

Introduction

Prehistory

The first mines in the territory that became Canada were unquestionably those that were dug by the First Nations peoples. As long as 6000 years ago, there was trading in North America in native copper that had been mined from excavations in the Lake Superior area — particularly on the Keweenaw Peninsula and Isle Royale. Wayman (1985) mentioned that as many as 5000 pits, each containing about 1000 tons of rock, were dug over a 5000-year period until 1000 A.D. Starting somewhat later, about 4000 years ago, the Maritime Archaic Indians mined the chert beds at Ramah Bay, Labrador, for material from which to fashion implements (Wilton et al., 1994). Still later, there was trading in native silver from the Cobalt area during the period 200 B.C. to 200 A.D. How many prehistoric small mines were there in Canada? We will probably never know the total, but there must have been hundreds, if not thousands.

By the time that Canada was born in 1867, there had been two centuries of mineral exploration and mining by the European settlers. As would be expected, the pattern of development and exploitation followed the penetration of the explorers and the people who followed into the interior of the continent.

The first record of mining in Canada by Europeans was in 998 A.D. when the Vikings mined bog iron ore near their settlement at L'Anse aux Meadows, Newfoundland. It was only some 600 years later, however, that the tempo increased as the first explorers examined the territories beside the Atlantic coast and the waterways that led to the heart of the continent. In 1577, Martin Frobisher searched for gold at the Countess of Warwick mine on Kodlunarn Island, near Iqaluit, on Baffin Island. In 1583, there was prospecting near today's St. John's, Newfoundland. In 1603, malachite was discovered beneath a mountain "with a greenish hue" in Quebec's Gaspé Peninsula. In 1604, Master Simon, a mining engineer accompanying Samuel de Champlain, reported silver, iron and native copper in parts of Nova Scotia.

Coal in the Maritimes

In 1639, what may have been Canada's first mine, a coal mine, was opened at Grand Lake, New Brunswick. In 1643, a shipment of coal was made from New Brunswick to England. Could this have been the birth of the export trade in minerals from the territory that would come to be known as Canada? It seems likely.

In 1654, Louis XIV of France granted a concession to Nicholas Denys to mine gold, silver and

copper on Cape Breton Island, Nova Scotia. The mining of the coal seams at Sydney is reported to have begun in 1672. The first mining of coal by “regular methods” was reported to have taken place at Cow Bay, Cape Breton Island, in 1720. It was used to supply Fortress Louisbourg. In 1724, a shipment of coal from Cape Breton to Boston was reported. In 1784, the government began the systematic mining of coal at Sydney. The first mine shaft in Nova Scotia was sunk at Sydney in 1830.

Oil and Gas in Ontario

Sometime in the 1850s, seepages of heavy petroleum were observed from the “gum beds” near Oil Springs in southwestern Ontario. It is likely that the first use was as an illuminating oil to replace whale

oil. In 1857, the Williams Number 1 Well, the first in Ontario and also the first producing oil well on the North American continent, was drilled in Enniskillen Township of Lambton County.

The Williams “refinery,” using the oil that seeped through to the surface, was constructed that year. By 1865, there were six refineries at Oil Springs. Production ceased in 1867, however, at the time of the Fenian Raids when many of the operators and drillers left the country (Harkness, 1926).

By 1870, there were 40 refineries, mostly small and using “stills,” in the London and Ingersoll areas. The number had been reduced to 13 in 1890, and to 3 by 1898.

In 1880, Imperial Oil built its first refinery at London. In 1897, it moved to Sarnia through its acquisition of the Bushnell Refining Company.

In 1889, the first well of the Provincial Natural Gas Company came into production in Welland County with a flow of over two million cubic feet a day. Others followed, with the Number 5 well producing eight and a half million cubic feet daily. As happens with natural gas, however, well pressures are reduced as production continues. This declined rapidly after 1900.

Iron in Quebec and Ontario

Meanwhile, in a more or less concurrent development, the Sieur de la Portlardière was sent from France in 1667 to investigate the iron deposits that had been reported at Baie St. Paul and in the St. Maurice Valley. In 1729, the famous Forges du St. Maurice were established at Fermont, near Trois-Rivières, to treat the abundant bog iron ores of the region. In 1736, the construction of

North America's second charcoal-fueled blast furnace (the first having been built in Virginia) was begun. Les Forges remained in operation until financial difficulties caused it to close in 1883.

Throughout the 19th century, the mineral industries developed rapidly as colonization spread westward. The first ironworking in Ontario, using bog iron ores, was reported to have taken place at Chippawa in the final years of the 18th century. The province's first blast furnace was erected at Furnace Falls (Lyndhurst) at the falls of the Gananoque River in Leeds County. This was followed by another blast furnace at Potter's Creek (Normandale), which proved to be unsuccessful.

In 1820, the Blairton or "Big Ore Bed" mine, Ontario's first iron mine, was opened in the Marmora area of Hastings County. The Marmora Ironworks followed in 1822. While not very successful at first, the operations ultimately succeeded. About 1870, the Blairton mine was reported to be the largest iron mine in the province — and there were then several. In the last decades of the 19th century, there were numerous iron works in Ontario, Quebec, New Brunswick and Nova Scotia. It was the period during which Canada was industrialized.

Coal in British Columbia

On the west coast, colonization had begun. In 1835, coal was discovered at Suquash on Vancouver Island. Mining began the following year. The Douglas coal seam at Nanaimo was discovered in 1850. By 1852, the economic importance had become such that the Hudson's Bay Company sent a Factor, J.W. McKay, from Victoria to take possession of the coal fields and to collect royalties from the users. In 1853, Governor James Douglas issued the first proclamation relating to mining in British Columbia.

Gold

Since earliest times there has been perhaps no other metal that has attracted as much attention as gold. Valued greatly for its beauty and the ease with which it can be worked into ornaments, it is the metal of legend. Much of the history of Canadian mining has been built upon this part of the industry.

The first attempt by Europeans to mine gold in Canada was when Martin Frobisher searched for it in the Arctic in 1577 (unsuccessfully). In 1823, however, placer gold was discovered in the streams of the Chaudière Valley in Quebec's Beauce region. Several rich deposits were discovered in 1847. Mining continued in the area until 1912.

In 1848, gold was discovered by settlers at Lawrencetown, Nova Scotia. This was followed by other discoveries in: beach sands near Halifax in 1857; the Tangier River and Mooseland in 1858; the Tangier district in 1860; the Oldham district in 1861; the Lawrencetown, Isaacs Harbour, Renfrew and Goldenville districts in 1862; the Mount Uniacke district in 1865; and the Fifteen Mile stream area in 1869. In 1858, the Legislature of Nova Scotia obtained possession and assumed control of the mines and the minerals in the province. In 1861, it took possession of the Tangier district in order to protect the landowners and secure the mineral rights. By the end of the century, there were almost 100 operating gold mines.

On the opposite side of the country, gold was discovered at Mitchell Harbour in the Queen Charlotte Islands in 1852. This triggered the first gold rush in British Columbia. Other discoveries soon followed at the mouth of the Pend d'Oreille River in 1855 and at the confluence of the Fraser and Thompson rivers in 1857. This resulted in a gold rush to the sand bars of the lower Fraser River in 1858. As the discoveries mounted there were further rushes to: the Cariboo district in 1860; Williams Creek in the Cariboo in 1861; Wildhorse Creek in the Kootenays in 1863; Leech Creek in 1864; the Big Bend area of the Columbia River in 1865; the Yukon River in the Yukon in 1869; Dease Lake in 1873; Granite Creek in 1885; Boundary Creek in 1886; and the Klondike in the Yukon in 1898. After the staking of the Discovery Claims on Bonanza Creek in the Yukon in 1896, there resulted one of the greatest gold rushes in the human experience. Who has not seen the early photographs of a seemingly endless line of people trudging up the Chilcoot Pass?

In British Columbia, as in Nova Scotia, it was necessary for the government to restore order and maintain control as quickly as possible. To that end, Governor James Douglas issued his second proclamation on mining relating to gold mines in the Kamloops, Ashcroft and Vernon areas in 1857. This was followed by the *Goldfields Act of British Columbia*, which was enacted in 1859. The Government Assay Department was established in New Westminster in 1860. This was followed by a mint, which operated for only a few years in 1862.

In the centre of what would shortly become a new Dominion, gold was discovered at Madoc in Hastings County, Ontario. The original strike in 1866, which resulted in the Richardson mine, has a unique place in Canadian history since it marked the first time that gold had been discovered in the Canadian Shield. Naturally, a gold rush to the Madoc-Marmora area followed immediately, with other famous mines resulting: Cordova, Golden Fleece, Ore Chimney, Sophia, and others. All of these deposits, however, while being rich were also very small. Thus, gold mining was intermittent and short-lived.

Copper, Silver, Asbestos, Nickel, and Other Minerals

In the 1600s, the missionaries who traveled into the Lake Superior country found the First Nations peoples using implements that had been fashioned from native copper. These deposits were mentioned in 1640. Over a hundred years later in 1770, while the Jesuits were experimenting with the native copper found at Point Mamaise, Alexander Henry returned from England with plans to mine the deposits. Unfortunately, the narrowing of the vein at depth resulted in a cave-in that caused the first recorded mining fatality in what would become Canada. At about the same time, Samuel Hearne was sent by the Hudson's Bay Company to explore for copper in today's Northwest Territories. In 1771, he discovered native copper at Coppermine, near the Arctic Ocean.

In 1843, copper was discovered at Bruce Mines on the north shore of Lake Huron. By 1846, the Bruce, Wellington and Huron Bay mines were opened by the West Canada Mining Company to exploit these deposits. Canada's first copper smelter was erected there in 1848 (it closed in 1850) and, before the mines closed in 1875, the area had become the most famous mining centre in Canada. In 1856, the Montréal Mining Company acquired native copper locations near Point Mamaise on the eastern side of Lake Superior. These locations were sold in 1871 to the Ontario Mineral Lands Company, and ultimately, in 1890, to the Canada Lands Purchase.

In 1847, the Geological Survey of Canada, which had been founded in Montréal in 1842, reported on the discoveries of copper ores in the Eastern Townships of Quebec. Several mines, such as the Eustis, near Capelton, were opened from the 1860s onward. The Eastern Townships was an important copper-producing region until well into the 20th century.

In 1846, veins of silver were reported near what has now become Thunder Bay. Several years later in 1868, the legendary Silver Islet deposit, on a small islet in Lake Superior, was discovered. Operating from 1870 until it flooded in 1884 (after the pumps failed due to a lack of fuel), it would occupy a unique place in Canadian mining history. Not only was its output tremendous for its time, it was also a place at which many new technologies were introduced into the Canadian mining scene: (1) the diamond drill, invented by Hermann in 1854, and later improved by others, was first used in Canada at Silver Islet in 1873; (2) The Burleigh piston-type compressed-air-powered rock drill, introduced in the late 1860s, was introduced at Silver Islet in 1872; and (3) the Frue Vanner, for concentration, was developed on the site in 1872. In the 1870s, the mining of asbestos began in the Eastern Townships of Quebec. The Johnson Asbestos Company's mine at Thetford Mines began operations in 1878. The W.H. Jeffrey mine at Danville, and the Bell Asbestos, Ward & Ross, and Lucke & Mitchell mines at Thetford Mines all began in 1880. The King Brothers' Hampden mine at Thetford Mines opened in 1881.

In 1882, during the construction of the Canadian Pacific Railway across northern Ontario, copper-nickel ore was uncovered in a rock cut near the site of what would become the Murray mine. The identification of the minerals in 1883 encouraged others to search for similar outcrops and gossans. In short order: the McConnell orebody was discovered in 1883, the Worthington in 1884, and the Stobie, Copper Cliff and Creighton orebodies in 1885. In 1886, the Canadian Copper Company was incorporated and the Copper Cliff, Stobie and Evans mines were in operation. The original shipments of ore were sent to refineries in Swansea, Wales; Long Island, New York; and Constable Hook, New Jersey. The latter was operated by the Orford Copper Company, which had its origins in the Orford Nickel and Copper Company, which had been organized to exploit a copper-nickel deposit in Orford County in the Eastern Townships of Quebec in 1878. In treating the ores from Sudbury, the nickel was recognized. The Orford Process, used for effectively separating the copper and the nickel as two distinct layers in the melt, was developed by them in 1891. In 1888, in order to reduce the costs of shipping the contained metals to the refineries, the Copper Cliff smelter, for the production of a Bessemer matte, was blown in. Still in operation today, after many modifications, it is Canada's longest operating smelter.

The middle to the latter part of the 19th century was a period of great activity in the development of Canada's mineral industries. Some of the key developments, other than those described previously were:

- the first mining of gypsum, near Paris, Ontario, in 1822;
- the production of the first hydraulic cement in Canada at Hull, Quebec, in 1840;
- the opening of Canada's first graphite mine, the Miller (Keystone) mine, near Grenville, Quebec, in 1845;
- the first report by the Geological Survey of Canada of copper ores in the Eastern Townships of Quebec in 1847;
- the discovery of corundum in Lanark County, Ontario, in 1847;
- the beginning of gypsum mining near Hillsborough, New Brunswick, in 1847;
- the opening of the Forsyth iron mine at Hull, Quebec, in 1848;
- the discovery of copper at Tilt Cove, Newfoundland, in 1857;
- the opening of the Ramsey lead mine at Carleton Place, Ontario, in 1858;
- the beginning of mica mining in Ontario in 1860;
- the first production of oil in Ontario, at Oil Springs, in 1862;
- the production of salt at Seaforth, Ontario, in 1869;
- the beginning of coal mining at Lethbridge, Alberta, in 1870;
- the beginning of apatite mining in the Lièvre River district of Quebec in 1871;
- the first staking of claims for silver at Eureka Mountain near Hope, British Columbia, in

- 1871;
- the first production of soapstone in Brome County, Quebec, also in 1871;
 - the discovery of gold in the Lake of the Woods area of Ontario in 1878;
 - the beginning of coal mining at Canmore, Alberta, in 1888;
 - the discovery of natural gas in Essex County, Ontario, also in 1888; and
 - the discoveries of gold-copper at Rossland and lead-zinc at Kimberley, British Columbia, in 1889.

During the 1880s, the Ottawa-Hull area was an important mining region because of the scores of phosphate and mica mines in the townships of Hull, Portland, and Templeton in Quebec, and in Frontenac and Lanark counties in Ontario. Many of these were first mined for apatite as a source of fertilizer. When large deposits of animal phosphate (guano) were discovered in the southern United States, however, the market disappeared rapidly after 1892. By 1930, the total output of apatite was a mere 40 tons.

Concurrent with the decline in the market for apatite, though, was an increase in the demand for mica. Used in the manufacture of electrical equipment, it was in great demand during the latter part of the 19th century. The result was that the same pegmatite dike deposits that had been mined for apatite were now being mined once again for mica. Still later, there was further mining for feldspar and quartz.

Development of the Infrastructure

All of these events resulted in singularly important contributions to the growth of our mineral industries. Communities were built close to the mines that were being developed — often times too close, and on top of the mine workings — as at Cobalt, Haileybury, Red Lake, Val-d'Or, and many other locations. The period, however, was at the beginning of the development of efficient transportation in Canada. The great period of railway building began in the 1860s and it was not until many years later that a transportation network was in place. Those working in the mines had no alternative but to live close by their place of employment. That continues in all areas of employment today, the notable difference being that the invention of the automobile and the airplane has made it possible for all of us to travel much farther to and from work than our predecessors would have believed possible. In effect, an automobile is a space ship at our own personal disposal.

The period from the 1860s onward was the period when the construction of the railways linked communities together and made it possible for mine owners to have a more efficient means of shipping their products to the markets — mostly to the south. There are stories of entire

communities being moved when the line or the station was placed elsewhere. In eastern Ontario alone there were dozens of small lines that were constructed in the hopes of deriving profits from the minerals to be shipped and the people to be transported. Often times, when the deposits did not live up to expectations, the lines were ultimately abandoned. The “Barry’s Bay and Bessemer,” “Belleville and Madoc,” “Brockville and Westport,” “Irondale and Bancroft,” and “Kingston and Pembroke” lines are names that have passed into history. Some of the lines remain, now part of either the Canadian National or the Canadian Pacific, or other systems. The others, long abandoned, remain as roadbeds into the period when Canada was being industrialized.

Development of Technology

The period was also that of the great industrial revolution. It was a time when all aspects of human endeavour were becoming more mechanized, no matter how simple these advances seem to be in retrospect.

Prior to the middle of the 19th century, mining had been a brute-force and dangerous occupation. Drilling was by hand methods. Blasting involved the use of black powder. Illumination in underground mines was by open flames or by safety lamps in coal mines. Ore sorting was primitive and by hand, and the means of liberating the valuable minerals from the gangue was most often the stamp mill. The difficulties are highlighted by the fact that, in 1903, the Nova Scotia legislature passed the *Deep Mining Act* through which subsidies would be given to assist in the sinking of shafts deeper than 500 feet.

In 1866, Alfred Bernard Nobel discovered the means of making dynamite. A Canadian patent was granted to C.W. Vollney of Brockville, Ontario, in 1873, while the first Canadian explosives plant was established in Kingston by George W. Mobray in 1876. A new, and safer, means of breaking rock was about to be introduced.

Concurrently, compressed air was introduced in the late 1860s and early 1870s. This enabled the distribution of power in mines through compressed air systems. While incredibly inefficient as a means of transmitting power (with only a small percentage of the energy being transmitted into the rock at the drill), it enabled energy to be transmitted as never before. The piston-type rock drill was developed by Charles Burleigh, an American, in 1865. The Burleigh drills, first introduced into Canada at Silver Islet, were subsequently replaced by drills developed by Rand and Ingersoll in the 1870s and 1880s. The diamond drill, invented by Hermann in 1854, was developed by Leschot in the 1860s, and later improved by Holt and Severance. These, too, were introduced quickly into Canada (first at Silver Islet).

In 1897, George Leyner of Colorado introduced hollow drill steel that permitted the flushing of

drill holes with water. This has been identified as perhaps the most significant advance in the entire history of rock drilling.

Developments in the crushing and grinding of rock were made through the Blake jaw crusher, developed in 1854, and through the rotating mills that were introduced in the 1850s and 1860s.

Another development that took place was the first introduction of the recovery of gold by cyanide leaching at the Brookfield gold mine in Nova Scotia in 1893.

Finally, the latter part of the 19th century and the early part of the 20th century was the period during which the electrification of North America took place. The first introduction of electricity into a Canadian mine was possibly at the MacRay phosphate mine in Templeton Township, Quebec, north of Hull. It became the first mine in the province to use electricity for motive power when it used it in 1890 “for boring and extracting, etc.” (Rapport du Commissaire des Terres de la Couronne, 1891). It was followed closely by the reported use of electric-powered machinery in a Nova Scotia gold mine in 1891.

The foundation was being laid for the transformation of mining from a brute-force “art” to a more efficient and sophisticated “science.” Diane Newell (1986) has called this period at the latter part of the 19th century the period of the “professionalization” of mining engineering.

“Professionalization” of Mining

The many Canadian mines that were developed in the 19th century created a demand for a local supply of engineering talent. Up to that time, the only alternative was to recruit mining engineers and other professionals from the schools that had been established for some time in Europe: Ptrozavodsk, Russia, in 1715; Feiberg Mining Academy, the world’s first technical university, in 1765; St. Petersburg Mining Institute, Russia, in 1773; Almadén, Spain, in 1777; École des Mines, France; and the Government School of Mines and Science Applied to the Arts, United Kingdom, which evolved into the Royal School of Mines, in 1863.

In North America, the first School of Mines was opened at Columbia University in New York City in 1864. The second program, and the first in Canada, was established at McGill University in Montréal in 1870. In 1892, the Kingston School of Mining and Agriculture was established at Queen’s University. Other programs followed.

The period also had to have been one when, because of the activity in the industry and the “professionalization” that was taking place, professionals felt the need to come together to meet and to exchange ideas and information through the vehicles of professional organizations. The first such organization, the Gold Miners Club of Nova Scotia, was formed in Halifax in 1887. The following year it became the Gold Miners Association of Nova Scotia and, in 1892, it became the Mining Association of Nova Scotia, which continues to this day as the Mining Society of Nova Scotia.

In 1891, the General Mining Association of the Province of Québec was formed in Montréal. This was followed by the Ontario Mining Institute in Toronto in 1894 and the British Columbia Association of Mining Engineers in 1895.

In 1896, the mining institutes of all the provincial groups came together as the Federated Canadian Mining Institute. At its second meeting in Montréal in 1898, it was dissolved and the Canadian Mining Institute was founded. By Act of Parliament in March 1898, the Institute was incorporated to include all of the former provincial groups. The Mining Society of Nova Scotia, however, while becoming affiliated with the Canadian Mining Institute in 1918, has kept its name and individual functions to this day.

During the past century, the dimensions and shape of the Canadian minerals industry have changed greatly with energy now representing well over half of the country's total annual production. In 1990, in recognition of this, the name of the Institute was changed to the "Canadian Institute of Mining, Metallurgy and Petroleum."

The New Technologies

During the last decade, there has been phenomenal growth in computing and information technologies. Against the background that many companies believe increasing productivity will be the key to survival and international competitiveness in the global market, the focus in the mining industry has very much been on improved mechanization and automation. In some cases, the thinking is being extended toward robotization and separating workers from the hazards of their occupations to the greatest extent possible.

During the past century, the minerals industry has moved from what was once a brute-force and often dangerous occupation to a highly sophisticated "high-tech" industry. The great majority of people in the industry use some form of advanced technology in the performance of their work, and safety records have improved to the point that the minerals industry is now one of the safest of the heavy industries. Truly, an industrial revolution has taken place!