

HARMONICS

The Engineering Explorations Newsletter

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WHAT IS MECHANICAL ENGINEERING?

Manufacturing Engineering

Acoustic Engineering

Mechanical engineering is one of the major fields within engineering (the others are civil engineering, chemical engineering & electrical engineering). The work of mechanical engineers involves machines and things that move. In fact, mechanical engineering involves,

"the design, development, manufacture, sale, operation and maintenance of machinery and devices that produce, transmit or consume power, or employ heat energy in everything from aircraft engines and railway locomotives to toasters and home furnaces."

Source: Association of Professional Engineers of Ontario

Automotive Engineering

As the definition implies, mechanical engineering is a very diverse field. All of the types of engineering in the shaded boxes are sub-groups of mechanical engineering ... and the list on this page isn't close to being complete!

Mechanical engineers played some role in the design of all of the following things:



- CD players
- Nintendo and SEGA game wear
- snowmobiles (the engines and the bodies)
- bicycles
- hockey and figure skates
- hockey arenas
- off-road vehicles

Aerospace Engineering

Power Engineering

But did you know that mechanical engineers also design things like artificial limbs for people who have lost arms or legs, and incubators which help keep premature babies alive? Mechanical engineers, like all other engineers, have a responsibility and concern for public health and security, so many of the problems they solve impact directly on people's lives.

Biomedical Engineering



Fluids Engineering

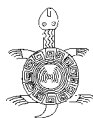
Think about the things a mechanical engineer could do within your community...

- adapt vehicles so that they function better and have less impact on the environment;
- develop efficient systems for raising crops or livestock;
- design air conditioning and other systems required for new schools and clinics.

On the road to self-sufficiency and self-government, the skills of mechanical engineers will be needed to find practical solutions to problems related to the management of natural resources; forestry machinery; fishing and fish processing; small manufacturing and industrial development.

Materials Engineering

Ocean Engineering



NATIVE ENGINEERS

A place to meet engineers from your community.



Courtesy of Queen's University

Name: Mark Green

Nation: Mohawk

Profession: Civil Engineer

School: Queen's University, Kingston & Cambridge University, England

Degrees: B.Sc. (Math & Engineering), Ph.D

Favourite thing about job: Working with students and discovering new ways of doing things.

Dr. Mark Green (not the one from ER) has been an engineer for 10 years. He teaches engineering at Queen's University in Kingston, Ontario (the same place where he got his undergraduate degree). Teaching allows him to combine two things he really enjoys - working with people and conducting scientific research.

In his research, Dr. Green studies the materials which are used for building structures like skyscrapers, houses and bridges. He is involved in a project with other researchers across Canada who are trying to make structures and the materials they are made out of "smarter." These engineers hope that by implanting tiny electronic sensors into building materials, they will be able to create "smart" structures which can monitor, regulate and adjust to their environment. If Dr. Green and his colleagues are successful, there will be many applications for their work. For instance, one day sensors in bricks on the outside of your house might be able to tell when the outdoor temperature is dropping and send a message to your furnace to turn up the heat - all before you realize it's getting colder.

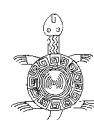
As a teacher, Dr. Green works with students at both the undergraduate and graduate levels. He lectures in classes, supervises student research and provides guidance to students about their course work and career paths. Teaching provides Dr. Green with the unique opportunity to give something back to the academic community which helped him become an engineer. Giving back is important, and he believes that math and science education provides that kind of opportunity to young Aboriginal people,

"It's only by learning how to use technology that you can use it to benefit the people in your community. And, in a technological society, we need Aboriginal people who understand how technology fits in or impacts on traditional life. People with a knowledge of science and engineering have a valuable contribution to make in bringing that knowledge back to their communities."

He adds,

"We need to adapt technology to our lives in order to maintain the integrity of traditional life. We can't do that if we are always importing technical expertise instead of developing it ourselves."

Queen's University is located in Kingston, Ontario. It has several Faculties and Schools including Applied Science (engineering), Arts & Science, Medicine, Education, Law, and Business. For more information you can contact the Admissions Office by writing to Admissions, Queen's University, Kingston, Ontario, K7L 3N6, phoning (613) 545-2128, or visiting the university Web site at <http://info.queensu.ca/index.html>.



ENGINEERING NEWS

Nunavut Territory

If you think engineering has nothing to do with land claims, think again.

The Inuit and their ancestors have lived on the land which is now considered a part Canada's Arctic for more than 4000 years. In 1976, the Inuit Tapirisat (governing council) presented the Canadian government with a land claims proposal to split the vast Northwest Territories into two regions. Although it took 16 years of negotiation, in 1993 the Inuit, the federal government and the government of the Northwest Territories came to an agreement to establish Nunavut (which means "Our land" in Inuktitut); it is the largest Aboriginal land claim settlement in Canadian history.

Establishing a new territory and new government is a huge job. Try to imagine all the questions which have to be answered -

Where will the capital be?

What types of industry should be encouraged?

Will the area be divided? If so, how?

How will the health care and education systems work?

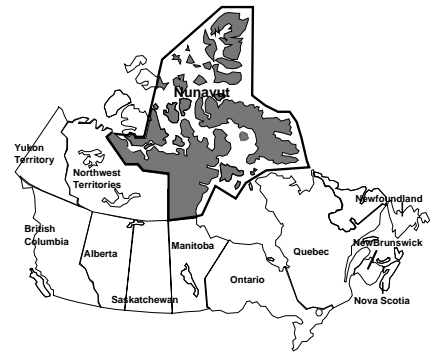
These are just a few of the difficult questions being tackled by the Nunavut Implementation Committee which is responsible for the first phase of establishing Nunavut. This phase ends on April 1, 1999 when the new territorial government will be elected and empowered. Nunavut will be fully established in 2009, when the federal government completes the transfer of just over \$1.1 billion in transfer payments which are a part of the land claim settlement.

As Nunavut develops, job opportunities arising from both government and private businesses should grow quickly. Areas which have been identified for development include fishing, trucking, mining, tourism, training and the environment. All of these areas are in some way related to engineering or other technical areas. For instance

- with only 20 km of roads in more 1.9 million square kilometers, the development of trucking will require the planning and construction of more roads by civil engineers.
- development of metal and oil industries will require both mining engineers for planning and environmental engineers to ensure that land, air, water and wildlife are protected from mining and drilling.
- hotels used for tourism will need people who can operate computers to handle bookings, and mechanical or building engineers to maintain buildings.

So, engineers and other technically skilled people will have a huge role to play in the development of Nunavut for many years.

Plenty of information about Nunavut is available on the Web. You can even take part in a nation wide project to help out by the Nunavut Implementation Committee - see Countdown to Nunavut Project at <http://www.arctic.ca/LUS/Nunavut.html>.



The shaded area in the map above represents the territory of Nunavut.

Nunavut Facts

Area: 1,900,000 sq. km.,
approx. 20% of
Canada

Kilometers of highway: 20 km

Population: 22,000

Inuit population: 17,500

People per sq. km: 0.01

Regions: Qikiqtaaluk, Kivalliq
& Kitikmeot

Number of Communities: 28

Capital: Iqaluit

Languages: Inuktitut,
Inuinnaqtun
& English



COMMUNITY PROFILE

Kitigan Zibi, Algonquin Nation

NETIZENS AT KITIGAN ZIBI SCHOOL

By Sunshine Tenasco and Kristy Whiteduck

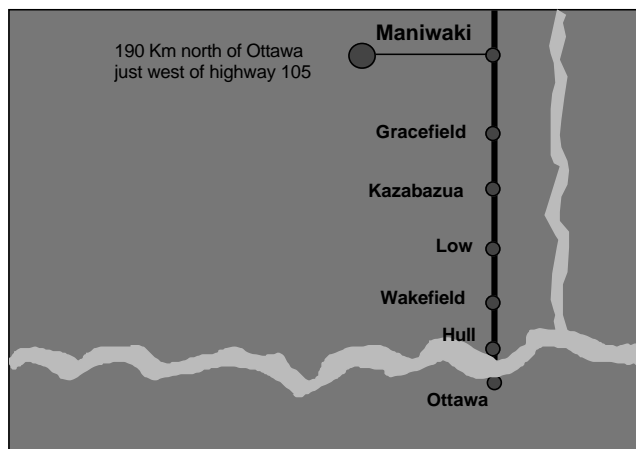
Exploring and learning on the Internet is fun and helpful for both students and teachers at Kitigan Zibi School, a First Nations school in Quebec. We incorporate the Internet in learning in many different and fun ways. With the help of the Internet hookup in our school library, research papers are a breeze. We no longer have to search far and wide for gems of information to support essays and assignments.

We created our own community Web site (<http://www.kza.qc.ca>) at the school to showcase information about our culture and heritage. Students at the school designed and programmed it. It includes information about powwows, band council meetings, community updates, and much more. We also use it to increase awareness of First Nations culture and history. We also participated in the SchoolNet-Canadian Environmental Solutions project to find an answer to the problem of high mineral content in our artesian wells.

As a traditional community, it is ironic that our history of using computers dates back to the early 1980s, when we used Commodore PET computers. We are much more advanced now, with sixteen Acer Pentium 133 MHz computers with eight-speed CD-ROM drives, various multimedia applications and Windows 95. Spoiled as we seem, we earned every ounce of this extraordinary upgrade.

Gilbert Whiteduck, the director of the Kitigan Zibi School, says the school makes computer and Internet education a priority. "We fundraise and budget extensively to ensure that students learn to use the most current and advanced technologies. Our students proudly leave Kitigan Zibi very computer-literate." Mr. Whiteduck also suggests that he plans to set up the school's own Web service, complete with 4 lines.

How do we feel about using computers so much and learning on the Internet? Although we spend many hours learning via the Net, we love every minute of it.



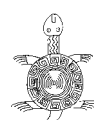
This map based on an image found at <http://www.kza.qc.ca>

Sunshine is a first year English/Theatre major at the University of Ottawa. . She enjoys hockey, downhill skiing, and computers. She hopes to make a difference in her community, for the children and the elders.

Kristy, 16, attends school in Maniwaki. Her favourite subjects are math, computers, English, and chemistry. She hopes to become an accountant someday, and to be involved with computers, which she sincerely loves.

Both girls have participated in the Native Access to Engineering Programme at Concordia.

This article originally appeared in the *SchoolNet Newsletter*, it is reprinted with the permission of the authors. Checkout SchoolNet's newsletter at <http://www.schoolnet.ca/infor/newsletter>.



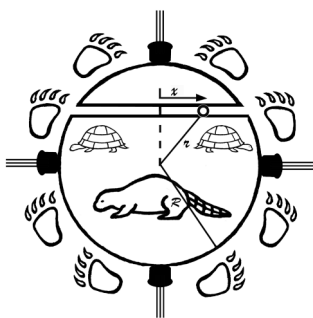
FUN FACTS AND

When computers are linked together in a network, each individual machine is given a name so that the network server (the computer which all of the other computers communicate through) knows where each machine is. Computer Scientists in the Department of Computer Science at Concordia have named their computers after North America's Aboriginal nations. Some of the computers are:

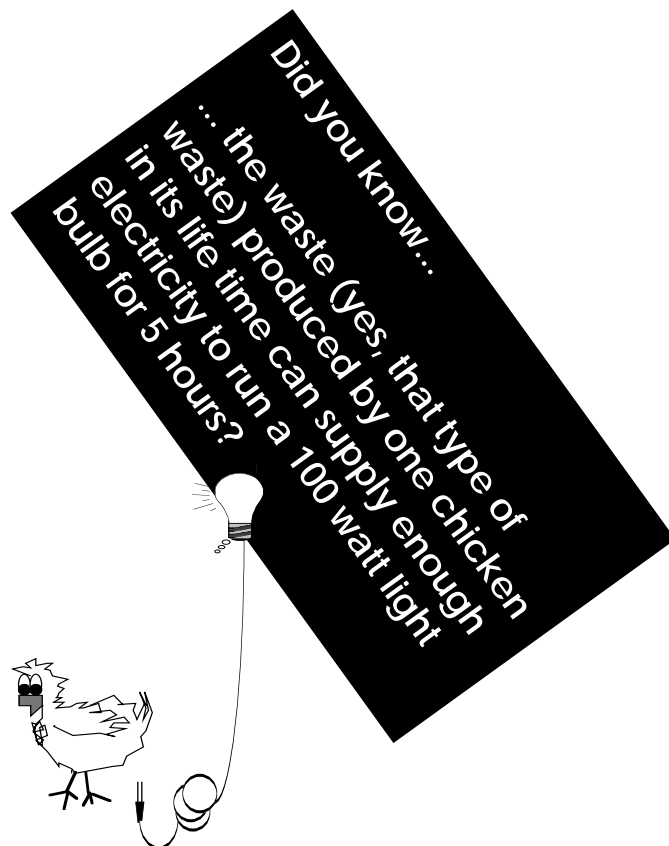
Algonquin
Bella Coola
Cree
Dene
Dogrib
Haida
Inuit
Mohawk
Montagnais
Navajo
Nootka
Ojibwa

Do you know where these nations are located geographically?

New Logo



Learning is not compulsory... neither is survival.
- W. Edwards Deming



The Native Access to Engineering Programme has a new logo designed by Ken Williams, a Potawatomi of Moose Deer Point Ontario and a former Fine Arts student of Concordia University.

Circle: represents a tunnel in a uniform planet of mass at a distance r from the center, the gravitational attraction is due only to the sphere off a radius r . (Newton's Law). The circle also represents Mother Earth and the Sacred Circle of Life.

Bear Paws: represent the courage and strength of the bear and the great medicine he is said to possess by Native people.

Beaver: represents the world's first engineer and life's qualities of being hardworking and industrious.

Transistors: that are radiating from the circle in four directions also represent the Four Directions of the Universe which Native people pray towards when conducting ceremonies.

Turtle: represents the ancient one who has the knowledge and understanding of all the teachings of the world which he carried on his back. The turtle's shell on his back also represents an igloo to signify the Inuit people.



PUZZLES AND GAMES

	1	2	3	4	5
A	●	●	●	●	●
B			●	●	●
C	●				●
D	●	●	●	●	
E		●			●

Your community plans to build 16 new homes. The initial layout of the homes is given above (each black dot is a home). The local planning engineer decides it would be better not to have any more than three homes on any street (each of row, column and main diagonal is a street).

The engineer says it can be accomplished by moving 3 separate homes one space over - vertically, horizontally or diagonally? As the engineer's assistant you get the job of drawing the new plans. Which homes do you move where?

Source: *Science et vie junior*, July 1997

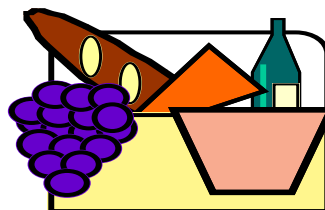
You get more tanned from a day at the beach than a day in the back yard. Can you figure out why?

Sonia and Bill went for a picnic. "I hope you remembered to bring the oil and vinegar for the salad," said Bill.

"I certainly did," replied Sonia, "and to save myself having to carry two bottles I put both the oil and vinegar in the same bottle."

"That wasn't very clever," returned Bill, "Because, as you well know, I like a lot of oil and very little vinegar, but you like a lot of vinegar and hardly any oil."

Sonia sighed and then proceeded to pour, from the single bottle, exactly the right proportions of oil and vinegar that each of them wanted. How did she do it?



Source: *Surprising Science Puzzles* (Sterling Publishing Co., Inc., 1995)

On a clear night, how many stars are visible to the naked eye?

We'd like to know what you think. You can send your answers by mail, email or fax just see the addresses below. Be sure to include your name, age, grade and address on anything you send in. Your answers could appear in a future issue of *Harmonics*.

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 ranks of practicing engineers and scientists in Canada.

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