HARMONICS

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WHAT IS MINING ENGINEERING?

If it can't be grown, it has to be mined.

Natural Resources Canada
http://www.nrcan.gc.ca/ms/efab/mmsd/facts

Do you use sunscreen in the summer? Drive a car? Ride a snow mobile? Wear jewellry? Use a computer? All of these products and many others we use every day contain metals or minerals which have been mined from the Earth. Although some metals and minerals may be found above ground, like the gold flakes panned from northern streams which set off the Yukon gold rush in the late 1800s, most minerals reside further beneath the Earth's surface and are only accessible through mining.

Mining engineers and geologists work closely together in the process of extracting minerals from the earth. They begin with exploration: drilling holes trying to find mineral deposits to extract. Once a good site has been found they begin planning. These first two stages involve many studies and, ideally, consultation with local communities. The company planning the mining must be clear about how they intend to mine the find, what services will be needed to make the mine work (new roads, air strips, electrical supply) and what impact mining will have on the local environment. At this stage, mining engineers will also be expected to come up with a reclamation plan: while a rich mine may contain enough material for operations to continue for a long period of time, mining is always a temporary activity, the reclamation plan lays out how the mining company will return the surrounding land to its premining state.

Once all the planning is done, the mine can open. During operations, mining engineers are largely concerned with getting the most ore out of the ground at the least cost. At the same time they must also take care of safety, the environment, and overall management of the project. In this stage, some mining engineers may also conduct research involving the minerals being mined or the processes being used to mine them.

When the mine is exhausted of its mineral supply, the surrounding area must be cleaned up and restored according to the reclamation plan. Depending on the type of mining used, restoration may include demolishing buildings, stabilizing the ground, removing trash materials, landscaping and periodic inspections to ensure that activities have no long-term negative effects on the environment.

In Canada, many traditional territories sit upon land rich in minerals; rights to these resources are a key element in many land claims negotiations. Aboriginal engineers with an understanding of their communities and mining operations will be able to contribute both to the effective clean-up of old abandoned mines on First Nations lands, and to the efficient and responsible development of mineral resources for the benefit of their own nations.

NATIVE ENGINEERS & SCIENTISTS

A place to meet people from your community.

Name: Rachael Claus-Buckles
Nation: Mohawk on my dad's side and Delaware on my Mom's
Profession: Mining Engineer
Degree: B.Sc. (Mining Engineering) 1998, Queen's University
Favourite thing about her work: The people and getting to see Saskatchewan.

Rachael Claus-Buckles (L) and friend at the McArthur River operation.

Every Thursday, Rachael Claus-Buckles gets on a plane and commutes 1200 kilometers either to or from work. She is a junior mine engineer at Cameco's McArthur River Operation, the world's largest known, high-grade uranium deposit located in northern Saskatchewan.

Back in high school, living in an isolated camp and working 500 to 600 meters underground was the furthest thing from Rachael's mind. In fact, she didn't even know what engineering was. Then one day someone from a nearby college came to talk to her grade 11 biology class. "I was sitting in the back of the class and I though, engineering? What's that? He really opened a door for me."

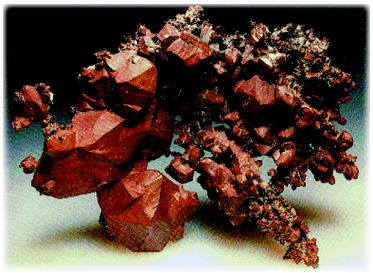
She chose to study at Queen's and loved it, even though university was a big shock at first. "Mom and Dad weren't there to say what are you doing. I had to develop my time-management and study skills." She also had to decide what it was she really wanted to do. Rachael spent the first two and half years in mechanical engineering, but then started wondering if it was really where she belonged, "I thought, I don't know if I want to do this." Luckily, a friend's sister in mining helped her make the switch. "I made the decision Friday afternoon, and switched the next Monday morning."

That change was what brought her to Cameco. A professor she worked for gave her a reference which led to summer job and then full-time employment. "When I graduated, Cameco didn't even have to train me, they just gave me a clipboard and said, go to it."

Rachael hopes that other Aboriginal students will follow her into engineering, "Through numbers and engineering, Native kids can compete on a world stage. But I'd encourage them to stay in school in general, even if engineering isn't for them. School brings the world closer, and exposes you to different people. When you meet someone from Botswana you learn they're not really that far away from you; and that goes both ways. At university, you become an ambassador for your community."

As for becoming mining engineers, Rachael admits it's not for everyone, "You're either meant for it or not," she says. But she obviously loves it. "Up north," she explains, "You can stand on a hill and there's nothing around, just the bears, the wolves, the ravens and you."

COPPER



Got a nickel in your pocket? How about a dime or a quarter? Well, these silver-coloured coins are actually about 70% copper. Copper was one of the first metals to be mined, probably because it can be extracted from surrounding rock by hammering. The peoples of Turtle Island have been using copper for at least 5000 years.

The region near Lake Superior now known as Michigan is home to ancient mines dating back to 5000 BC. The metal was extracted by the ancestors of the Chippewa and Powatomi who used it for making tools such as knives and spearheads. Remnants of copper from this region can be found all over North America showing the extent of Aboriginal trade routes before contact with Europeans. It is estimated that the ancient mine workers from this area extracted 1.5 billion pounds of copper from these mines over about 3000 years.

The people of the north also had access to copper. Victoria Island and the surrounding regions in the Northwest Territories and Nunavut are rich in the ore. The ancestors of the Inuit who now live there were known as Copper Inuit because of their mining and use of it. Like people further south, they used copper to make tools such as rivets, staples, knives and arrowheads.

On the Northwest Coast, between present day Alaska and Washington states, copper was a valued metal. Copper plates engraved with totem images had a special place in the potlatch, an elaborate gift exchange ceremony. The owners of such plates were considered wealthy and powerful. When they gave someone a plate, or even a piece broken off of one, it was an esteemed gift.

MINERAL LEECHING

Turtle Island is rich in mineral and metal deposits including gold, silver, zinc, diamonds and coal; all of great interest to mining companies. Many of these deposits lie deep within traditional lands. In many places they have been mined to the point where it is no longer economical for companies to continue operations, and so mines are abandoned.

Rock contains sulphides – a combination of sulfur and other minerals. When rock is exposed to air or water through natural weathering processes, the sulphides chemically react to produce sulfuric acid. The acid can move (leech) into the nearby soil or watershed but, generally, there isn't enough sulfuric acid produced through weathering to significantly raise their acidity. During and after mining, however, large quantities of rocks that are normally underground become exposed. Much more sulfuric acid is produced than through natural conditions. In addition, the acid can dissolve the traces of metal left in waste rock, dragging poisonous heavy metals such as lead, zinc, copper, arsenic, selenium, mercury, and cadmium into the ground and surface water. Left unchecked, this mineral leeching can destroy local aquatic life and habitat.

While steps are being made to avoid the negative effects of mining, damage is still being done, particularly by abandoned mines. For example, a salmon breeding river in northern BC, the Taku, is threatened due to the mineral leeching from the abandoned Tulsequah-Chief Mine. Mineral leeching is a potential long-term problem of mining. There are ways to minimize and even avoid leeching, but they work best when put in place before operations begin. Clean-up is always harder: some abandoned Roman coal mines in Britain still leech minerals today, almost 2000 years after being abandoned.

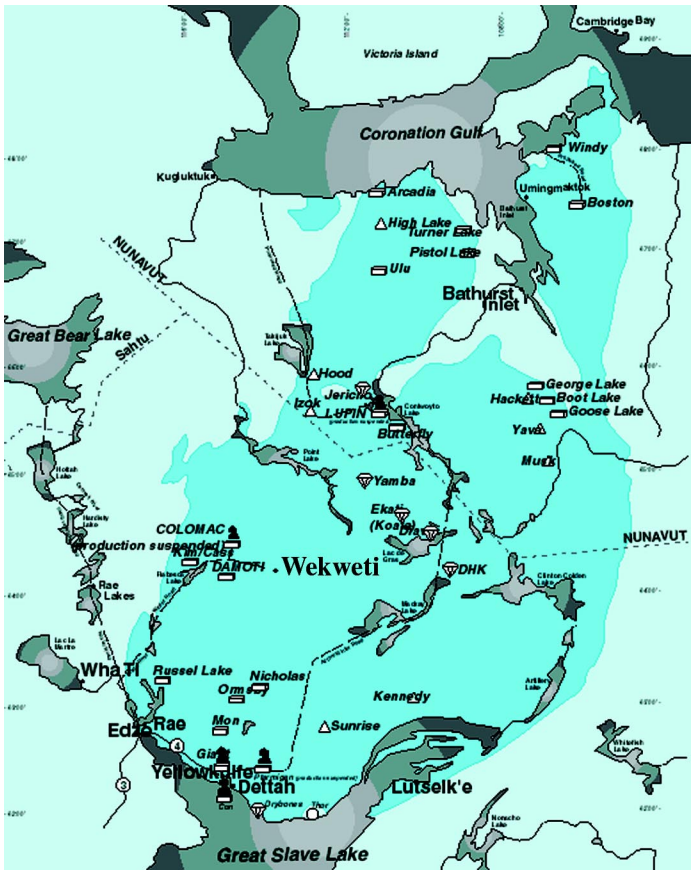
Look into it: http://www.miningwatch.org/emcbc/primer/acid_mine_drainage.html, http://www.nrcan.gc.ca/mms/school/index.html

COMMUNITY PROFILE

Diamond mining in the Northwest Territories

The Dechi Laot'I First Nation is located in Wekweti, North West Territories on the shores of Snare Lake, 200 kilometers north of Yellowknife. A permanent settlement since 1962, it was founded by former chief and elder Alexis Arrowmaker who brought a number of families to the area to preserve traditional lifestyle and values. Today, the community is home for approximately 140 Dogrib people. Before settlement it served as an outpost hunting camp. Hunting, fishing and trapping are still major activities today. In 1996, the community achieved Band Status making it a full partner of the Dogrib Nation under Treaty 11. This status gives the people of Wekweti a clear claim in self-government and land claims negotiations.

One hundred eighty kilometers northeast of Wekweti is the EKATI diamond mine which officially opened in October, 1998. Wekweti is its closest neighbour. BHP Mines, which owns most of EKATI, was required to come to agreements concerning the environmental and cultural impacts of the proposed mine before it could receive approval for large scale operations. The Dogrib Nations of Treaty 11 were the first to sign an Impact and Benefit agreement with the company.



As part of the agreement, BHP must submit an annual report to the Dogrib and other signing nations (Métis, Inuit and Akaitcho Treaty 8) which includes information regarding the company's environmental monitoring programs. BHP must consult with Aboriginal communities regarding any activities which might disturb land used for burial grounds or other traditional purposes. In addition, like many other mines operating on or near aboriginal lands, EKATI has a policy to hire Aboriginal peoples and provide them with necessary training.

Based on initial projections, the EKATI Diamond Mine is expected to operate for 17 to 25 years. During this time approximately 78 million tonnes of kimberlite ore will be processed; kimberlite is the type of rock in which diamonds are usually found. EKATI already has a plan to restore the land in and around the mine site once it is closed.

The information in this article was obtained from www.assembly.gov.nt.ca/NewNWT/wekweti.html, www.bhp.com.au/minerals/diamonds/index.htm, www.inac.gc.ca, www.wkss.nt.ca/html/snare_lakes.html and *BHP Diamond Facts*, Issue 3, 1999.

Fun Facts and Things to Think About

It's not that I'm so smart, it's just that I stay with problems longer.
- Albert Einstein

The chalk you teacher uses on the blackboard used to be alive. It is made from limestone, a rock composed of tiny vegetable and animal fossils.

http://nyelabs.kcts.org/openNyeLabs.html

Did you know…
…that Native Elders and scientists have been working together to protect caribou from dangers at mine sites? In the Northwest Territories many new mines are opening on and around the Bathhurst caribou herd's calving and feeding grounds. The caribou seem to be attracted to mine sites, possibly because they are very open and leave no hiding places for predators. Unfortunately, the sites can be dangerous to the animals. Scientists working with Elders determined that by building fences based on traditional Dogrib design – wood and rope fences with plastic flutters - they can keep the caribou away from any dangerous sites.

Source: www.wkss.nt.ca

What's in a name?
If your teacher shows you two rocks and says one is quartz and the other is quartzite, what's the difference? Well, quartz is a pure substance whereas quartzite is not. The three little letters "ite" added to the end of mineral name, means it is made mostly, but not entirely. of that mineral.

No pressure, no diamonds.

Mary Case

PUZZLES & GAMES

A mineral engineer tells some miners to divide the ore they just dug into six 1/6 tonne piles in one section of the storage area and three 1/3 tonne piles in another. If the engineer later asks the miners to put them all together, how many piles of coal would there be?

Ans: 1

DADNMOI
PEORCP
NRIO
ALCO
RVILSE
LGOD
ATSL
CKNELI
ZURAQT

We wanted a poster listing the names of common minerals. Unfortunately our painter was a little confused. Can you decipher what these 9 minerals are?

Be happy it isn't toes!

Before starting their dig, 13 miners each ventured into the mine and brought out 7 sacks. Each sack had 7 moles. Each mole had 7 babies. How many legs in all?

Ans: 20,410

Source: www.gomath.com/category/Log/logic1.html

All about us

Native Access provides culturally relevant learning opportunities in science, math, engineering and technology to Aboriginal students and their teachers across Canada.

Established in 1993, the project's ultimate goal was to increase the representation of Aboriginal peoples among the the ranks of practicing engineers and scientists in Canada.

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