

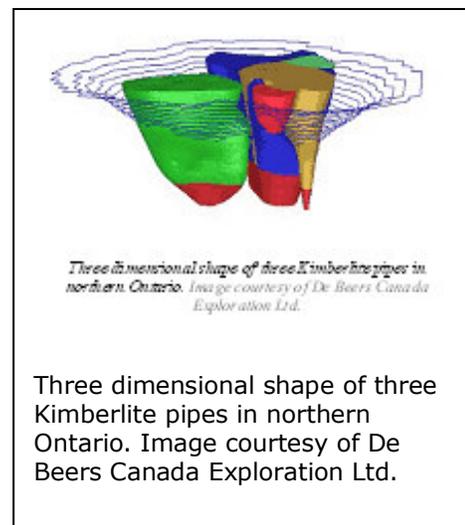


Diamonds in the Snow

Diamond is a mineral, a natural crystalline substance and is the transparent form of pure carbon. Diamonds found today were formed billions of years ago deep in the Earth's mantle, approximately 150 kilometres below the surface. Carbon in the mantle was squeezed together under tremendous heat and pressure, transforming it into hard, clear diamond crystals. Millions of years after the diamonds were formed, ancient explosive volcanoes acted like elevators, bringing diamonds from deep inside the Earth up through rocky carrot-shaped pipes to the surface. The pipes filled with volcanic rock, mantle fragments and some embedded diamonds. The rocks formed in the pipe and by the explosion are called kimberlites. Kimberlite pipes vary in size and shape, but are generally between 50 metres to several hundred metres across.

Diamond exploration begins with a search for the telltale kimberlite pipes – evidence of the long-ago eruptions. Diamond-bearing kimberlite pipes are only found in ancient areas of the continents. But diamonds have also been found far from the pipes. This is because volcanic rock erodes and is washed away over time. Rivers, streams and glaciers can carry diamonds far from the original volcanoes.

With much of Canada underlain by ancient bedrock, the existence of diamond-bearing kimberlite makes Canada a prime target for exploration. The first Canadian diamond was found in 1920 near Peterborough, Ontario by a worker digging a railroad cut. This diamond, and perhaps others, originated in kimberlite pipes located in the far north. Erosion released the precious mineral from a pipe and ancient glaciers pushed the diamond south. The first Canadian diamond mine was just recently opened in 1998 after exciting kimberlite discoveries in the Northwest



Three dimensional shape of three Kimberlite pipes in northern Ontario. Image courtesy of De Beers Canada Exploration Ltd.

Territories. This mine now produces 6% of the world's diamond production, and diamond exploration in Canada is rapidly expanding.

Where to find Diamonds in Canada:

- Northwest Territories
- Wawa, Ontario
- Chapleau, Ontario
- James Bay Lowlands
- Even more prospective sites in Alberta, Manitoba, and Quebec!

Diamond Mining and Processing

There are two main types of diamond mining:

1. Pipe Mining: Extracting diamonds from kimberlite pipes

Initially kimberlite is dug from the surface of the pipes. Once the surface deposits have been exhausted, shafts are sunk into the ground at the edge of the pipes, and tunnels are driven into the deeper parts of the pipes. After the diamond-bearing rock is brought to the surface, it is transported to a sorting plant.

2. Alluvial Mining: Extracting diamonds from riverbeds or ocean beaches

Millions of years ago some diamonds were eroded out of the pipes and carried great distances along rivers and even into oceans. In order to extract diamonds from beaches, a wall is built to hold back the surf. Up to 25 metres of sand is bulldozed aside to reach the diamond-bearing level. Once reached, the diamond-bearing soil is removed and transported to a sorting plant. Mining of these deposits depends upon sufficient concentration and quality of diamonds.

The Sorting Plant

Diamond has a very high density, which means it can be sorted out from the waste rock by density suspension. In this process the diamond bearing rock is mixed with a muddy water suspension and stirred by rotating blades. The heavier materials, including the diamonds, settle to the bottom while the lighter waste rises to the top. The diamonds are sorted out from the ore concentrate usually by one of two methods:

1. Grease table

Diamonds repel water but are attracted to grease. So an easy way to pick out the diamonds is to flush the concentrate with water over a surface covered with grease, called a "grease table." The diamonds stick to the grease while the waste debris is washed away.



EKATI Diamond Mine – Canada's first diamond mine located in the Northwest Territories. Image courtesy of BHP Billiton Diamonds.

2. X-ray sorter

Some diamonds are fluorescent. This means that when diamonds are exposed to ultraviolet light, the diamond can absorb the high-energy radiation and re-emit it as visible light. An x-ray sorter takes advantage of this property. Diamonds fluoresce when exposed to x-rays and a sorter detects the fluorescence and triggers a jet of air, which knocks the diamond into a collection box.

Earth's Hardest Gems are on the Cutting-edge of Technology

Diamonds are beautiful, rare and durable, but they are used for much more than gemstones. Since diamond is the hardest substance on Earth it has many uses. Diamonds' hard edges are used in dentists' tools to drill through tooth enamel and doctors perform surgery with diamond-edged scalpels. The precious mineral is used in protective eyewear, computer chips, and construction tools. Natural diamonds

were even used to make a tiny window in the Pioneer spacecraft that went to Venus in 1978.



Sparkling Diamonds

- Most diamonds are 3 billion years old.
- On the Mohs scale of hardness diamonds are the hardest at 10.
- Diamonds are better heat conductors than copper.
- Diamonds are the birthstone for April.
- Diamonds are measured by their weight in carats. One carat is equal to 1/100th of an ounce. The average diamond in an engagement ring weighs less than 1 carat.

Experience Diamond Exploration with your Students

Visit <http://www.sciencenorth.on.ca/groundwork/> to explore for diamonds. Using maps, photographs and encouraging text, this interactive Web site takes your students through four exploration activities - geological mapping, geochemical surveys, geophysical surveys, and diamond drilling. After successfully locating a diamond-bearing kimberlite pipe, your students can continue their detective work as they explore for gold and copper!