that the WHERE Challenge allows for cross-curricular collaboration and thematic teaching. English, Art, Science, Geography, Social Studies, Technology and Media can all be integrated to create an amazing project.

Launched each September, the WHERE Challenge accepts entries online, in English and French, until the following March. Creativity is encouraged. WHERE entries may be submitted in song, essay, video, poem or poster format.

Judges select regional and national winners, awarding cash prizes! This year, 458 students were involved in the WHERE Challenge, resulting in 13 regional winners, of which seven won national prizes. Some participants have entered and won multiple years!

You Be the Judge!

Volunteer to be a contest judge in the 2015 – 2016 WHERE Challenge. Just a few hours of your time can help encourage young people to consider WHERE on Earth the rocks, metals and minerals in their everyday items come from. If you possess a degree in geosciences, education, environmental studies or resource management, or if you work in a similar field, please consider contacting us.

For more information about the contest, to see the rules and to view some of the winning entries, visit the website at earthsciencescanada.com/where.

2015 National Prize Winners

Age Category	9 - 11	12 - 14
Best Overall	Jérôme Lavoie, Quebec	Julie Krug-MacLeod, Saskatchewan
Best Creative	Maude Carrier, Quebec	Marianne Carrier, Quebec Taylor Eagles, Saskatchewan (Tie)
Best Research	Magalie Beaulac, Justin Lemay and Aglaée Lavoie, Quebec	Céleste Nantel, Ontario

To see the complete list of winning projects, go to earthsciencescanada.com/where/results.html.

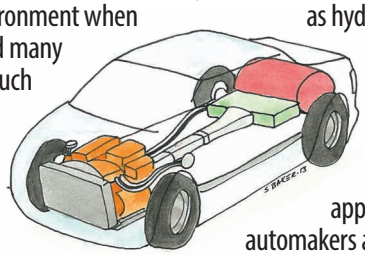
Water Hazards Energy Resources Environment

Saving Energy: Rechargeable Batteries and Fuel Cells

Rechargeable batteries and fuel cells save energy, but they can't do that without the metals and minerals of the Earth. In rechargeable batteries, we find cobalt, nickel, lithium, lead and Rare Earth Elements (REEs). In fuel cells, platinum, graphite, nickel and ruthenium are important components.

Rechargeable batteries convert chemical energy into electrical energy. They power small electronics like cameras, cell phones, power tools and laptop computers, as well as large vehicles. One rechargeable battery can replace hundreds of single-use batteries and can be recycled when no longer useful.

There are many types of rechargeable batteries. Nickel cadmium batteries (NiCd) were once commonly used for small applications; however, containing cadmium, they were toxic to the environment when discarded. Nickel–metal hydride (NiMH) batteries replaced many NiCd batteries. NiMH batteries powered early hybrid cars such as the Toyota Prius. Sealed lead acid batteries, or SLAs, power vehicles and vehicular electronics, uninterruptible power sources and computer systems, and industrial and medical equipment.



Lithium-ion (Li-ion) batteries are now a top choice in many electronics, from laptop computers to electric vehicles (EVs). EVs use no gasoline and can be recharged by household electricity. Some can travel over 300 km on a single charge. By 2020, over 10 million EVs could be on North American roads, significantly reducing fossil fuel use for transportation.

Fuel cells provide power as long as they have constant fuel, usually hydrogen, never losing charge. They break down the hydrogen into protons and electrons, directing protons through a membrane and electrons to an electrical circuit to provide power. The electrons and protons then recombine and join with oxygen, creating water and heat.

Fuel cells work quietly and efficiently, producing little or no pollution. One cell does not produce a lot of power, but stacked cells can produce a required amount. Fuel cells can complement wind-, solar- and hydro-produced electricity; extra electricity these sources produce can be stored as hydrogen and converted to usable electricity when needed.

Different types of fuel cells suit specific purposes. Those in stationary power generation plants power systems for large buildings and telecommunications networks. Some provide electricity, heat and water in space shuttles; others suit military and marine applications; others power buses, cars and forklifts. A few automakers already sell fuel cell electric vehicles to the public; many countries are building hydrogen refuelling stations.

Canada is recognized internationally as a global leader in hydrogen and fuel cell research, development and early stage commercialization. Hydrogen + Fuel Cells 2015 (HFC 2015) is the premier summit for the international hydrogen and fuel cell industry and celebrated its seventh edition in April in Vancouver, Canada. Learn more about the Canadian Hydrogen and Fuel Cell Association at chfca.ca.

Gem and Mineral Shows across Canada

Gem and mineral shows offer all kinds of information to spark interest and fascinating treasures for novice and experienced collectors alike. For a comprehensive list of shows across Canada, see tinyurl.com/mm-shows. Another source of current information about events is the Central Canadian Federation of Mineralogical Societies (CCFMS). It is a non-profit federation of rock, mineral and lapidary clubs for hobbyists in central Canada. ccfms.ca

May

Robert Hall Originals Spring Open House
St. George, ON
roberthalloriginals.com

Kitchener-Waterloo Gem & Mineral Club's Annual Gem & Mineral Show
Waterloo Community Arts Centre, Waterloo, ON calaverite.com/kwgmc

Canadian Micro-Mineral Association Micro-Symposium
Brock University, St. Catharines, ON
Email: cmmafrank@gmail.com

Calgary Rock & Lapidary Club Annual Gem, Mineral & Fossil Show
Cardel Place, Calgary, AB
crlc.ca/crlcshow.htm

Edmonton Gem, Mineral, Fossil & Jewellery Show
Westwood Arena, Edmonton, AB
edmontongemshow.com

June

Kootenay Gem, Mineral, Fossil Show & Sale
Castlegar and District Community Complex, Castlegar, BC
kokaneerockclub.ca/

Niagara Peninsula Geological Society Gem, Mineral & Fossil Show
Heartland Forest, Niagara Falls, ON
tinyurl.com/mf-niagara

July

Sudbury Rock & Lapidary Society's Annual Sudbury Gem & Mineral Show
Sudbury, ON ccfms.ca

Kingston Lapidary & Mineral Club's Annual Gem Shower
Crystal Palace, Picton, ON
tinyurl.com/lmc-king

August

Bancroft Rockhound Gemboree
North Hastings Community Centre, Bancroft, ON
rockhoundgemboree.ca

Nova Scotia Gem & Mineral Show
Lion's Recreation Centre, Parrsboro, NS
tinyurl.com/ns-geo-gms

September

The Gem & Mineral Club of Scarborough Wonders of the Earth Show
Don Montgomery Community Centre, Scarborough, ON scarbgemclub.ca

Ottawa Lapsmith & Mineral Club Annual Gem & Mineral Show
Nepean Sportsplex Curling Rink, Ottawa, ON olmc.ca/gemshows.html

October

Ancaster Gem, Mineral, Bead & Jewellery Show
Ancaster Fairgrounds, Ancaster, ON
ancastergemshow.com

Kingston Lapidary & Mineral Club Annual Gem Storm
Portsmouth Olympic Harbour, Kingston, ON mineralclub.ca

University of Waterloo Annual Gem & Mineral Show
CEIT Building, University of Waterloo south campus, Waterloo, ON
tinyurl.com/UW-show

November

Montreal Gem & Mineral Club 54th Annual Show
Place Bonaventure, Montreal, QC
montrealgemmineralclub.ca

Robert Hall Originals Fall Open House
St. George, ON
roberthalloriginals.com

London Gem & Mineral Show
Western Fairgrounds (Special Events Building), London, ON
gemandmineral.ca

Activities: Rocks and Crafts for all Ages

People have long used natural materials such as bone, wood, shells, fibre or stone for artistic expression. Some of the most lasting creations have used rocks and minerals. Today, we can appreciate rock-based art created anywhere from many thousands of years ago to the present day because of the endurance of stone. From prehistoric pictographs (drawn or painted) and petroglyphs (carved) on cave walls and the famous Stone Age Venus figurines through to spectacular Greek friezes, intricately carved Asian temples (Angkor Wat) and Renaissance masterpieces, rocks and minerals have yielded incredible art.

Your students can also produce works of art with rocks and minerals. First of all, they are natural collectors; how often do kids go home with rocks in their pockets? Ask them to bring in any rocks and minerals they have collected for a show and tell. Naturally creative, they can then transform their rocks into beautiful pieces of art, with some additional lessons, guidance and resourcefulness.

Primary School Activity: Rock Walk ABCs

Take your students on a rock walk where they can collect rocks along the way. Guide them to choose some with smooth surfaces that would be easy to paint. Students will paint the letters of the alphabet on the rocks, so you will need 26 or 52 rocks. Alternately, buy a collection of flattened, tumbled river stones.

Materials

- 26 or 52 rocks
- Liquid or solid water-based craft paint, various colours (e.g., Tempera, poster paints)
- Paint brushes, fine and broad tips
- Aprons and smocks (cotton, nylon, and/or polyester)
- Clear spray lacquer

Instructions

1. Have students put on aprons or smocks.
2. Rinse the rocks to remove soil or dust that would prevent paint from adhering.
3. Select a base colour paint for the rocks, e.g., white or black.
4. With a broad brush, paint the base colour on the part of the rock that will serve as the face.
5. Allow the paint to dry thoroughly. Drying time will depend on the type of paint used.
6. With a fine brush and various paint colours, paint the 26 letters of the alphabet on the rocks, upper case letters only.
7. Once the paint has completely dried, an adult should spray the rocks with clear lacquer to protect the paint from wear and tear.
8. Follow steps 2 through 7 to create a second set of alphabet letters, this time with lower case letters.

Students can now learn the alphabet, spell their names, or create new words with their crafty rocks!

Middle School Activity: Canada Rocks! Keychain

Middle school is a time of transition, with many students experiencing changes in school and home life. For some, this might be the first time they are considered responsible enough to have their own house key. Why not mark this milestone by having them create Canada Rocks! keychains for their first set of keys? Alternately, they could make paper weights or even door stops, depending on rock size.

Materials

- One long, smooth and flat rock per student
- Pencil with eraser
- Metric ruler
- Red and white tempera paint
- Maple leaf template (BLM's can be found at firstpalette.com)
- Brushes
- Clear spray lacquer or clear nail polish

Instructions

1. Rinse the rock to remove soil or dust that would prevent paint from adhering.
2. Paint the top of the rock white and allow the paint to dry thoroughly.
3. Divide the painted space on the rock into three panels, similar to those of the Canadian flag. The centre section should be twice the width of the panel to the left or right.
4. Fill in the left and right panels with red paint. Leave the centre panel white.
5. Using the pencil, trace the maple leaf template onto the middle of the central panel.
6. Go over the maple leaf outline with red paint and fill in.
7. Allow the paint to dry completely, then spray with clear lacquer.

Assemble the Keychain

Materials

- Painted rock flag
- Keychain with jump ring, bell caps
- Epoxy or jewellery glue
- Paper clip or toothpick
- Round-nose pliers
- Sand or molding clay

Instructions

1. Decide where on the painted rock the bell cap will be attached. Fit the bell cap snugly over the rock, using pliers if necessary, ensuring the bell cap fingers are all in contact with the rock surface. One or two of the bell cap fingers could be cut off to ensure a secure fit.
2. With a toothpick or paper clip, lightly coat the inside of the bell cap with glue. Make sure to coat the underside of all the bell cap fingers.
3. Place the glue-covered bell cap on the part of the rock it was shaped around.
4. Once the bell cap and stone are together, place the rock in the sand or molding clay so that the bell cap is sticking straight up.
   The glue could take from 15 minutes to two hours to set and harden completely. Placing the rock in the sand will ensure that the cap remains in the position it was set.
5. Once the glue has hardened, attach the bell-capped stone to the key chain. Using two pairs of pliers, hold the keychain jump ring on both sides of the opening; push one side backward and pull the other side forward.
   DO NOT PULL IT APART. If you pull it apart it is very difficult to get the ring to close properly.
6. Slide the bell cap loop onto the open jump ring. Using the pliers, close the jump ring.

High School Activity: Purple and Proud – A Provincial Keepsake

While many Ontario students know that the provincial flower is the White Trillium and the provincial bird is the Common Loon, few know the provincial mineral emblem. Ontario's mineral emblem is the Amethyst. Adopted in 1975 as Ontario's official mineral emblem, Amethyst represents the mineral wealth of the province. It is a form of quartz that is found in clusters throughout northern Ontario, concentrating around the area of Thunder Bay. Amethyst crystals in that area are believed to be over one billion years old.

Have your students create beautiful Amethyst necklaces for themselves or to give as a gift. They will each wrap an Amethyst stone with a cradle of copper wire and attach it to a cord or create a macramé knotted gemstone bag. Tumbled Amethyst or any variety of gemstones can be purchased at local gem and mineral shows. For information on shows in your area, visit the Central Canadian Federation of Mineralogical Societies at ccfms.ca/Events/events.html or consult Rockin' Mineral Shows at tinyurl.com/mm-shows.

Gemstone in a Copper Wire Cradle

Materials

- A roll of medium gauge copper wire
- Tumbled Amethyst stones or other regional gemstones
- Waxed cotton / hemp cords or chains
- Long-nose pliers
- Clear nail polish

Instructions

1. Provide each student with 30 cm of copper wire, an Amethyst and enough cord to meet their desired length of necklace.
2. Using fingers and long-nose pliers, wrap the copper wire around the stone in several directions. No two cradles will be the same since each gemstone has its own unique shape and each student will use their discretion on how to best cradle the gemstone.
3. Twist the copper wire together at the top of the stone to hold it in place.
4. Create a loop for the cord to pass through.
5. Coat the wire and stone with clear nail polish to prevent tarnishing and allow to dry.
6. Thread the hemp/cotton cord through the loop and tie the ends together.

Gemstone in a Macramé Pouch

Materials

Waxed cotton or hemp cords

Gemstones of your choosing

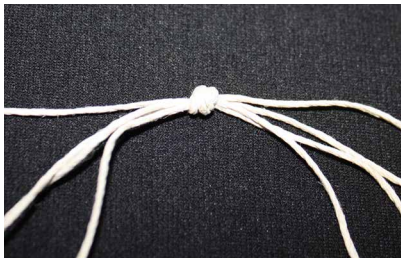
Scissors

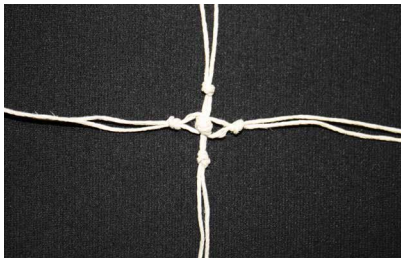
Beads (optional)

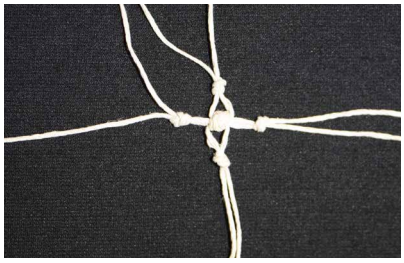
Instructions

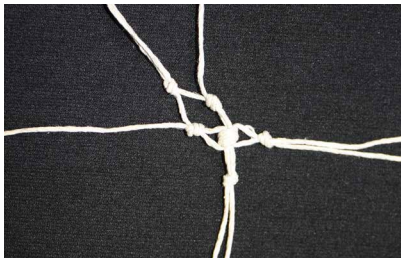
1. Measure four equal lengths of cord. The length is determined by how long the student desires the finished necklace to be. Keep in mind that knotting will take up some of the cord. Try using 125 to 150 cm to start with.
2. Line up all four lengths of cord beside one another. Tie them in a knot in the centre with a single base knot. This will result in eight equal length strands to work with to create the gemstone pouch.
3. Separate the strands into pairs and tie a knot in each pair; keep in mind the size of the gemstone you would like the bag to hold. If the gems are small, the paired knots should be tied closer to the base knot. This will result in a smaller weave, preventing stones from slipping out.
4. From the initial set of paired knots, tie each strand to the neighbour it is not knotted to. Notice as you continue to do this that the pouch shape starts to form. Keep tying neighbouring strands together until the desired depth is achieved (refer to size of gemstone).
5. Once the bag size for the stone is achieved, take four strands in each hand and tie a knot at the top of the pouch on each side. You will then have two necklace lengths, each with four strands.
6. Using a four strand braid method, braid together the four strands on each side of the necklace.

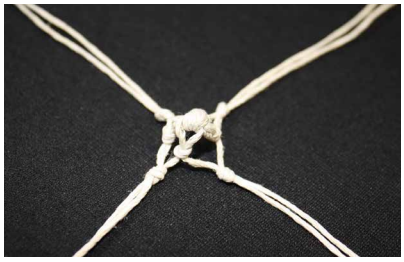
   This step may take some time depending on the length of cord and your ability to braid. tinyurl.com/4strand
7. Once braids are complete, slide one bead over both braided strands of the necklace, then tie a knot at each end of the braided sections to prevent them from unravelling.
8. To finish, tie both ends of the braids together at the desired necklace length.











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Mining Matters is a charitable organization dedicated to bringing knowledge and awareness about Canada's geology and mineral resources to students, teachers and the public. Since 1994, *Mining Matters* has reached an estimated 600,000 teachers and students through resources that promote the vital role rocks, minerals, metals and mining play in everyday life. *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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Mining matters to everyone!

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