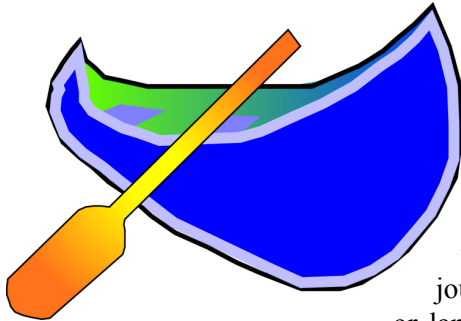




# Harmonics

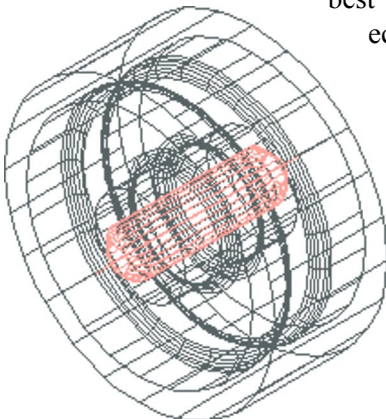
## What is Transportation Engineering?



You know a lot about transportation engineering, but you may not realize it. Think about when you go on a fishing trip with your father and grandfather. YouÖvprobably done this many times, so you know exactly how you are getting there and getting the catch from the river or lake back home. It may seem easy to you, but think about how many questions you have to be able to answer just to get the fish back home. How many fish do you have? How big are they? How far are you from home? Is the trip so long that you need to keep the fish cold or preserve them before the journey? How will you carry the fish? Are you travelling home by boat, foot, or land vehicle? Over paved roads or dirt tracks? Whenever transportation specialists look at a problem, these are the types of questions they have to answer.

Transportation is about moving something from one place to another . It may be as simple as moving your lunch from the kitchen to school, or as complex as moving a family of 4 from Inuvik, NT to Orlando for a visit to Disney World. People who study transportation are generally concerned with three elements, the objects being moved (cago), what they are being moved in (vehicles) and what they are being moved on or through (land, water air or mode of transport). The process can get so involved and complex that there are people who study each or these elements in detail and even specialists for each type of vehicle, car go and mode of transport. Transportation is a broad and expanding field.

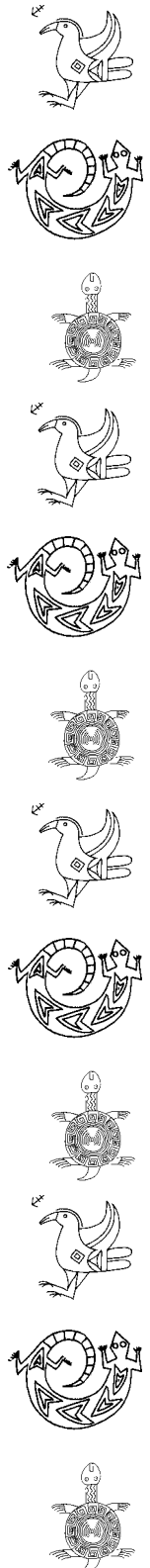
Transportation engineering is a branch of civil engineering. As a general rule, transportation engineers are most interested in the infrastructure of transportation: all the elements which support the movement of vehicles, people and cargo. They design airports and shipping facilities, build roads and plan hiking trails. They also examine the transportation needs of communities. In cities and towns this includes looking at traffic patterns, determining where traffic lights are placed and deciding when and where to build new roads and highways. In remote communities it includes figuring out how to support food and supply delivery and studying the best way to build roads and other transportation infrastructure to support local economic development.



How do people travel to, from and around your community? How many roads does it have? Are they paved, gravel, made of ice? What kind of land is underneath them? Is there a nearby airport or landing strip? What about docks for boats? How do food and supplies reach your local co-op? How do community artists ship their goods to buyers? Is there a mine nearby which needs roads strong enough to support heavy equipment? Many Aboriginal communities need transportation engineers who have the expertise to support local economic and community development. Would you enjoy becoming a transportation engineer? Read on to find out more.



You could become an  
ATV specialist!



# Native Engineers & Scientists

A place to meet people from your community.

**Name:** Brendan Montour  
**Nation:** Mohawk - Kahnawake  
**School Attended:** Concordia University  
**Degree:** B. Eng Mechanical Engineering  
**Job Title:** Director of Public Works  
**Favorite thing about job:** Learning to work with different people.



Brendan Montour's fascination with all things mechanical began at an early age. "It started with bicycles and snowmobiles, then I moved onto motorcycles and cars." He learned to fix things by taking them apart and putting them back together.

His natural interest, along with the encouragement of his welding teacher, Mr. Trotman, made Brendan research a number of technical areas as a teenager. Eventually, he got summer jobs in the field. At 18, he was a concrete instrument technician during the building of Kahnawake's sports complex. The following year, he was a land surveyor taking measurements for municipal pipe installation. These jobs lead him to study engineering at Concordia.

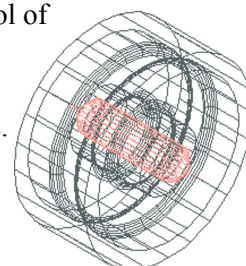
Brendan says that the toughest thing about going into engineering was "the break from my friends. I have spoken with other Native graduates in engineering and this is a common thread. Let's be honest, not everybody goes into the science field and that is even more true in a Native community." Support from my family helped me to deal with this challenge. "Their support also helped him to persevere through the intense work load and lack of sleep. But there were a few things Brendan had to learn by himself; for instance, he discovered that it was better to hand in a good paper on time, than a perfect one a week later. This lesson has led him to encourage students he talks with to strive for perfection but to balance it with flexibility.

Now, as the Director of the Public Works in Kahnawake, Brendan is responsible for eight departments and three of which are connected to transportation: the Roads Department, Highway Maintenance Department and School Bus Transportation Department. As such, he has to ensure that all local roads and transportation systems are safe and maintained which takes "a lot of planning and reviewing of maintenance schedules."

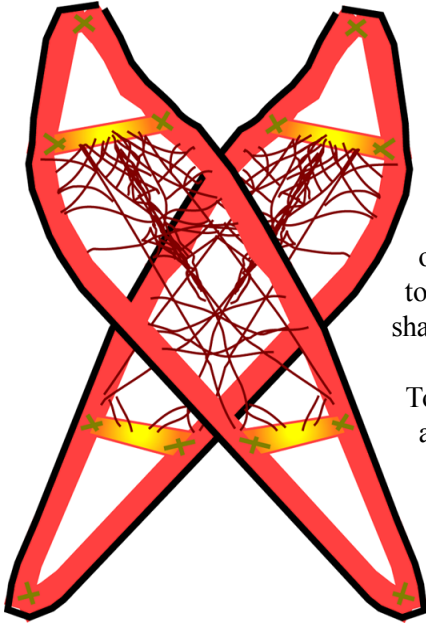
One of the main tasks of the Roads Department is snow removal in the winter and grass cutting along roads in the summer. Kahnawake recently took over this maintenance on the highways which run through the community from the Quebec Ministry of Transport, which meant hiring more people and purchasing more equipment.

Brendan is glad he went into the sciences because, "Science gives you a greater understanding of the natural world." But he knows science may not be for everyone, so he tells students to "decide what is best for them." Still, he believes that a post-secondary education "opens the way to meaningful employment through which you can help your community by adding to the local pool of expertise."

In his own time, Brendan really enjoys spending time with his family and being outdoors. He also races his dirt bike with his brothers and likes to hunt and fish.



# Dashing through the snow



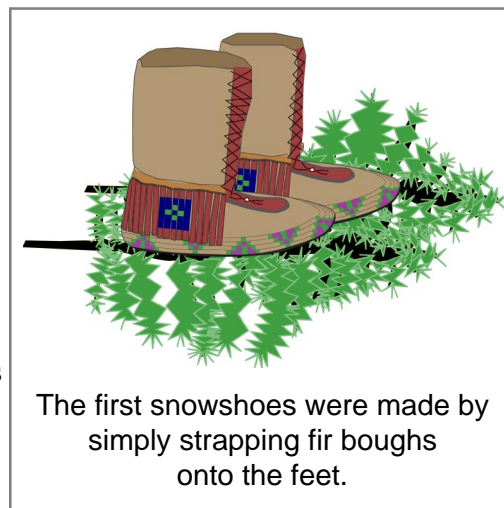
Have you ever gone out on a day where freshly fallen snow is lying thick on the ground? If you're only wearing boots, chances are you'll sink up to your hips. What if you had something to keep you from sinking?

Snowshoes probably originated in Asia, but they were perfected in the Americas, and more specifically by the peoples of the North. Because northern Aboriginal peoples of Turtle Island had to hunt game and otherwise get around in the heavy snows of winter, snowshoes were vital to survival. When Europeans arrived they quickly learned to use this odd-shaped contraption or else sink in the snow and be slowed down considerably!

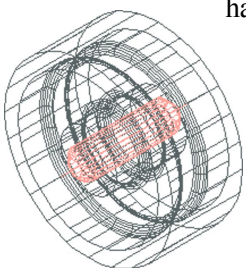
Today, snowshoes are made with hi-tech, lightweight materials like aluminum and plastic resins, and are manufactured in factories. Their general shape and function, however, are much the same as snowshoes made in the traditional way from bent wood and sinew. No matter how they are made, snowshoes must be sized to the wearer: a snowshoe that is too big will be cumbersome and awkward to walk with, while a snowshoe that is too small will not keep the wearer from sinking into the snow and getting stuck.

Snowshoes work using the same basic principle which helps engineers construct huge structures like bridges and buildings: distribution of weight.

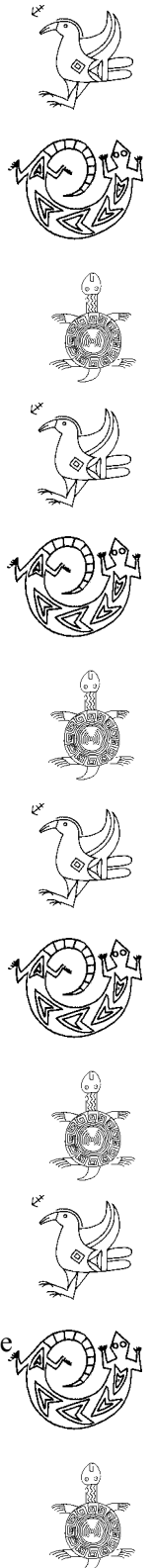
Have you ever had a baby bounce on your belly? Does it feel more comfortable when the baby bounces her toes or when she finally tires out and falls asleep? When the baby is standing on your stomach all of its weight is being supported by its 2 feet (engineers would call these point loads). If you have a 10kg baby bouncing on your belly, she's probably only on 1 foot at a time, which means that tiny foot is supporting 10kg. (Supported a little bit by your of course.) If the baby's foot is about 25cm<sup>2</sup>, this means that there is about 400 grams on each square centimeter. When she lies down, she still weighs 10kg, but now all that weight is spread over a much larger area: it depends on the size of the baby but it will probably be about 1000cm<sup>2</sup>. So when the baby lies down there is only 10 grams per square centimeter pushing down on your belly. That's 40 times less than when she was bouncing!



So, standing on the snow in your boots gives you only 2 point loads to carry all your weight. Snowshoes take that weight and distribute it over a much larger area, so that each square centimeter of snow has to hold up much less of you. In this way you can run, hunt and travel on snowy landscape without the worry of sinking and getting stuck.



Using lightweight materials and the scientific principle of weight distribution, the snowshoes of our ancestors are feats of engineering.





# Community Profile

## Wikwemikong Unceded Indian Reserve

The peoples of the Three Fire Confederacy - the Ojibway , Odawa and Pottawatomi - say that when the Great Spirit, the Gitchi Manitou, was creating the world, he made a special place for himself: an island in which he combined the best of all the parts of his creation - water, air and earth. Today, the island of Manitou is still known by his name, we call it Manitoulin Island.

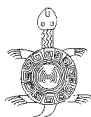


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Manitoulin Island lies near the north shore of Lake Huron, southwest of Sudbury and North Bay. It is the largest fresh water island in the world. People have lived on the island for more than 30,000 years. Today, the Wikwemikong Unceded Indian Reserve covers 417 square kilometers on Manitoulin's eastern peninsula. It is home to 2,700 people, with another 3,600 members who live off reserve. Locally the people of Wikwemikong call themselves Wiky. Their reserve is the only unceded reserve in Canada. This means that they never signed any treaties with the government and still lay claim to the lands of their ancestors.



Manitoulin Island is a popular summer vacation spot for many people. A good deal of business in Wikwemikong focuses on the tourist industry. The reserve has a marina, a golf course and a number of tour companies, one of which runs island tours with all-terrain-vehicles or ATVs.



ATVs were developed in Japan as a farm-to-town vehicle for isolated, mountainous areas. During spring thaws and rainy seasons steep mountain roads were often impassable with conventional vehicles, so ATVs became a very popular mode of transportation. When they were imported to Turtle Island, they immediately became popular, especially in rural and remote communities where they could travel over land which was impassable by other vehicles.



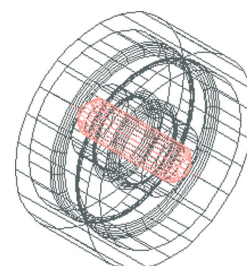
WaWashkesh Wilderness ATV Tours runs 2-hour and day-long tours of areas in and around Wikwemikong, including Be-Nong-Ghong (The Cliffs) and Mid-Weh-Ghong (Where-you-can-hear-the-rapids). The tours are fun, and designed to show people areas of the island they wouldn't normally be able to visit. WaWashkesh is also very safety conscious; ATVs often have little or no built-in suspension and balloon wheels, these features make them fun and bouncy, but also very unstable. To avoid injuries and accidents WaWashkesh insists all clients wear helmets, ride with a guide who knows the land, and drive at safe speeds.



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For more information check out, [www.quadtours.com](http://www.quadtours.com).



# Fun facts and things to think about

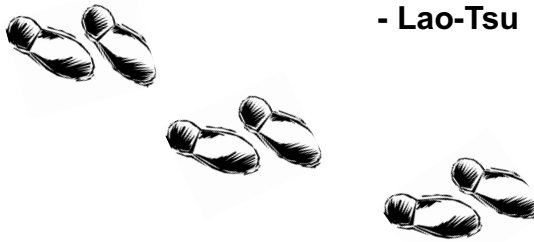
Did you know?

In the Baffin region, the only road connecting two communities is a 21 km section linking Arctic Bay and Nanisivik.  
<http://www.arctictravel.com/chapters/vehiclepage.htm>



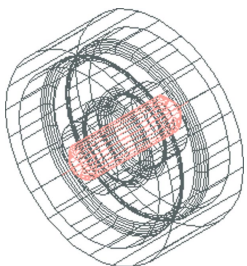
**A journey of a thousand miles must begin with a single step.**

**- Lao-Tsu**



In Canada, there are:

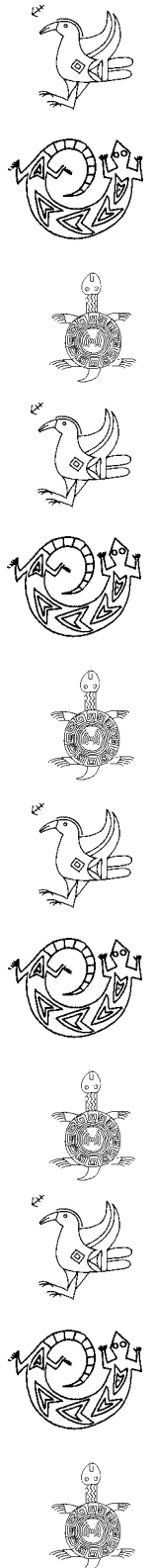
- 1,800 aerodromes/airports
- 28,000 registered aircraft
- 50,000 kilometres of railway track
- 3,260 rail locomotives
- 112,000 rail freight cars
- 430 rail passenger cars
- 300 marine ports
- 2,170 commercial marine vessels
- 900,000 kilometres of road
- 11,600 urban transit buses
- 2,500 urban passenger rail vehicles
- 375,000 heavy-duty trucks
- 17 million cars and light trucks
- 16,000 service stations
- 20 million licensed drivers



Transport Canada

[http://www.tc.gc.ca/envaffairs/english/UNCSD9\\_April23\\_01.htm](http://www.tc.gc.ca/envaffairs/english/UNCSD9_April23_01.htm)

**Two roads diverge in a wood, and I – I took the one less traveled by, and that has made all the difference.  
- Robert Frost**



# Puzzles and games

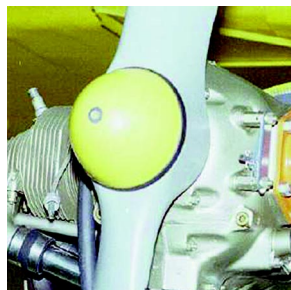
## What is it?

Each of these pictures is related to transportation.  
Can you identify the image in each photo?



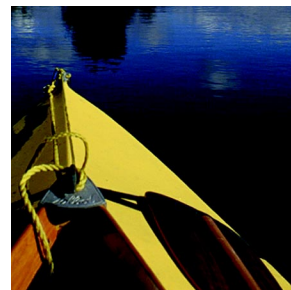
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1. Speeding through the snow.



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2. Round and round and round it goes.



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3. If you tip, you just roll back up.



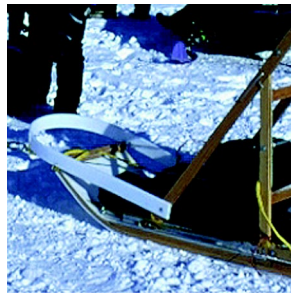
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4. On the road again.



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5. Two great lines go east-west.



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6. Uses puppy power.

Answers: 1. snowmobile; 2. airplane propeller; 3. kayak; 4. tire; 5. train tracks; 6. dog sled

## 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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