Vol. 5, No. 2 November 2001

The Engineering Explorations Newsletter

Harmonics

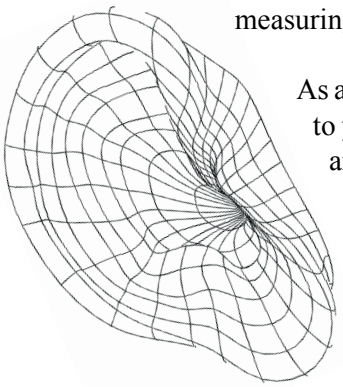
What is Acoustical Engineering?

Have you ever been out on the land alone?What do you hear? When you get away from inhabited areas at first you might think itÕs very, very quiet. Soon though, you start to hear all sorts of sounds you may not be able to hear while closer to home: the rustle of the wind through grass, animals, even your own heart beating. Sound is all around us all the time. Even places we think of as quiet - an empty room, a clearing in the forest - are full of sound. Because sound is such a constant in our lives, scientists and engineers study it. The science of sound is called acoustics, and engineers who work with sound are called acoustics engineers.

While it might seem new to you, you probably know a little more about acoustical engineering than you realize. Have you ever had an ultrasound?This medical diagnostic technology was developed by acoustics engineers.

Sound travels in waves which move at dif ferent speeds in different substances. In ultrasounds, high-frequency waves pass through human tissue. Each time the waves pass from one type of tissue to another some of the waves continue forward while others get reflected back. An ultrasound technician uses a device called a transducer to ÒhearÓ the reflected waves. The transducer can measure how fast the waves are moving and sends this information to a computer. It combines the speed of the reflected sound waves with the length of time they travelled through the body and programmed information about the speed of sound in different types of tissue, to calculate the distance from the transducer to the object the sound waves hit. The computer then assigns a shade of grey to each distance and maps them on a computer monitor generating a picture of a personÕs erupting appendix or growing baby.

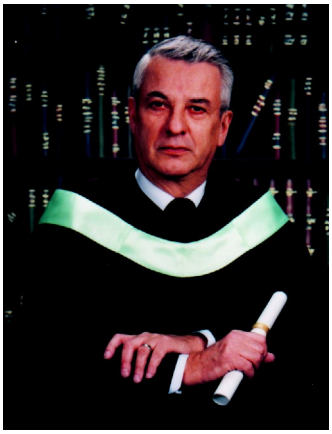
Acoustics engineers use technologies similar to ultrasound to look for flaws in airplane engines, find fish in the ocean, map oil and mineral deposits and track submarines under water . They are also involved in noise control, concert hall and building design and the development of new technologies for measuring sound.



As an acoustics engineer you would have a wide range of skills which could contribute to your community. You could study the effects of low level flying on caribou herds and childrenÕs hearing levels. You could help local fishermen detect schools of fish and fill their nets faster. You could redesign the town meeting hall so people in the back of the room can hear those at the front.You could even contribute to land claims negotiations by mapping mineral and oil deposits on or near traditional lands. Acoustical engineering would be a sound choice for both you and your community.

Native Engineers & Scientists

A place to meet people from your community.



Name: Lloyd G. Mandeville
Nation: Salt River First Nation #195, Fort Smith, NT
School Attended: University of Alberta
Degree: B.Sc., Civil Engineering
Job Title: Part-time Field Inspecting Engineer
Favorite thing about school: Competing and surviving against terrific and intelligent young minds, as well as excelling in my own right academically.

Who could imagine that losing the ability to hear would lead to an engineering degree? In 1992, Lloyd Mandeville, a construction consultant in Alberta, was driving home from work. Without any warning, his world went silent. Doctors still canÕt explain what happened, but in a matter of seconds he had lost 95% of his hearing. Lloyd continued to work, but after a time felt the hearing loss was impacting his productivity. So, at 50, a time of life when most people begin to look forward to retirement, he entered the Transition year program at the University of Alberta. The next year he began his studies in engineering.

At first, the university provided Lloyd with notetakers, people who would attend class with him and act as his ears. But soon these people were replaced with an engineered solution called a pocket talker. A pocket talker is a wireless device which allowed Lloyd to use the hearing he has. In each class a microphone equipped with a transmitter was hooked on to the professor . A small receiver fit into LloydÕs ears. By adjusting the volume, he could hear everything the professor said, but only what the professor said: if another student asked a question, the professor had to repeat it before responding, so Lloyd could follow with the rest of the class. Lloyd says the pocket talker was invaluable and the only challenge he had was reminding professors that they didnÕt have to talk any louder than usual.

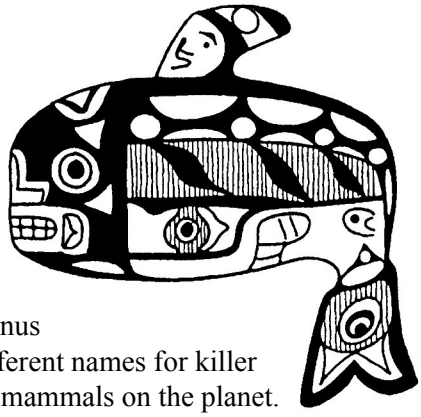
Lloyd graduated with a Bachelor of Civil Engineering in May 2001. While he admits that Òat my age it was very hard to maintain the ener gy level required to study in the program,Ó he Òenjoyed competing and surviving against intelligent young minds.Ó The support of his wife and family, as well as the UniversityÕs Native Student Services were also key, Ò I would not have made it without them, [they are] just a great bunch of people. The students are so fortunate to have them.Ó

And, depite being much older than most students, Lloyd drew on lessons he learned from his parents while growing up on a trapline in the Northwest Territories, ÒMy parents instilled a hardworking ethic that I practice to this day.Ó He recalls his mother insisting that he and his siblings not fall behind in their studies, which were done mostly by correspondence, ÒA big thing for us was to go hunting in the spring with Dad. so we would have to start working ahead in our lessons in mid-January to be able to take 10 days off for the spring hunt.Ó

Since graduating from the University of Alberta, Lloyd has been busy seeking employment as a civil engineer specializing in structural design or geo-technical subsurface exploration. He is looking forward to using the skills he learned in university. At the same time, Lloyd wants to enjoy what heÕs doing professionally, so he is being selective about which offers he pursues, and the one he eventually accepts. In the meantime, he is volunteering as the Region 1 representative for the American Indian Science and Engineering Society, helping Native students in the US northwest, western Canada and Alaska pursue their dreams of science and engineering.

Some of the information in this article was obtained from the University of Alberta web site, http://www.engineering.ualberta.ca/news/home_details.asp?ID=72.

Whale Song



In the languages of coastal peoples in theAmericas, there are many names for killer whales. The Kwakiutl call them maxÕinux; the Haida, ska-ana. In the eastern Arctic, the Inuit have named the animals arluq, and at the southern tip of SouthAmerica, the Yahgan call them shamanaj. The Latin scientific name for the species is Orcinus orca, often shortened to orca. ItÕs not surprising there are so many different names for killer whales because, next to humans, they are the most widely distributed mammals on the planet.

Although killer whales can be found in every ocean, one of the best places scientists have found to study them in the wild is off the west coast of British Columbia. In the straits between the mainland and the islands of the coastal Pacific, there are 19 resident pods (family groups), totalling about 300 animals and another 170 or so lone transient killer whales. Like many sea mammals, killer whales communicate using sound.

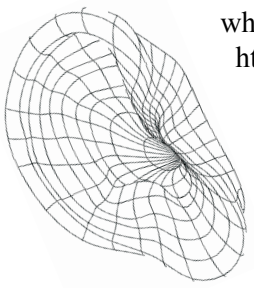
Sound is important to water animals, they use it not only to communicate with one another but also to navigate and hunt. Scientists suspect they use sound because visibility can be extremely limited under water . Members of the dolphin family (killer whales are dolphins) use a method of echolocation much like the sonar used on submarines. By making noises and listening to the echo which returns to them after the sound hits an object, they can create an acoustic picture of their surroundings which helps them to identify food, other dolphins, predators and topographical features like sandbars.

The resident pods off BC each have a distinctive dialect of 7 to 17 different sounds. Because scientists can distinguish each group by the sounds they make, they have been tracking the migration of the pods up and down the coast using a network of underwater microphones (called hydrophones). In 1998, the scientists working at Vancouver AquariumÕs Cetacean Acoustic Lab, decided to share the killer whalesÕ songs with the public.

So, the hydrophone in Robson Bight (just off northeastern Vancouver Island) was set not only to record, but to transmit. The live broadcast can be heard on ORCAFM (88.5FM) within 15 kilometers of the transmitter. It is also carried by land line to the Vancouver Aquarium where it is played for visitors and sent out world wide via the web.

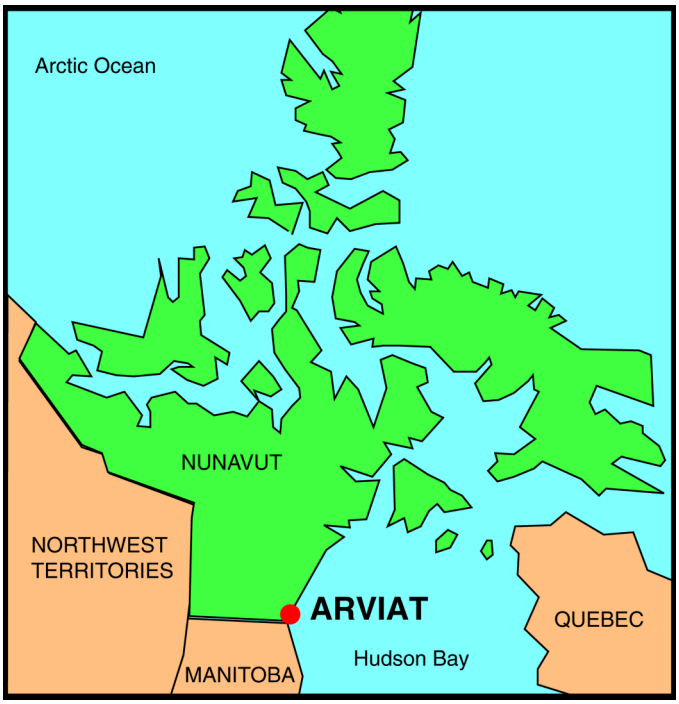
Listening to the whales helps the scientists track their movements. It also helps them to understand more about whale behaviour. For instance, resident pods hunt together and make lots of noise while hunting, probably so each member of the pod knows where the other members are. By contrast, transient killer whales which pass through the same waters tend to hunt silentlyScientists think they stay silent so that they donÕt advertise food sources to other animals.

Check out http://www.whalelink.org to listen to ORCA FM. For more information about whales and dolphins take a look at http://oceanlink.island.net and http://www.seaworld.org.



Community Profile

Arviat, Nunavut



The town of Arviat, formerly known as Eskimo Point, lies on the west coast of Hudson Bay . It is the southernmost community in Nunavut. Arviat is named for a nearby island which is shaped like a bow head whale, a staple of local hunters: the Inuktitut word for bow head whale is *arviq*.

With a population of over 1600, Arviat is a fairly large Arctic community. The townÕs people are a mix of three groups of Inuit:

- the *Paallirmiut* who originally inhabited the area;
- the *Ahiarmiut* who were inland caribou-hunters;
- and whaling people from the areas of Repulse Bay and Caribou Harbour.

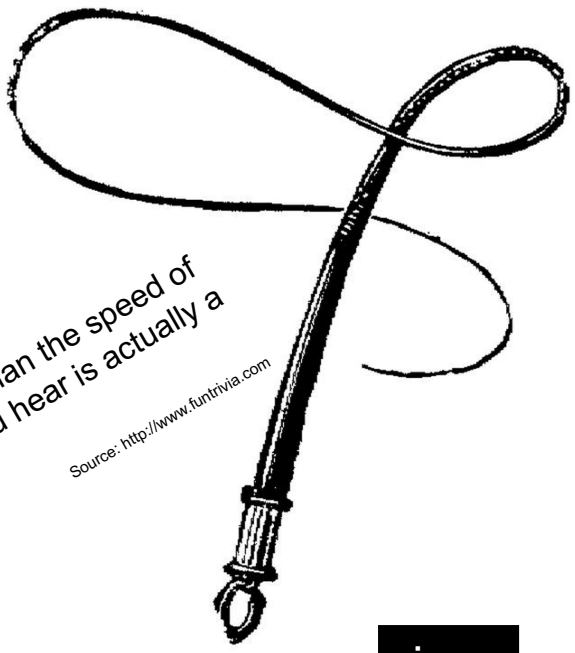
All the peoples of Arviat have worked hard to maintain and combine their traditions, such as throat singing and drum dancing, while building their communtiy.

The community is renowned for its local artists who produce dolls, carvings and other crafts using traditional materials such as antler, bone, soap stone, sinew, and ivory. It is also well-known for producing recording artists such as Simon Sigeeurak (the Johnny Cash of the North), Charlie Panigoniak and Susan Aglukaark.

Because of the wealth of local singers, the three-day Inummariit Music Festival has been held regularly in Arviat since 1989. Inummariit means Òthe real peopleÓ and is meant to be an eclectic celebration of northern life. The festival, which is 100% Inuit owned and run, promotes the talents of performers from all over the Canadian Arctic. The musical artists featured at Inummariit cover a wide range of styles from traditional to country, gospel and even rock.

For more information about Arviat check out http://www.arctic.ca/arviat/, http://collections.ic.gc.ca/arviat/ and http://www.arctictravel.com/chapters/arviatpage.html.

Fun facts and things to think about

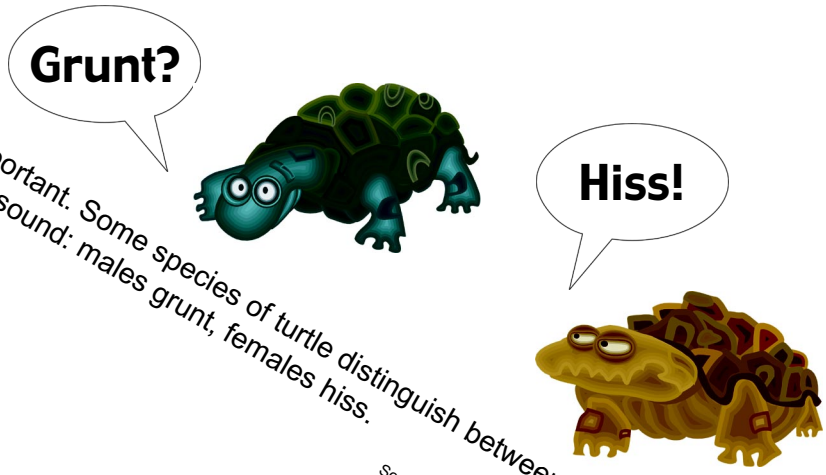


Silence is golden.
-unknown

The tip of a whip travels faster than the speed of sound. The cracking sound you hear is actually a tiny sonic boom.

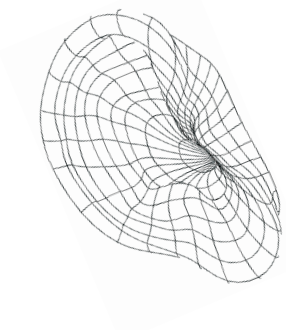
Source: http://www.funtrivia.com

Did you know?
Humans can hear sounds with frequencies from 20Hz to 20,000Hz.
Dogs can hear sounds with frequncies from 67Hz to 45,000Hz.
Dolphins can hear sounds with frequencies from 15Hz to 150,000Hz.



Sounds are important. Some species of turtle distinguish between the sexes largely by sound: males grunt, females hiss.

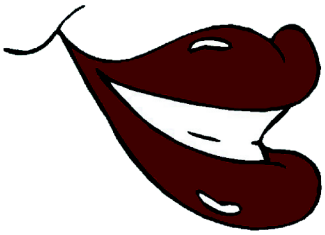
Source: http://www.funtrivia.com



No trumpets sound when the important decisions of our life are made. Destiny is made known silently.
- Agnes DeMille

Puzzles and games

Your best friend wants to tell you something about a guy she likes. She doesn't want anyone else to hear so she whispers it in your ear. From the start point find a path through the maze to the centre of your ear to hear what she's saying.



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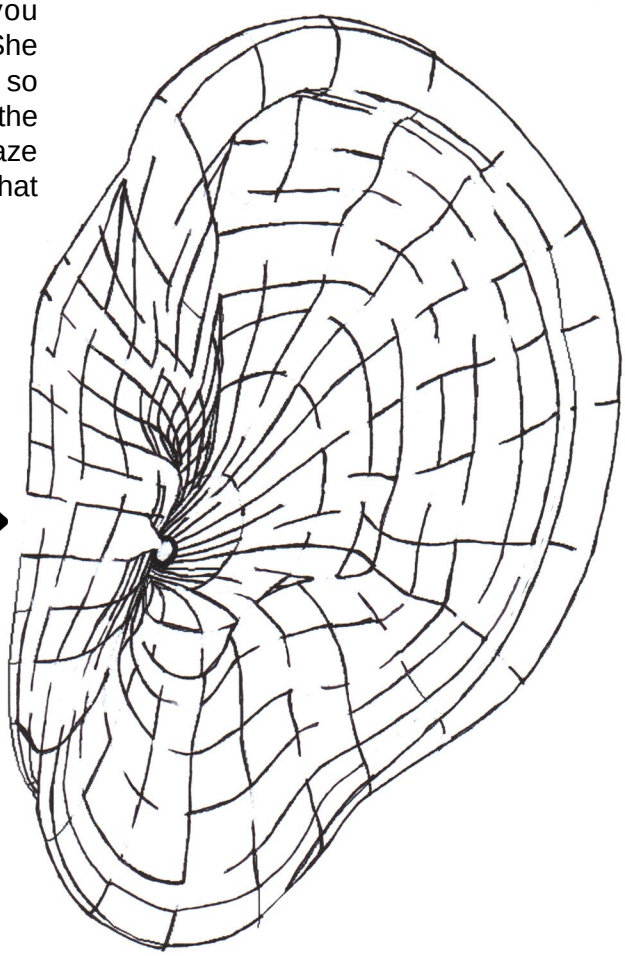

All about us

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

Established in 1993, the projectÕs ultimate goal was to increase the representation ofAboriginal peoples among the the ranks of practicing engineers and scientists in Canada.

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