MINERAL RESOURCES AND MINING ACTIVITY IN THE CANADIAN EASTERN ARCTIC*

by J. LEWIS ROBINSON

CANADA has two Northlands—the West and the East. The former has been geographically endowed with resources possible of development; the latter is a barren, bleak and little-developed region. The two regions are quite distinct and differ greatly in many respects. The problems which are met in opening-up and developing Canada’s Western Northland are not the same as those which will be met in the Eastern Arctic. While it is possible to move about fairly freely in the Mackenzie Valley area during the summer and to a lesser extent during the winter, the Eastern Arctic is almost cut off from the rest of Canada during the winter, except for the god-send of radio. In the East, summer transportation facilities are different from those of the West and more limited by natural conditions.

The Eastern Arctic may be roughly defined as that part of Northeastern Canada north of the tree-line, which is serviced from the Atlantic and Hudson Bay. It comprises an area of about 700,000 square miles, including most of the numerous and large Arctic Islands, totalling about 19 per cent of Canada. In this area, about twice the size of the Province of British Columbia, or about equal to the area of Quebec and Manitoba combined, live about 150 white inhabitants and 6,000 Eskimo (79 per cent of the Canadian Eskimo population).

There are 30 tiny settlements within this region, approximately 100 to 200 miles from each other. Each of the settlements has a trading post which consists of four or five buildings. Many of them have no more than that, while others may have Department of Transport Radio and Meteorology Stations, Royal Canadian Mounted Police detachments, and church missions. The two hospitals at Chesterfield and Pangnirtung are normally attended by Government doctors. The largest settle-

ments have from 25 to 30 buildings in all, including warehouses, outhouses and blubber sheds, and approximately 15 or 20 people is the greatest white population at any one place.

The region may be reached only by water or air, the dependability of both methods being influenced by natural conditions. The nearest railroads terminate at Churchill on western Hudson Bay, and Moosonee on southern James Bay. There are no roads within the area and no need for roads, since nearly all of the tiny settlements are located on the coast. Supplies and mail are brought into each of the posts during the short summer season, and communication during the rest of the year is by radio, with which each settlement is equipped. Air transport is still in its beginning stages and has been hampered by serious fog and icing conditions. Water transportation has been the only dependable way of reaching the settlements and it has been hindered at times by uncertain ice conditions in a short navigation season. From late October to late June the harbours are frozen over, and the sea-ice extends for several miles out from the coast. Drifting ice floes which reach the Atlantic through Hudson and Davis Straits may impede navigation at any time.

These are some of the problems of the Eastern Arctic, and illustrate why a study of the geography of the region is necessary to understand why it is so different from the rest of Canada, and why development has come slowly to the area.

The resources of the Eastern Arctic are limited. They are limited both in known quantity and quality, and also in relative accessibility to the more populated parts of Canada. The last Ice Age left the Eastern Arctic as an area of little possible agricultural development by virtually denuding it of soil. The

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West coast of Hudson Bay. The low, swampy and lake-dotted character of the coast which extends westward from Hudson Bay makes overland travel by foot very difficult in the summer, while canoe travel is hampered by glacial drift which has cut off drainage. When this region is frozen over and snow-covered, sledge travel by dog-team is relatively easy.

R.C.A.F. photos
present Arctic climate, influenced by the cold Labrador current flowing southward between Greenland and Baffin Island, has maintained the region as a generally "barren" land with no forest growth.

To the natives of the area, who comprise most of Canada's Eskimo population, the chief resource is the game of the land and sea. They hunt the caribou herds which migrate over a large part of the area, and use them for food and clothing. The Eskimo traps white foxes during the open season and trades the furs to the trading companies for ammunition, food, and utensils. An abundant sea life in the form of seals, walruses, white whales and fish supply food, dog-feed and clothing to the native population. For the limited Eskimo population of this vast region the game resources have been fairly adequate in giving them a relative self-sufficiency.

But what are the resources of the region which will attract interest from the rest of Canada and encourage development? It has been true of many pioneer areas that mining has been the forerunner of future settlement, and, in the Mackenzie District of the Northwest Territories, it is one of the bases for economic development, when associated with other resources. In a region such as the Eastern Arctic, where other assets are either limited or lacking, mineral resources become important in estimating the value of the area; and a general knowledge of the geology of the
region is fundamental in understanding the mineral possibilities.

**General Economic Geology**

In any consideration of the economic mineral possibilities of the Eastern Arctic, basic factors of geologic structure and mineralization must share their importance with problems of accessibility, transportation and climate. Much of the area is underlain by Precambrian rocks of the Canadian Shield from which great wealth in rich minerals has been extracted in its southern and western sections. The ancient assemblages of sediments and volcanics, which occur amid the predominant granites and gneisses of the Eastern Arctic, resemble the rocks which are found in the southern part of the Shield. "Since these rocks in the Northwest Territories seem to be the counterpart of those to the south both as regards the kinds of rocks present and their relations with the invading igneous rocks, there is no known reason why they, too, should not be the sites of valuable mineral deposits." (1) Limited prospecting has shown this mineralization is present locally.

Although the fact that minerals are to be found is promising, it must be noted that to overcome the higher costs of transportation and development any finds must be proportionately richer than those in more accessible areas. Geologic knowledge has indicated that mineral wealth may be found, but economics and geography must determine whether these resources can or will be developed. Although information on the geology of the Eastern Arctic is based primarily on what has been observed along coastal strips, with interpretation for the interior areas, it is sufficient to take a broad view of the region in considering economic possibilities. Certain areas seem to be promising, while others can be ignored for several reasons.

The areas covered by ice caps or permanent snow-fields can be excluded from economic consideration. This includes several large sections in Ellesmere Island, most of Devon Island, much of the interior of Bylot Island, and scattered high or mountainous areas of Baffin Island. In Keewatin and Ungava Districts there are extensive areas, as yet not closely defined as to boundaries, which are covered by glacial drift. Prospecting is difficult or

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impossible in such areas because structure is hidden, and only drilling can reveal with certainty what lies below.

Sedimentary rocks of Palaeozoic age are found mainly in the central and western Arctic islands. Since the latest known period of widespread mineralization in Canada preceded the deposition of these sediments, rocks of this and later ages may be excluded as promising sources of metalliferous deposits. Such rocks, however, may still be considered as sources of coal, oil or gas. Most of the far northern islands, except the east coast of Ellesmere and Devon Islands, are included in this category. Similarly, large areas of sedimentary rock occur on Prince of Wales and Somerset Islands, Broughton Peninsula and the central west coast of Baffin Island, the coasts of Boothia, Simpson and Melville Peninsulas, and the southwest half of Southampton Island.

Inaccessibility by ship, because of ice conditions, prohibits much hope for the development of the Parry or Sverdrup Islands, unless large ice-breakers are used.

In the same way, difficulties of sea-transport as a result of drifting ice in the very short navigation season makes mineral development unlikely along the east coasts of Ellesmere and Devon Islands.

Most of Keewatin and Ungava Districts and Baffin Island remain as areas of Precambrian granites, gneisses, schists, sediments and volcanic eruptives. These areas have been relatively well endowed both as to mineralization and accessibility. Here, also, lack of tree growth and soil leaves the rocks exposed to the prospector after many millions of years of weathering.

West Coast of Hudson Bay

Along the western side of Hudson Bay the coast is low-lying and generally flat. It is dotted with countless lakes which spill uncertainly one from another. The rivers and lakes which appear on the maps are chiefly the routes of early explorations, but from the air they may be difficult to pick out from the other numerous unmapped lakes and rivers which surround them. Coastal transportation is limited to small
schooners along much of this low coast because of the shallow water and shoals which extend into Hudson Bay. In winter, travel is fairly easy by dog-team across the frozen, snow-covered surface, but in summer the myriad of lakes, swamps and intervening spongy muskeg confine travel chiefly to the rapid-infested rivers.

One of the most promising areas for mineral development lies between Eskimo Point and Chesterfield on the west side of Hudson Bay and inland as far as the Kazan River. The region, so far as is known, is mainly underlain by two divisions of rocks, both of Precambrian age. One group consists of granite and granite-gneiss, the other of volcanic and sedimentary strata. Although the gneisses have produced mineral wealth in the southern part of the Shield, the granites have been found to be generally barren, and therefore it is likely that those of the northern region will be similarly lacking in economic minerals. The volcanics and sedimentary strata, on the other hand, are known to contain mineral deposits.

Although traces of gold and silver were first reported from this area in 1885 by Robert Bell of the Geological Survey of Canada, it can be said that intensive prospecting of the mineral resources did not start until 1928. At that time four major companies turned their attention to the Hudson Bay region and simultaneously explored the area with the use of canoes, supply ships and spectacular servicing by aeroplane. These companies were: Northern Aerial Minerals Exploration (N. A.M.E.), Dominion Explorers, Cyril Knight Prospecting Company, and Nipissing Mining Corporation.

During the spring of 1928 unsuccessful attempts were made to reserve large areas for certain companies. However, all started on an equal basis as soon as the ice broke up and the season opened. Late in July the N.A.M.E. ship *Patrick and Michael* and the Dominion Explorers' schooner...
Morso entered Hudson Bay, but arrived too late in the season to allow for little more than preparatory work for the next season's activities. The *Patrick and Michael* was wrecked at the entrance to Baker Lake, but most of the equipment was saved and N.A.M.E. established their base and wireless station at the old Royal Canadian Mounted Police barracks near this place. The *Morso* brought material for a base and wireless station at Tavani and also delivered supplies safely to another base at Baker Lake. Planes were carried to the Bay on the ship, and later others flew in to join the Dominion Explorers' expedition.

The Nipissing Mining Corporation sent canoe parties into the area west of Hudson Bay. One came via Great Slave Lake and the Thelon River and the other by rail to Churchill and thence along the coast. The Cyril Knight Company used canoes for exploration and aeroplanes to service their parties.

In the 1928 season, investigation was limited chiefly to the coast, with exploratory flights inland. Only two locations were staked: gold at Term Island by the Nipissing party, and pyrrhotite at Rankin Inlet by the Cyril Knight Company. Mineralization was noted at several scattered places, but occurrences were small.

During the winter N.A.M.E. maintained their base at Baker Lake, while the Dominion Explorers' party stayed at Tavani. The latter group made a difficult flight to Baker Lake, but abandoned further attempts at winter flying. They also tried to move freight by tractor north from Churchill over the sea-ice along the coast.

Early in the spring of 1929 men and planes gathered at Churchill and started an early season of reconnaissance. Spring mists hung over the land most of May, hindering ski-plane observations, and then in late June flying was suspended until the ice on the lakes broke up. Ground
parties could do little prospecting work until the end of June, when the surface was free of snow.

The Nipissing and Knight companies confined their summer activity chiefly to proving and developing their claims on Term Island and on the north shore of Rankin Inlet. The other two companies continued aerial exploration and servicing of their ground parties, who were scattered from Eskimo Point and Padleli on the south to Repulse Bay on the north, and as far inland as the Kazan and Thelon Rivers.

The Nipissing Mining Corporation located and prospected a mineralized shear zone near the contact between the volcanic rocks and granite on the northeast side of Term Island. Free gold, accompanied by pyrite and chalcopyrite, was found in quartz and silicified greenstone. A small open cut was hand-picked and about 1,100 pounds were shipped out. This proved to be the extent of the deposit.

Work of Dominion Explorers covered a broad stretch of low-lying coast south of Chesterfield in which rock exposures are meagre due to glacial drift, and where little could be done without more intensive study than was possible at the time. The more rugged country north of the inlet was found to be largely unpromising granites or gneiss.

Late in the summer the MacAlpine party in a Dominion Explorers' plane was forced down on the Arctic Coast, and were cared for by Eskimo until Dease Strait froze over, when they were guided to the Cambridge Bay trading post on Victoria Island. In the widespread searching operations carried on by plane for the missing party, much more of Keewatin and eastern Mackenzie became known by aerial reconnaissance.

During the 1929 season no new finds of importance were made in the Hudson Bay area, and in the following year the two aerial companies turned their attention to the Coppermine River area. Although
the Hudson Bay activity was ambitious for that time, it was barren of economic returns. The costly adventure was useful chiefly in giving valuable experience, which helped in future operations in the Mackenzie District, and in pointing out some technical problems that had to be overcome in the planes of that time. Large sums of money were spent in two seasons of investigating the Hudson Bay area, but no economic deposits were discovered; the only claims staked were by the two companies who used more conservative methods.

The conclusion stated by Guy Blanchet, who was one of the leaders of the Dominion Explorers’ field party, was that, after two years of intensive prospecting on a large scale, “Where the exposed rock was of a character that might lead to the expectation of mineral deposits, the lack of intrusive bodies and structural disturbances discouraged the hope of finding anything important.”(1) However, much of the country rock was covered by glacial drift that hampered prospecting, so that these operations do not necessarily prove the country worthless for mining. Exploration has shown that the area is definitely mineralized, and it remains for future investigation to attempt to discover commercial deposits.

The Cyril Knight Prospecting Company was the only party to return to the west coast of Hudson Bay in 1930. Diamond drilling during that season showed that their claims at Rankin Inlet contained a mineral body which is a sulphide ore intruded between sedimentary and volcanic rocks, containing considerable pyrrhotite.

with a little chalcopyrite, pentlandite and pyrite. In one place the mineralization extends beneath the sand and gravel of the shore.

The Company estimated that a profit could be made by shipping out the 30,000 tons of indicated high grade ore to a smelter, but, unless more than 200,000 tons of medium grade ore could be uncovered, it would not pay to build a concentrator on the location. It was further estimated that one million tons would have to be found to justify the construction of smelting and refining facilities at the ore body. In 1931, however, the Cyril Knight Company claimed that owing to the remoteness of the area, the lack of transportation, and the depressed condition of the base metals market, further development of the mineral deposits at Rankin Inlet was inadvisable, and requested that the area be withdrawn from the representation provisions of the Quartz Mining Regulations. (4) In June, 1931, due to general adverse conditions, a moratorium was created in the whole Northwest Territories relating to representation work. This moratorium expired in October, 1933, and claim owners again had to work on their claims to maintain them in good standing.

In 1935, International Nickel representatives flew in to Rankin Inlet with Cyril Knight to investigate the property. In 1937, due to the fact that some of their claims were expiring unless additional work was carried on, the Knight Company

(4) Any licensee who has recorded a mineral claim is entitled to hold it for one year provided that he performs work on the claim to the value of at least one hundred dollars. Any excess may be credited to subsequent years.

R.C.A.F. photos
decided to prove up the deposit thoroughly for its size and economic possibilities.

In mid-April, 26 tons of mining material, including drill equipment and a radio station, were carried by ski-equipped planes from Churchill to Rankin Inlet. They planned to ship in further mining equipment by boat when the navigation season opened, after obtaining drilling results. Their plans thus utilized the advantages of both air and water transportation. Drilling lasted from May to July, and when the results indicated that the mineral body was not of a substantial tonnage, the ship did not sail with the further equipment. The report of 2,413 feet of drilling operations showed that the ore body pinched out and was only 350 feet long and 100 feet deep. The Company's engineer in charge reported that "it is believed that sufficient drilling has been done to indicate that the body is limited in extent".

Other individuals and companies have investigated the mineral possibilities of Keewatin District within recent years. A private prospector from Churchill staked some claims near Padlei in 1938. In the summer of 1941 the Hudson Bay Mining and Smelting Company flew a group of prospectors north to Padlei and from there they spent the season investigating the area. Previous to that the Company had already quietly carried on for two years of extensive mapping and reconnaissance geology. However, no claims were filed as a result of their work.

During the summer of 1942, several prospectors of the Hudson Bay Exploration and Development Company explored the area west of Hudson Bay, between latitudes 60°-63° north, and as far west as longitude 99°. The Company staked four widespread claims within this region.

*East Coast of Hudson Bay*

Ungava Peninsula of Northern Quebec is a rolling plateau area which rises rather abruptly along the eastern Hudson Bay

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Top to bottom:

- *Hudson Bay post, Lake Harbour*  
  [R.C.A.F. photo]
- *Arctic Bay, Baffin Island, September, 1943*
- *Wolstenholme, Ungava, Quebec, August, 1943*
- *River Clyde, Northwest Territories, October, 1943*
and southern Hudson Strait coasts to altitudes of 1,000 to 2,000 feet, and slopes down toward Ungava Bay. North of the tree-line, which roughly extends from southern Ungava Bay to Richmond Gulf on Hudson Bay, the surface is one of broad, alluvial and gravel-filled valleys between low ridges of bare rock. This area is similar to the west coast of Hudson Bay in that it is also underlain by the old Precambrian rocks which comprise the foundations of about two-thirds of Canada.

At the same time as the area on the west coast of Hudson Bay was being investigated, similar prospecting activity was being carried on along the east-coast of the Bay. In 1928 N.A.M.E. staked several claims in the area of Little Whale River, searching for an extension of the lead deposits which had been mined there by the Hudson's Bay Company as early as 1749. They also sent two men inland to investigate native reports of copper and lead deposits. No further action was taken by the Company.

In the years 1931-32 a greenstone belt that extends into Ungava District from Cape Smith was prospected by several companies, led by the Cyril Knight Prospecting Company. Mineralization had been first reported from here, in 1900, by A. P. Low of the Geological Survey. The prospectors found the belt to be 40 miles broad, and they explored it inland for 150 miles. Mineral showings were located on Smith Island and the nearby mainland. In 1933 prospectors and supplies were transported by plane from Moosonee, and a more intensive study was made of the discoveries.

The greenstone belt, (5) probably early Precambrian in age, consists of altered lavas, and some sediments, all cut by diorite dykes. The area is bordered to the north and south by granitic and gneissic rocks. The rocks of most of the belt are intensely folded, with a generally northeast strike. Some of the pillow lavas are sheared and faulted.

The mineral showings are sulphide deposits which consist of massive, fine-grained pyrrhotite cut by veinlets of coarser pyrrhotite, associated in places with small amounts of chalcopyrite. Assays indicated, however, that the gold content of the quartz veins is either nil or so low as to be of no commercial value, while only traces of copper and nickel were found in the sulphides. The Knight Company decided that the mineralization of the whole greenstone belt was probably all of the same uniformly low grade and no further work was done.

Exploratory work has thus shown that mineralization occurs throughout this area, but testing of one section has shown that the sulphide bodies are much too low grade to encourage development. It is quite possible that the same condition applies to the whole greenstone belt, but only further prospecting can determine this. "The belt has been barely explored, not to say prospected, and it compares favourably in size with any of the larger areas of similar rocks that, throughout the Canadian Shield, are generally considered to constitute favourable ground for prospecting."(6)
An iron formation of Proterozoic age found in the Nastapoka Islands and Richmond Gulf area of the mainland on the east side of Hudson Bay has been known for a long time. (7) Iron formations hundreds of feet thick were described by C. K. Leith in 1910. (8) Since then many of the leading steel companies have sent men into the area to look over the deposits carefully, and all have agreed that none constitute iron ore under present conditions. Seven of the islands of the Nastapoka group have been patented to two companies (in 1903 and 1916) giving rights forever to the surface and all base minerals except coal. No development work has been done on the iron formation. The other islands of the group have not been surveyed and are available for disposition under the Quartz Mining Regulations. These late Proterozoic sediments, however, hold little hope for finds of precious metals.

The Belcher Islands, located about 60 miles off the east coast of Hudson Bay, are a maze of narrow islands cut by long arms, bays, inlets and sounds. Their broken hills and long, low, black ridges are the eroded tops of submerged ranges which appear again northward in the Sleeper and King George group of islands.

An iron formation similar to that which was known in the Nastapoka area was investigated by R. J. Flaherty in 1916. When E. S. Moore reported on the iron, in 1918, he stated that he saw no ore of commercial value but that there was a large reserve of iron formation. (9) He found 39 feet of iron oxides mixed with jaspilite in bands and therefore very difficult to extract.

A more comprehensive study was made by G. A. Young in 1921. (10) He reported that "no iron ore of commercial value, under existing conditions, was seen. Highly ferruginous zones were found, and, where exposed, there were always two or more zones in evidence. Thickness of zones varied from 10 to 50 feet, with a total thickness of 365 feet."

"Examination of the material itself indicated that the zones are composed almost wholly of silica and iron oxides. The silica is largely in the form of quartz, the iron oxides in the form of magnetite and hematite, but a small proportion of the silica and iron oxides is combined as an iron silicate. In four samples tested, silica varied from 32-46 per cent. By hand-picking these layers the metallic iron content could be raised to 50 per cent, or more, but the silica content would still be greater than 20 per cent, and this hand-picking process would be expensive.

Young pointed out that the formation is similar to that forming the rich Mesabi Range of Minnesota, and that it is possible that ore bodies may be hidden by the glacial drift mantling the islands.

In 1928 the N.A.M.E. Company did some surface work and drilling in the iron deposits of the Belcher Islands. They found that some of the exposures contained as much as 48 per cent iron and that the ore was low in phosphorus. The Company, however, withdrew from the area due to difficulty of transportation to markets.

Most of the iron formation of the Belcher Islands has been leased to Belcher Islands Iron Mines Limited. In 1940, the Company claimed that "a suitable process for the development of the iron ore on the locations has been secured, and in spite of low grade ore and the remoteness of the Belcher Islands from markets, the Company is satisfied that, with further expenditure, an iron mining industry may be established". However, the Company has been unable to obtain priorities for steel equipment or the necessary labour to do very much work on the property since then.

In 1940, the Ore Dressing and Metallurgical Laboratories of the Department of Mines and Resources tested a sample of hematite from the Belcher Islands. They found that it contained 43 per cent iron and 29 per cent silica. The percentage of iron is relatively high, and is very finely crystalline. Ten per cent silica, however, is usually the limit for commercial development. The laboratories found that it was very difficult to separate the ore from the gangue by the common methods of concentration, and reported that "this iron formation does not seem suitable for commercial recovery of iron".

Thus, the iron of the Belcher Islands can be classed as an iron formation, but,
Richmond Gulf. Iron formations are exposed here in the tilted Proterozoic strata between Richmond Gulf and the east coast of Hudson Bay. This is near the southern limit of the Eastern Arctic, and has small trees growing in the sheltered valleys.

R.C.A.F. photos
so far as known, not as a deposit of iron ore under present conditions. (11) However, the islands have not been fully prospected, and higher grade deposits may yet be found. Though iron is present in large amounts, technological problems prevent it from being economically important at present. When this factor is combined with general inaccessibility and present lack of transport to the Belchers, it becomes evident that ores in more accessible places will be used before the reserve wealth of the islands becomes necessary.

In the interior of Ungava District on the Quebec-Labrador boundary, in the vicinity of Hamilton Falls, a large deposit of iron ore has recently been explored. Field work has demonstrated that ore is definitely present in large quantities. These deposits have been traced discontinuously as far north as Fort McKenzie. Rocks of a similar age continue north along the Koksoak River past Fort Chimo, where traces of iron formation were noted by A. P. Low in 1895. (12) Whether deposits with the grade of the Labrador ore occur this far north into the Eastern Arctic is not yet known.

Baffin Island

Baffin Island is the largest of the Canadian Arctic islands. Its area of slightly over 200,000 square miles is about equal to the area of the Province of Manitoba. The high mountain range which extends along its whole northeast coast from Pond Inlet to Cumberland Sound is the highest range of Eastern North America, with altitudes of 10,000 feet having been recently noted by aeroplanes crossing the area. Picturesque scenery reminiscent of Switzerland, is found in the long glaciers, deep fiords, and serrated ridges of this east and northeast coast, which rises majestically directly from the water. The south coast is lower and less spectacular. It rises steeply from the water in a drab, bare-rock surface to altitudes of about 1,000 feet and extends inland as a general rolling plateau of about 2,000 feet elevation. On the northern side the upland slopes down toward the broad tundra lowland west of Amadjuaq and Nettling Lakes.

The south and east coasts of Baffin Island hold possibilities of mineral wealth. Discoveries of mica, graphite and garnet have been noted at several places. However, most of the known minerals of the area are non-metalliferous, and occur either in small or low grade deposits. Their lack of value has prevented them from playing a part in the world market. The whole indented south and east coast of Baffin Island is accessible from the Atlantic for several months of the year, and although present known deposits have been of no value, the fact that mineralization has occurred should point the way to future investigation.

Attempts to utilize the mineral resources of southern Baffin Island have been unsuccessful. In 1876 an American took a large load of mica from the Cumberland Gulf area, reported to be worth $120,000; and in the early part of this century the Hudson's Bay Company mined the graphite of Blacklead Island. The Hudson's Bay Company also shipped a small tonnage of graphite from Lake Harbour in 1917-18. Following World War 1, the Hudson's Bay Company shipped both mica and garnet from Lake Harbour to England, but the project was soon dropped.

The Admiralty Inlet area, centring around the post of Arctic Bay in northern Baffin Island, is considered to be a promising prospecting area. Here faulted and folded Precambrian and lower Palaeozoic sediments have been cut by several dykes of gabbro and basalt. Mineralization is known to have occurred along the contacts. Gold, silver, platinum, copper, iron, nickel and antimony were found in small quantities by Captain Bernier's exploratory parties in 1910-11. Against the favourable facts of good structure and known mineralization are the problems of long distance from markets, a short and uncertain navigation season, and incomplete knowledge of the area.

An attempt was made to prospect the Arctic Bay area in 1937. J. F. Tibbett, geologist, accompanied by F. McInnes, a retired Royal Canadian Mounted Police officer, travelled by dog-team in the spring from Churchill to Arctic Bay via Chesterfield and Repulse Bay. They were delayed on the way and reached Arctic Bay only a short time before the Nascopie arrived on the Eastern Arctic Patrol to take them out again. The men found that snow cover hindered the work, and their time was too short for adequate reconnaissance. They staked two claims each, but did not renew

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(11) Tanton, T. L., Iron Geologist at the Mines and Geology Branch, Dept. of Mines and Resources, Ottawa
Two striking air views of Baffin Island. Note the triple glacier in the upper photograph.

R.C.A.F. photos
Akpatok Island, Ungava Bay, provides striking example of sedimentary rock.

Falls, Fort McKenzie, Quebec

R.C.A.F. photos
them. On his return Tibbett was quoted as saying, "There is plenty of mineralization and unusual rock formation, and conditions are favourable for prospecting". (13)

Numerous fair-sized quartz crystals from the vicinity of Isabella and Home Bays in east Baffin Island were found by Eskimos who gave them to D. A. Nichols of the Mines and Geology Branch. Because of their scarcity and importance, future investigation may show these crystals to be of value, if they prove large enough for cutting.

In a land devoid of wood and developed water power, the numerous coal deposits of the Arctic islands may be of value in the future. The Tertiary lignite of Salmon River, near Pond Inlet, northern Baffin Island, has been known and utilized for several decades. The first recorded use was 155 tons which Captain Bernier mined in 1910 for use by the C.G.S. Arctic in her northern patrols. Captain Henry Toke Munn also used the coal at his trading-post at Pond Inlet in 1920. In 1924 the Hudson’s Bay Company began to mine coal from a seam about three miles upstream on the east bank of the Salmon River. The workings of Captains Bernier and Munn were about a mile downstream from this, but had caved in.

In 1924, L. J. Weeks, of the Geological Survey, investigated the coal deposits and reported that there are two main seams, 3½ feet thick, about 18 feet apart, with the intervening rock usually containing several minor seams of one to two inches. (14) The beds are horizontal, or nearly so. When mined, this coal breaks into irregular lumps without signs of cleavage, and tends to crumble once it is left in the open. The associated sandstone beds weather so easily that the coal is exposed only where the river is actively undermining its banks. Coal exposures have also been found inland along the sides and tops of knolls, suggesting continuation of the beds. The coal is again exposed at the coast, on Eclipse Sound, about one mile west of the mouth of the Salmon River.

An analysis showed a low percentage of volatile matter and a fairly high fixed carbon content for a lignite coal. Although chemically the coal could be rated as of good quality, its physical property of easy crumbling makes transportation difficult. Attempts were made several years ago to ship the coal to River Clyde and Pangnirtung, but it crumbled so greatly that it was of little value upon arrival. Since the coal has a high heat value, briquetting is a possible method of shipment.

The coal has been used continuously by the Hudson’s Bay Company post at Pond Inlet since 1924, and recently the Anglican and Roman Catholic missions also obtained permits to mine it. An Eskimo who is acquainted with the mining method can remove about 800 pounds of coal a day for the Hudson’s Bay Company, using a little blasting powder and a long-handled steel drill. A total of about 50 tons is mined annually by the three parties of the settlement and transported to the post by dog-team.

The coal is usually mined in April, since it is neither hard-frozen nor soft, and can be chiselled out in larger lumps than at any other time of year. (15) It is impossible to mine during May and the summer months due to a steady stream of water running over the seams down the bank of the river, making the coal soft and crumbly. The coal is bagged and stored in a dry building, where wastage caused by crumbling and slacking during the summer is approximately 20 per cent. If it is left in bulk and exposed to the weather wastage is about 60 per cent. The coal burns well and gives out good heat as long as it is sifted and all dust removed.

Other Canadian Arctic Islands

In the Carboniferous rocks of the Parry Islands a high grade lignite or sub-bituminous coal is known to crop out in many places, and was utilized by early exploratory expeditions. Although not adequately examined, the fact that the coal is of the same general age as some of the world’s great coal fields is suggestive. The value of this fuel to any future outpost or meteorological station, to which transportation will be exceedingly difficult, is obvious. Other coal deposits of the Arctic islands are generally of low grade, but being in an area where freight is expensive and fuel a necessity, they may become important.

Most of the western and northern Arctic islands may be geologically favourable for petroleum. (16) Meagre as our

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(11) Toronto Daily Star, September 29, 1937
(15) Swaffield, A. T., H.B.C. Post Manager at Pond Inlet, 1940-43, Personal Information
information is, we know that they are composed of sedimentary rocks, containing organic remains, ranging in age from Ordovician to Triassic. Recent investigations in southern Ellesmere Island show that the Silurian and Devonian rocks alone attain a thickness of 8,000 feet. Seepages of petroleum (or bituminous seepages) have been reported on northern Melville Island, and further exploration may reveal others. It is possible that the Arctic islands may produce oil similar to that now known in the Mackenzie River Valley and along the north coast of Alaska.

Summary

Any prospecting or mining activity which is carried on in the Eastern Arctic faces serious problems. General exploration costs are much higher than in some other areas of Canada because of relative inaccessibility and lack of all-year dependable transportation. Fuel and power have to be imported, thus increasing costs. Most of the area has not been mapped geologically, and information on structure is poor in many places. Much of the areas of low-relief topography, where movement is not too difficult, is covered by glacial drift, burying rock exposures. Moreover, the ground is permanently frozen a few feet below the surface, making trenching very difficult.

The Eastern Arctic is not an easy country to develop. It is different from any other part of Canada and has distinctive problems of topography, climate, ice conditions and transportation. Plans for exploiting the resources of the region will have to consider these matters before definite action can be taken. If one thinks of development in terms of exploiting the natural resources of any one area to the advantage of Canada as a whole, the mineral possibilities are the chief attraction of the Eastern Arctic.

Although incomplete knowledge of the geology of the area indicates the possibility of mineral resources, wealth will be hard to win. Mineralization is known in several widely-scattered places, but so far mining activity has been unsuccessful in locating mineral deposits of present economic value. The area is vast, however, and prospectors have covered only small sections of it. The old Precambrian complex which has supplied wealth to the more accessible areas of Canada may yet bring changes to the Eastern Arctic. The aerial photo-

graphs which are now being taken of the region will greatly assist future prospecting and map-making. Whether present mineral indications are the limits of development or point the way to future wealth is left for geologic investigation to determine.

The following is a list of all known mineral occurrences in the Eastern Arctic. It is a compilation of occurrences only, with no statement as to size or grade. In many places they are simply traces or small discoveries, often reported by untrained men. The purpose of the list, however, is to summarize what is known show where mineralization has occurred, and point out areas where future investigation might be profitable.

Keeewatin District

- Rankin Inlet: Nickel, copper, platinum in pyrrhotite
- Term Island: Gold, molybdenite
- Corbet Inlet: Pyrites, copper, arsenic
- Mistake Bay: Copper
- Ferguson River: Gold
- Rabbit Island: Arsenic
- Baker Lake: Pitchblende, fluorite
- Wager Bay: Gold
- Belcher Islands: Iron

Ungava District

- Port Burwell: Graphite
- Koksoak River: Iron
- Wakeham Bay: Garnet
- Cape Smith: Pyrrhotite, copper, pyrite
- Port Harrison: Silver, lead, soapstone
- Richmond Gulf: Iron
- Nastapoka Islands: Iron
- Little Whale River: Silver, lead, copper

Baffin Island

- Cape Dorset: Mica, copper
- Nuwata: Asbestos
- Chorkbak Inlet: Garnet, magnetite, pyrites
- Lake Harbour: Mica, graphite, garnet, lazurite
- Cyrus Field Bay: Copper, iron, phosphorous, pyrites
- Cumberland Gulf: Mica
- Blacklead Island: Graphite
- River Clyde: Mica, iron pyrite
- Isabella and Home Bays: Quartz crystals
- Salmon River (Pond Inlet): Coal
- Milne Inlet (Phillipp's Creek): Mica
<table>
<thead>
<tr>
<th>Location</th>
<th>Mineral(s)</th>
</tr>
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<tbody>
<tr>
<td>Baffin Island</td>
<td></td>
</tr>
<tr>
<td>Moffett Inlet</td>
<td>Mica</td>
</tr>
<tr>
<td>Yeoman's Island</td>
<td>Mica</td>
</tr>
<tr>
<td>Arctic Bay</td>
<td>Gold, silver, copper, platinum, nickel, antimony, iron, gypsum</td>
</tr>
<tr>
<td>Piling</td>
<td>Lignite</td>
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<tr>
<td>Bylot Island</td>
<td></td>
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<tr>
<td>Cape Hay</td>
<td>Lignite</td>
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<tr>
<td>Canada Point</td>
<td>Lignite</td>
</tr>
<tr>
<td>Cameron Point</td>
<td>Hematite</td>
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<tr>
<td>S.W. Bylot Island</td>
<td>Magnetite</td>
</tr>
<tr>
<td>Somerset Island</td>
<td>Gold-bearing pyrite</td>
</tr>
<tr>
<td>Northern Melville Island</td>
<td>Petroleum (bituminous) See pages</td>
</tr>
</tbody>
</table>

The following early reports contain a great deal of good topographic and general geologic information

**Bell, Robert,** Report on Hudson Bay, and Some Lakes and Rivers Lying to the West of It, Geological Survey of Canada, 1879-80

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**Low, A. P.,** Geology and Physical Characters of Nastapoka Islands, Geological Survey of Canada, Vol. 13, Part D, 1900

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Bibliography for more detailed information on the economic geology of the Eastern Arctic


**Gunning, H. C.,** Sulphide Deposits at Cape Smith, East Coast of Hudson Bay, Geological Survey of Canada, Summary Report, 1933, Part D


**Moore, E. S.,** The Iron Formation of Belcher Island, Hudson Bay, Journal of Geology, Vol. 26, 1918