Module B. Colour from the Cosmos

Lesson 10 - Diamond Geology and Geography

Where is Diamond Found Locally?

Geologists and exploration companies had postulated for many years that Canada's north should host diamond bearing kimberlite but it wasn't until the 1980's that serious discoveries began. Today (by 2012 numbers) Canada is the world's 3rd top producer of diamonds by value (representing ~16% of global production), with four operating mines. The rise of Canada as a diamond producing country has had a major impact on the global industry.

In 1991 the first economic diamond-bearing kimberlite pipe was discovered in the Lac de Gras area in the Northwest Territories. This would become established in 1998 as the [Ekati Mine](http://www.ddcorp.ca/home" \t "_blank), started by BHP Billiton and now owned by Dominion Diamond Corporation. It took just under one year for Ekati to produce its 1 millionth carat and now produces between 3 to 5 million carats annually from a number of distinct kimberlite pipes.

A stone's throw away from Ekati (30 km to the SE) is the [Diavik Diamond Mine](http://www.diavik.ca/" \t "_blank), which officially opened its doors in 2003 and produces approximately 8 million carats annually through a partnership between Harry Winston Corp and Rio Tinto. Canada's third economic deposit is De Beers' [Snap Lake Mine](http://www.canada.debeersgroup.com/Mining/Snap-Lake-Mine/), also located in the NWT. It was discovered in 1997 and started production underground in July 2008 with an expected ~1.5 million carats to be produced annually, though output in 2011 was ~900,000 carats.

De Beers' also claims ownership of Canada's fourth diamond mine, the [Victor Mine](http://www.canada.debeersgroup.com/Mining/Victor-Mine/), which is located in northern Ontario within the Attawapiskat kimberlite field. It also began production in early 2008 and is expected to produce ~600,000 carats annually. Many other sites teeter on the verge of becoming mines, including the Jericho, Gahcho Kué, Aviat, Chidliak, Fox Trot and Fort a la Corne diamond projects.

Distribution of clusters of diamond-bearing kimberlite in Canada in areas that are underlain by the Canadian Shield. Note how the majority of the known kimberlite localities are hosted in Archean Rocks older than 2.5 billion years. Localities as follows: 1) Kyle Lake cluster, Ontario; 2) Renard cluster - north Otish Mountains, Quebec; 3) Wemindji sills, Quebec; 4) Anuri, Nunavut; 5) Lac Beaver - south Otish Mountains, Quebec; 6) Aviat cluster, Melville Peninsula, Nunavut; 7) southeast Slave field, Gahcho Kué cluster, NWT; 8) southeast Slave field, Snap Lake area, NWT; 9) southwest Slave field, including the Drybones Bay and Upper Carp Lake clusters, NWT; 10) Victoria Island field (with four distinct clusters), Nunavut and NWT; 11) Crossing Creek cluster, southeast British Columbia; 12) Rankin Inlet field, Nunavut; 13) Attawapiskat field, Ontario; 14) Kirkland Lake field, Ontario; 15) Lake Timiskaming field, Ontario and Quebec; 16) Jericho cluster, Nunavut; 17) Fort à la Corne field (with six distinct clusters), Saskatchewan; 18) Somerset Island field, Nunavut; 19) Buffalo Head Hills field, Alberta; 20) Birch Mountains cluster, Alberta; 21) Lac de Gras field, NWT; 22) Coronation Gulf field, Nunavut; 23) Snow Lake - Wekusko, Manitoba; 24) Brodeur Peninsula cluster, Nunavut; 25) Baffin Island, Nunavut; 26) Boothia Peninsula, Nunavut; 27) Wales Island, Nunavut; 28) Repulse Bay cluster, Nunavut; 29) Darnley Bay cluster, NWT. Figure adapted from Kjarsgaard and Levinson (2002).

The Diavik Diamond Mine and kimberlite cluster in Lac de Gras, NWT, Canada. Photo courtesy of [Diavik Diamond Mine](http://www.diavik.ca/default.asp" \t "_blank).

Diamonds with perfect octahedral shapes from Diavik Diamond Mine, Lac de Gras, NWT, Canada. Photo courtesy of [Diavik Diamond Mine](http://www.diavik.ca/default.asp" \t "_blank).

Fancy yellow diamond from the Misery Pipe on the Ekati Property with slightly modified octahedral shape. Photo from 2013 NI43101 Report on Ekati Property.

Because the Archean craton stretches across Canada from northeastern B.C. all the way across to Nunavut and Quebec, the prospective area for diamond mineralization in kimberlite host rock is very high. Indeed, a number of advanced exploration projects and feasibility studies are underway by many different companies. Old craton is also present in the United States and Greenland. Although some discoveries have been made in both places, none are (yet) of the scale that Canadian occurrences have shown to be.

**Optional Reading Resource**

The story of diamond exploration in Canada is an exciting one, and many books have been written on the subject. These include "Fire Into Ice: Charles Fipke & the Great Diamond Hunt" by Vernon Frolick and "Barren Lands: An Epic Search for Diamonds in the North American Arctic" by Kevin Krajick.

You will find a great deal of technical and objective information on Canadian diamond exploration in "[Diamonds](https://connect.ubc.ca/bbcswebdav/pid-2559827-dt-content-rid-10494249_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleB/lesson09/download/Diamonds%202010%20Annual%20Review.pdf)", a review from the 2010 Canadian Minerals Yearbook, Natural Resources Canada.

**Required Video**

View the required video entitled [*Queens of Diamonds*](https://connect.ubc.ca/bbcswebdav/pid-2559827-dt-content-rid-10494249_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleA/00-modA-les08and10-queensdiam-video.html) which follows the dramatic adventures of two women and their high-stakes quest to develop Canada's next diamond mine in Nunavut. This video showcases a good cross-section of the diamond exploration industry in Canada from the boardroom to the field, from the science lab to investor shows. Don't forget to use the [Queens of Diamonds Guide](https://connect.ubc.ca/bbcswebdav/pid-2559827-dt-content-rid-10494249_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleB/lesson09/download/Queens-of-Diamonds-Guide.pdf)to help you with the video.