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THE UNDEVELOPED MINERAL WEALTH OF NEWFOUNDLAND.

BY A. E. OUTERBRIDGE, JR.

The island of Newfoundland, situated at the main entrance to the great Gulf of St. Lawrence, enjoys the distinction of being the oldest land, in a geological sense, in the new world, and the first land upon which was established an English-speaking colony in America.

Mr. James P. Howley, F.G.S., Director of the Governmental Geological Survey of Newfoundland, says:

"The appellation of *Terra-Nova*, or New Land, given to

this island by the early navigators, is one of the most ridiculous misnomers conceivable—at least in a geological sense.

“It is, in reality, a very old land, and had an existence, in large part as dry land, when but one small rock in the northeast corner of Great Britain represented that island. The 42,000 square miles, comprising the total area of Newfoundland, are made up of the oldest known geological formations, beginning with the Laurentian and ending with the Carboniferous. Not one of the higher or more recent Mesozoic systems, known to geologists, have any existence here, always excepting the superficial drift, chiefly made up of glacial *débris*, river silt and ordinary clays, derived from disintegration of the surface rocks.”

With respect to the date of discovery of Newfoundland, there has been, and still is, some dispute, but the preponderance of evidence is, I think, clearly in favor of the contention that on June 24, 1497, John Cabot landed upon the island and took possession in the name of King Henry VII of England, by whom he was commissioned to explore new lands.

This was only five years after Columbus “sailed the ocean blue,” and was more than a century before the landing of the Pilgrim fathers on the shores of New England.

Much interesting and valuable evidence in favor of this claim is presented by Judge D. W. Prowse, Q.C. (Judge of the Central District Court of Newfoundland), in his admirable history of that island, published in 1895 by Macmillan & Co.

Judge Prowse had access, through the favor of Lord Salisbury, to rare unpublished papers and historical records of the Elizabethan era, and Mr. Edmond Gosse, in a prefatory note, states that the work is an original and valuable contribution to early American history, and that the new material was “obtained from records which are, many of them, entirely unpublished.”

Judge Prowse gives copies of entries found in the expense accounts of Henry VII, showing gratuities paid to Cabot and his men immediately after their return to England, as rewards for their discovery of the new-found-land.

It is not within the province of this paper to review the his-

tory of the expedition of John Cabot, although it is full of interest. A brief reference must suffice to indicate the scope of these investigations to those who may desire to explore the subject more fully.* Through the kindness of a friend, who has been a resident of Newfoundland for many years, I am able to present, in an appendix, an extract from a letter recently received, giving an interesting general description of some of the characteristic features of the island.

In 1881, the late Alexander Murray, F.R.S., then Director of the Geological Survey, published an official geological chart and survey of Newfoundland, made by Mr. Jas. P. Howley, then assistant geologist, who states that as long ago as 1778 a copper mine was opened at Shoal Bay, near Petty Harbor, on the eastern coast. This was probably the first attempt at mining, and copper mining is the most important mineral industry to-day, or rather it is the most fully developed. The official year-book of Newfoundland for 1897 gives tabular statements of imports and exports for the fiscal year ended June 30, 1896, and it therein appears that copper, in the form of ingots, regulus and green ore, was exported during the year to the amount of 64,672 tons.

The principal forms in which copper ores occur are copper-pyrites, glance, tetrahedrite (or gray copper ore), and specimens have been brought in, from outports around Conception Bay, of a very beautiful blue ore of copper, which is probably chrysocolla, or silicate of copper (Cu, 45 per cent.; Si, 34 per cent.).

Lumps of native copper are quite common in a matrix of calc-spar from Blue Mountain Tolt, near Salmon Cove.

*The charter granted by Henry VII to Giovanni Cabotta (John Cabot) and his three sons—Sebastian, Sancti and Lewes—is dated March 5, 1496, and authorizes Cabot "to sail to all parts, countries and seas of the East, of the West and of the North, under our banner and ensigns, with five ships, and to set up our banner on any new-found-land as our vassals and lieutenants."

Cape Bona Vista, on the southern coast of Newfoundland, is now generally believed to be the point where Cabot landed and established the first English Colony five years after the discovery of the new world by Christopher Columbus.

The copper glance, or vitreous copper, will readily melt in a candle flame, and yields 80 per cent. of copper and 20 per cent. of sulphur.

Tetrahedrite, or "gray copper," as the miners call it, has (approximately) the following composition:

	Per Cent.
Cu	35
S	30
Sb	20
Zn	3
As	7
Fe	5

These are important commercial ores, which have been brought into St. John's from many localities; especially valuable are the copper glance, yellow pyrites and erubescite, from the neighborhood of Placentia Bay and elsewhere. Galena and zinc-blende, or "black jack," and calamine (silicate of zinc) are found in calcareous veins in the lower Huronian formation.

Galena (87 per cent. lead, 13 per cent. sulphur) is found in quartz veins at Tickle Harbor, Trinity Bay and in many other localities; the gangue being calc-spar, brown-spar and occasionally barytes. The best known vein, the "La Manche," is a good example of this form. At Little Placentia small fissures occur, in which a rich argentiferous galena is found associated with zinc-blende and specular iron ore.

Mr. Alexander Murray stated in his report (1881) that specimens from these veins yielded as high as 159 ounces of silver per ton.

"On a few blasts being inserted near the outcrop, one of these veins was found to increase rapidly in thickness and some rich-looking specimens were shown me as the produce. Three such veins were seen to contain ore, and were traced over the surface across a projecting point of the shore about 100 yards. There is great probability, that, owing to the disturbed state of the strata here, generally, these are droppers to a stronger and better defined lode which might reasonably be expected to occur somewhere in the neighborhood."

So far as I am informed, silver mining has never been successfully prosecuted to any extent, although the earliest his-

torical records show that silver was known to exist and this aroused great expectations of future wealth.

About a year ago, two samples of quartz were sent to me from the island for assay for gold and silver. Both specimens closely resembled gold-bearing quartz rock, but analyses gave only microscopic beads or traces of gold and silver, after cupellation with lead.

Iron ores are very plentiful, and a Nova Scotia company has operated for several years quite extensively at Bell-Isle, Conception Bay. The export of iron ore is rapidly growing; the ore is found near the surface, is very economically mined and is loaded on board steamers which run close under the high bluffs and take the ore directly into their holds through chutes. It has been found that the cinder refuse, commonly called "blue billy," from the Newfoundland pyrites, after extracting the sulphur in the manufacture of sulphuric acid, is almost entirely free from sulphur and is a valuable by-product, used in the manufacture of steel. It commands a higher price than similar cinder from any other source.

The Newfoundland year-book for 1897 shows that the export of iron pyrites has increased from 410 tons in 1887 to 36,496 tons in 1896.

Nickel is found in the serpentines, and was worked in a primitive fashion at the Union Mine, Tilt Cove, until the fall in price of nickel rendered the operations unprofitable.

Coal has been found in workable seams at St. George's Bay and on the line of the new governmental railway, which is now almost finished and will be opened during the coming autumn. This railway is a belt line, 564 miles in length, starting from the capital, St. John's, running northward near the coast for more than 100 miles, then veering inland, crossing the island from east to west and running down the coast to the southwestern extremity. This point is only about 80 miles distant from Cape Breton Island across the mouth of the Gulf. A fine fast steamer will convey passengers in a few hours from the railway terminus at Cape Breton to the Newfoundland railway terminus. Prospectors, tourists and others will thus be able to reach all parts of the island within three days' jour-

ney from New York, and will avoid the tedious and sometimes dangerous sea voyage from Halifax.

Returning, after this brief digression, to the subject of my address, I am able, through the kindness of Mr. Howley, to give some further statistics from a paper published by him in 1892. Mr. Howley states that a copper mine, known as the "Bett's Cove Mine," was opened in 1875, and actively worked for ten years, during which time 130,682 tons of ore and regulus were exported therefrom, besides 2,450 tons of iron pyrites. The ore occurs in a mass of mixed chloritic slate and diorite. In the course of the excavating some enormous pockets of ore were uncovered.

In 1885, the bluff caved in, owing to having been honey-combed by the excavations, and, although it is thought that the ore was far from being exhausted, operations were discontinued. "The Little Bay Mine was opened in 1878, and before the end of the first season 10,000 tons of ore were raised and shipped to Swansea. Between 1880 and 1885, 61,776 tons were shipped from this mine, and since that date to the end of last year (1891) over 40,000 tons of ore, regulus and ingots of copper are given in the customs returns. Between 1880 and 1882 the Southwest Arm Mines yielded 490 tons; Hall's Bay, 240 tons; Rabbitt's Arm Mine (worked only one year), 1,260 tons, averaging 28 per cent. copper."

The variety of iron ores is very large, and there is little doubt that in future years an extensive export of hematite will be developed, which is found of the richest variety, containing 70 per cent. iron; besides chrome and other ores.

The sample of chrome ore on the table before you, recently received from Newfoundland, was analyzed by the well-known firm of Booth, Garrett & Blair, with the following results:

	Per Cent.
Chromic sesqui-oxide	50
Prot-oxide of iron	40
Silica, etc.	10

This ore is the valuable source of bichromate of potash used so largely in dyeing and paint-making. Chromate of potash or soda is first produced from the ore, and from this base the

bichromates, and all of the other pigments, greens, yellows, blues, browns and reds, are obtained.

A remarkable circumstance connected with this industry, which is not generally known, is, that the entire business is in the hands of two families, one in Europe and one in this country. It is said that time and again expensive works have been erected and new chrome products put upon the market, but the old manufacturers have invariably succeeded in killing all opposition by the simple method of reducing prices until the new makers were driven to the wall. As these two firms create the only market for chrome ore, the mine owners are at their mercy. According to Mr. Frederick H. Smith, a well-known geologist of Baltimore, chrome ore containing 60 per cent. of chromium sesquioxide has been sold in that city at \$42 a ton.

Two years ago several samples of crude petroleum were sent to me from the west coast of Newfoundland. This was a heavy mineral oil, resembling the Lima fuel oil, and was pronounced by experts an admirable lubricant. I was informed that the samples were obtained by spreading blankets upon the surface of a stream on which the oil floated. The oil was absorbed by the blankets and then squeezed into buckets.

Since that time a well has been bored and the letter, appended hereto, states that a considerable flow has been secured.

There are quite a number of other economic minerals, such as plumbago, manganese, asbestos, rutile, steatite, mica, mineral pigments, etc., of which I cannot now speak in detail.

I can only pause a moment in concluding this address to allude to the great variety of fine building stones found all over the island.

"Granites, syenites, porphyries of every shade of color and consistency, and immense deposits of pure white statuary and mottled marbles range from the mouth of the Humber River northward, towards White Bay, and are again met with in Canada Bay.

"Amongst these are beautifully veined, pale pinkish, bluish, drab, yellowish and some black varieties, all of which take a high polish."*

*Report of Jas. P. Howley, F.G.S., 1892.

Iron mine at Bell Isle, Conception Bay, showing surface workings.

Iron mine at Bell Isle, Conception Bay, showing ore chutes and loading pier ;
1,800 tons of ore were loaded in steamer *Regulus* in $4\frac{3}{4}$ hours.

(Outerbridge.)

Copper mine at Little Bay. Total output about 200,000 tons.

Pyrites mine at Pilley's Isle. Employs a fleet of ships.

A granite quarry was opened several years ago, which is, I believe, unique in the fact that, owing probably to some great convulsion of nature in past times, the granite has been split into rectangular blocks of various sizes, and of such regular form that schooner loads of selected stones have been procured, ready for the builder's use. In fact, there are buildings in St. John's constructed of these cubical blocks which have been dressed by nature's hand only. If any similar instance is on record, I have failed to find it.

While I have only been able to touch lightly upon the subject of the undeveloped mineral wealth of Newfoundland, I think you will all agree with me that this island may be truly called a natural cabinet of minerals, which will, perhaps, at no very distant day, be opened up for the benefit of mankind.

It is certainly remarkable that this oldest colony of Great Britain in the new world should have remained to this day in so primitive a condition. Until the pathway for the iron rails was blazed across the island the interior was almost a *terra-incognita*, and even now many parts of the interior have never been visited by white men.

History relates that a tribe of aborigines, called "Bethuks," existed on the island when John Cabot landed there in 1497, and two of the savages were taken to England by Sebastian Cabot, where they created much interest. But this tribe has long since disappeared, and there are no native Indians or Esquimaux inhabiting the island.

The coast of the island is exceedingly rugged, and its outline is extraordinarily irregular, being indented with innumerable bays, some of great size. Vast herds of caribou range through the interior, the rivers are alive with salmon, which may frequently be seen leaping rapids, and the smaller streams are filled with speckled trout.

It is said that the simple fishermen dread to venture inland beyond the sound of the ocean, but the opening of the railway will undoubtedly change all of these primitive conditions and lead to an influx of sportsmen, tourists and prospectors.

The Government of Newfoundland realizes that the time has come when the mineral wealth of the country should be

developed, and is therefore offering every facility to explorers. License fees to secure a large mining area are fixed at the nominal sum of \$20. There is a museum in St. John's, where specimens of all of the minerals which have been discovered are preserved, labeled and catalogued, this is under the charge of the Director of Surveys. Geological reports are furnished from which valuable information regarding the economic minerals may be obtained.

The summer season, though short, is delightful; and an erroneous impression prevails regarding the rigors of winter. Very low temperature is almost unknown, and deep snows are rare. The capital, St. John's, is further south than London, being in the same latitude as Paris. The occasional grounding of large icebergs a short distance from the shore produces astonishing local climatic changes, delaying the ripening of crops and garden fruits, but presenting at sunset magnificent prismatic or iridescent effects.

The coastal steamers, which carry the mails to the outlying ports, as far up as the coast of Labrador, afford an easy means of viewing the bold bluffs and of visiting the mines, all of which are located close to the seaports.

The island is 360 miles in length, and at its broadest part is somewhat wider than its greatest length, but in some places narrow strips of land only separate the great bays indenting the coast on all sides. There are no mountains; but the precipitous bluffs and high hills rising abruptly from the water's edge convey the impression of a mountainous country.

APPENDIX.

[FROM A PRIVATE LETTER.]

The island of Newfoundland has always been so associated with the suggestions of "fog and cod" that probably many people may have imagined its mineral resources to be connected with its general trade and covered by the metal-producing stamp called "C. O. D.," but such is not the case.

The rock-bound shores have scarcely yet been scratched, though thousands of tons of copper, iron pyrites and lead have been shipped, and there is little doubt that a brilliant field is there open to the prospector who will turn his steps a short distance inland, where heretofore, owing to the absence of communication with the coast, scarcely any one has thought it worth while to seek.

Many years ago, a gentleman stood upon the shores of Placentia Bay and observed some fishing smacks approaching the land. Suddenly a squall heeled over one of the boats and revealed a brilliant carmine below the water-line.

On arrival, the skipper was interrogated as to whence the color was obtained. "Over yonder, under the cliff, is a great block of it," he replied, "which, when ground with oil, produces the paint."

Mr. Charles Fox Bennett, the pioneer of mining in Newfoundland—for this was the gentleman—went to the spot indicated, and there found an enormous block of silver ore which had fallen from the cliff. It was too late in the year to prosecute the search further, but the following spring Mr. Bennett arrived with miners, equipped to commence work; but alas! a great landslide had effaced his landmarks, and from that day to this, although many efforts have been made, the supposed rich vein has not been discovered, although indications of its existence have been not infrequent.

Mr. Bennett subsequently opened and worked the Tilt Cove Copper Mine, which has produced abundant supplies of copper and nickel and a small percentage of gold. This mine is still worked by the Cape Copper Company.

Practically no prospecting has been attempted, except on the immediate coast line, but that little has given indications of valuable deposits of many minerals, some of which are about to be vigorously worked by the railway contractor, Mr. Reid, and others. A large surface deposit of iron ore on Bell-Isle was worked last summer by the New Glasgow Steel Company, and other deposits are to be worked during the approaching season, both on the east and west coast.

Until very recently the whole west coast was a forbidden land, owing to the disputed claims of the French; but those difficulties have been partially removed, and enormous known deposits of chrome and other iron ores are likely to be worked in the near future. Workable seams of coal have been discovered, and the new railway will probably be run with native coal during the present year.

Petroleum has also been found on the west coast, and one boring is already yielding a considerable flow.

Asbestos is frequently found on the line of the railroad, but this has not been developed.

The Pilley Island Pyrites Mine employs a fleet of steamers to transport the mineral to the United States. Numerous other deposits are known to exist, but heretofore, the paucity of local capital has prevented their commercial development.

MAP OF THE COMPASS VARIATION IN BUCKS & MONTGOMERY COS., PENN'A, COPIED FROM A MAP MADE BY THE PHILADELPHIA WATER DEPARTMENT, ABOUT 1883; WITH THE GEOLOGICAL FAULT MARKED BY BENJ. SMITH LYMAN. 1897.

THE DOTTED CURVES ARE
AMENDMENTS SUGGESTED
BY B.S.L.

791
MOUNT ROSE
J.E. HILGARD

THE BROKEN CURVED LINES
SHOW DIFFERENCES OF ONE
TENTH OF A DEGREE IN THE
VARIATION.

SCALE:—
6 MILES TO AN INCH.
OR 1:380160

15 MILES

AT WESTCHESTER, 6517
J.E. PHILLIPS, T.W. HARLAN