

GEOLOGICAL SURVEY OF CANADA,

THOMAS W. LEECH, F.R.S., DIRECTOR.

REPORTS

BY DR. C. STERRY HUNT AND MR. A. MICHEL.

of the
Gold Region of the County of Hastings,

TRANSMITTED BY DR. HUNT

TO THE

HON. COMMISSIONER OF CROWN LANDS.

JANUARY 29, 1907.



Ottawa:

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GEOLOGICAL SURVEY OF CANADA,

SIR W. E. LOGAN, F.R.S., DIRECTOR.

R E P O R T S

OF

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REPORT
ON THE
GOLD REGION OF HASTINGS,

BY

DR. T. STERRY HUNT, F.R.S.,

ADDRESSED TO THE

HON. COMMISSIONER OF CROWN LANDS.

MONTREAL, January 29, 1867.

To the Hon. ALEX. CAMPBELL,

Commissioner of Crown Lands.

SIR,—In the absence of Sir William Logan, I have the honor, in conformity with the request conveyed in your letter to him, dated January 14th, to transmit to you a translation of Mr. Michel's Report on the discovery of gold in the County of Hastings.

The rocks of that region have already been described to some extent in the Geology of Canada, and again in Mr. Macfarlane's Report on that county, published in the Geological Report for 1865-66, pages 91-96. Farther explorations with regard to the geological structure of this region have been made by Mr. Vennor, under the direction of Sir William Logan, during the past summer. A series of gneissoid rocks, often holding epidote and chlorite, associated with diorites, fine grained mica-slates, quartzites, conglomerates, dolomites, and limestones, is here met with, extending over a large part of the North Riding of Hastings.

The limestones are sometimes coarsely crystalline, but more generally fine-grained, dark grey in color, and from an admixture of mica, pass into calcareous schists. This series of rocks, many thousand feet in thickness, appears to be conformable with the adjacent coarsely crystalline gneissic strata, which form a continuous part of the great Laurentian area of Canada and northern New York. These rocks of Hastings thus appear to be a portion of the true Laurentian series, in proof of which they are, in the Township of Lake, apparently overlaid unconformably by rocks bearing the mineralogical characters of the anorthosites of the Labrador or Upper Laurentian series. To these facts is moreover to be added the evidence of organic remains. The *Eozoön Canadense*, which characterizes

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the uppermost or Grenville band of the Laurentian limestones, on the Ottawa, has been detected in the grey fine-grained limestones of Hastings; in a fragmentary condition in Madoc, and more recently in a large and well-defined shape, on the weathered surface of a similar limestone in Tudor; in both cases however filled, not with serpentine, but with carbonate of lime.

Although these rocks have been traced over a considerable area, it is not yet certain whether their distribution is due to a synclinal or an anticlinal form. In the latter case they would be an older series than the other Laurentian rocks of the region, and probably than any others as yet examined in Canada. If however, as seems more probable, they occupy a synclinal, they will represent an upper member of the true or Lower Laurentian, and it will then remain to be decided whether these Hastings limestones belong to a higher position of the system than any yet examined in the Ottawa district, or whether they are the equivalents of the Grenville band, of which they contain the peculiar fossil. In this case, their peculiarities, both in texture and mineral characters, must be regarded as due to original local differences. In the Hastings series, in addition to the lead and iron common to other parts of the Laurentian system, the dolomites are often highly ferruginous, and copper is frequently met with in small quantities, together with arsenic, antimony and bismuth.

The mineralogy of the Laurentian rocks is as yet but imperfectly studied, since this system is scarcely known except in Canada, New York, and parts of Scandinavia. In the last Report will be found a comparative study of the mineralogy of these rocks on the two continents. It is there shewn that in Norway, Sweden, and Finland, besides the ores of iron, copper, lead, and cobalt, tin, silver, mercury and gold,—the latter two however, in but small quantities, occur among the minerals of the Laurentian system. (Report for 1865-66, p. 196.)

Since those pages of the Geological Report were written, gold has been met with among the rocks of Hastings, under conditions of which some account will be found in subjoined report. It may be added that the locality of copper ore mentioned by Mr. Macfarlane (Report 1865-66, p. 106) is on the same lot as the Richardson mine, where two or three explorations had been made for copper, previous to the one in which the gold was accidentally discovered. The greenish epidotic gneiss, with red feldspathic and grey quartzose layers, is in some parts chloritic, and encloses also a bed of imperfect steatite. Besides the veins of quartz holding epidote, chlorite and specular iron, one was observed containing yellow and purple copper ores in a gangue of quartz and ferruginous bitter-spar. This latter mineral, in some specimens obtained from an excavation on that lot in 1864, is seen to be, in parts, decomposed, leaving only a light reddish pulverulent oxyd of iron, like that which is described in the Report for 1865-66, page 85, as derived from the decay of a similar spar in veins in the Eastern Townships. The reddish earthy matter, described by Mr. Michel as partly filling the gold-bearing crevice at the Richardson mine, has evidently a similar origin. It is there however associated with a black carbonaceous matter, which is described as encrusting the walls of the fissure. This occurs, in the specimens before me, in small fragments with a conchoidal fracture, and a somewhat resinous lustre, and is soft and readily crushed between the fingers. When exposed to heat in a tube, it gives out some water, but no bituminous matter; in the open air, at a red heat it takes fire, and burns readily without flame, leaving a somewhat abundant ash,

whitish and sometimes reddish, consisting of carbonate of lime, with some silicious and ferruginous matter, including a quantity of gold. This metal is visible in the form of grains and scales in the recent fractures of the black substance, which, although coal-like in its aspect, resembles more the carbonaceous matter which has been described in the "Geology of Canada," as filling veins or fissures in the rocks of the Quebec group, and is doubtless derived from the transformation of bitumen.

This substance as I have shewn, is in some cases, so far altered by oxydation, as to have a composition like that of anthracite, and is then scarcely distinguishable from the Madoc mineral. The examination of various specimens from the Madoc mine, shews the native gold in three different associations; first in the black carbonaceous matter; second in the reddish ochery oxyd of iron, which is found in the same crevices with the latter; and third in plates in the midst of crystalline ferriferous bitter-spar. The farther examination of veins in their undecomposed state, carrying this carbonaceous matter, will perhaps throw a clearer light on its relations. Meanwhile it would seem, from the study of the specimens, that this black matter, probably in the form of bitumen, had first been introduced into the fissures, which were subsequently filled with the ferruginous bitter-spar, whose deposition was contemporaneous with that of the gold. The precious metal is therefore found, not only in the midst of the bitter-spar, but disseminated through the carbonaceous matter which has resulted from the subsequent change of the bitumen, as well as through the decomposed spar. This association of the metal, although singular, is thus at the same time, perfectly intelligible.

Carbonaceous matters not unfrequently occur in mineral veins, in other regions, and are met with in several localities in the Laurentian rocks of Scandinavia, where, according to Daubr e, in the silver mine of Kongsberg, a matter allied to anthracite, and similar to that of Madoc, occurs in mammillary masses imbedded in the calc-spar of the veinstone, and sometimes penetrated by native silver. (*Ann. des Mines* [4] iv. p. 260.) In other veins in that region the presence of bitumen is indicated, and in the beds of magnetic iron ore found in gneiss at Dannemora, small masses of a matter closely resembling bituminous coal in composition, and penetrated by quartz veins, occur in the midst of the ore. According to Daubr e, both graphite and anthracite, where they occur in the ancient rocks of Scandinavia, are accompanied by bitumen. No such associations have hitherto been observed with the graphite of our Laurentian series.

As to the presence of gold in these ancient rocks, it was for a long time the opinion of most geologists that gold was confined to the rocks of the Lower Silurian period, and when it was shewn by the Geological Survey, a few years since, that the Upper Silurian strata of eastern Canada were auriferous, this conclusion was received by the geological world with surprise, which was farther increased when Prof. Whitney pointed out that the gold of California occurs in rocks still more recent. In Scandinavia, however, as above noted, small portions of gold have been found in several localities in rocks, probably of Laurentian age, though in 1849, according to Durocher, none of them were worked. It is worthy of notice in this connection, that Dr. A. A. Hayes, of Boston, in 1864, detected in a pyritiferous quartz from the twenty-third lot of the sixth concession of Belmont, a small amount of gold, equal to about ten grains' weight to the ton of rock. More recently Dr. Girdwood of this city, in examining a portion from a bed of impure plumbago, from the twenty-first lot of the sixth concession of North Elmsley, found in two samples, small

quantities of silver, with traces of gold. The rocks of this locality are lithologically unlike those of the Hastings series, and have the general character of those of the great Laurentian area, to which they belong; so that gold may eventually be found widely distributed through the rocks of this system.

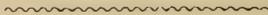
Since the Report of Mr. Michel was handed in, I am informed that the Richardson mine has been re-opened, and has yielded specimens of great richness, some of which I have seen. The gold in them is disseminated in the same ferruginous bitter-spar already mentioned. The conviction expressed by Mr. Michel, at the close of his report is thus fully justified.

With regard to the existence of bismuth in this region, alluded to above, I have received from a reliable source, a small specimen, said to have been found in Tudor, which contains bismuth ochre, or earthy carbonate of bismuth, associated with quartz.

I have the honor to be, Sir,

Your most obedient servant,

T. STERRY HUNT.



REPORT
ON THE
GOLD REGION OF HASTINGS,

BY
A. MICHEL, Esq.,

ADDRESSED TO
SIR W. E. LOGAN, F. R. S.,
DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

(Translated from the French.)

MONTREAL, January 20, 1867.

SIR,—I had the honor, some time since, to report to you the results of an excursion which I made to Madoc, at your request, about the middle of November last. In then submitting to you the observations which I had been able to make, and the information which I had gathered regarding the so-called Richardson gold mine, I stated to you that I was not allowed to descend into the excavation for the purpose of examining the auriferous deposit, whose extraordinary richness was spoken of in the journals of Upper Canada. Later, on the 16th December, you desired me to revisit the County of Hastings, not to make explorations, which the season of the year would have rendered difficult and costly, but because you hoped that Mr. Richardson and his associates would permit me to visit their mine, and because, moreover, you desired to obtain some certain information relative to various other discoveries of gold, said to have been made in the county. I therefore left Montreal again, on the 18th December, and spent three weeks in excursions in the Townships of Hungerford, Elzevir, Madoc, and Marmora; and now, after having submitted to Dr. T. Sterry Hunt the various specimens of rocks and earthy matter collected by me in the different localities visited, I have the honor to lay before you the facts ascertained with regard to the Richardson mine, and other discoveries of gold in that region.

In order to give you an idea of the difficulties attending my examination, I shall mention certain details of which I should not otherwise have spoken. Thus, when I first went to the mine, on the 22nd December, those of the proprietors then present would not allow me to go down into it, alleging as a reason, the absence of Mr. Richardson.

Through the new purchasers of the mine, however, some days later, I was permitted to descend, but the number of persons at the same time in the pit, the darkness, and moreover the irregularity of the working, were all unfavorable to my examination. The excavation at the Richardson mine, on the eighteenth lot of the fifth concession of Madoc, is round in form, six or seven feet in diameter, and about eighteen feet deep; the rock in which it is sunk appears to be a chloritic gneiss, more or less mixed with crystalline ferruginous bitter-spar, with which crystalline quartz and orthoclase feldspar are also apparent, forming what seems to be a veinstone. The excavation appears to have terminated in a steatitic rock. In the western side of the excavation is seen the gold-bearing crevice, which appears to be an earthy decomposed vein, irregular and twisted, with two expansions or pockets in its course, the one about four feet below the surface of the ground, the other beginning at the bottom of the pit, and extending downwards in the steatite. From the decomposition of the veinstone, there remains now little more than an earthy reddish oxyd of iron, associated with a black carbonaceous matter, in both of which, but especially in the latter, the gold is imbedded. Specimens of a veinstone of ferruginous bitter-spar, with crystalline hornblende, rich in gold, were shown me, and others of steatite penetrated by gold, but I saw none of these in place, nor was I permitted to make, or cause to be made, the requisite examinations.

One of the new purchasers of the mine, who undertook to shew it to me, lying upon his back at the bottom of the pit, and introducing part of his body into the crevice, was able by stretching out his arm, to extract with difficulty, three small pinches of the black matter, which he gave me. This weighing 282 grains, yielded me nineteen grains of gold, worth 76 cents. I was also permitted to gather from the bottom of the pit about two pounds of earthy material, mixed with debris of the rocks. Of this matter, which shewed none of the black carbonaceous substance, and traces only of the earthy oxyd of iron, one and a half pounds gave me, by pulverizing and washing, twenty-four grains weight of gold, worth 96c. Having taken care to examine the little fragments of rock, before pulverizing, I found among them several morsels of bitter-spar, associated with hornblende, and rich in visible gold. I moreover caused to be broken from the gneissic rock, of the excavation, about a dozen pounds, taken from three different places. One of these, weighing about twenty-five ounces, and supposed to have been taken from near the crevices gave me one grain weight of gold, by a mechanical assay, but the remaining eight pounds did not yield a trace. The most striking peculiarity in this deposit is the association with the earthy oxyd of iron, of a carbonaceous matter, in both of which the gold is disseminated. For the rest, the occurrence of gold in earth oxyd of iron is a fact frequently observed in South America, and elsewhere, as I have myself observed, and as is described by Burat, who refers these oxyds to the decomposition of pyrites, from which they are, no doubt, often derived. In the present case, however, the oxyd would seem to come from the decomposition of the ferriferous spar, as in the case signalized by Dr. Hunt in his Report of last year on the gold-bearing veins of the Chaudière. To shew the richness of the Richardson mine, it is sufficient to say that the ochreous and carbonaceous matters extracted from the crevice have yielded from fifteen to twenty dollars of gold to the pound. Sixty pounds or more of this material were carried to the United States, by the first purchaser of the mine, and I met numbers of persons in the County of Hastings, having more or less of the gold from this mine in their possession, so that the quantity already abstracted must be considerable.

The gold from the mine, in its native state, is not at all like the alluvial gold of Lower Canada, but is dull reddish in colour, and in thin scales or plates, sometimes dendritic, or more often in fine dust. The abundance of the precious metal would be sufficient to forbid any suspicion of an artificial enriching of the mine, and the peculiar character of the gold, as well as its unusual associations, are so many more proofs, to my mind, of the genuineness of the discovery. Nevertheless, I should have been glad to support my conviction by still farther facts, and I therefore, earnestly begged to be allowed to make, at the cost of the Geological Survey, and in the presence of the proprietors of the mine, some farther trials, which might have easily been made, but I was refused. I was finally informed at Belleville, on the 30th December, that Mr. Richardson and his friends had at last consented, and I at once returned to Madoc, but only to be disappointed, for I learned on my arrival there, that the proprietors had already again changed their minds, and had filled up the pit with logs of wood and stones, so that, as they said, no one should go down into the mine until they had been paid for it.

It appears evident that Mr. Richardson and his associates, guided probably by the counsels of persons of more experience than themselves, entertain doubts as to the continued richness of the crevice, a question which must rest in doubt until farther explorations shall have been made. Burat remarks, with regard to veins, that they are subject to a great many accidents and variations of form; they swell out, contract, and are sometimes entirely cut off, for a time. It often happens, moreover, that veins, earthy or decayed in parts, are found in other portions of their course, less decomposed, or altogether unaltered. These considerations appear sufficient to show the uncertainty which exists as to the continuity in depth of the vein in question.

I have also visited, in accordance with your instructions, various lots in the Townships of Hungerford, Elzevir, Madoc, and Marmora, where the presence of gold had been mentioned in the Belleville journals. With but few exceptions, the examinations which had been made had been very superficial and slight. On the eighteenth lot of the seventh concession of Madoc, and the seventeenth of the tenth of Marmora, the matters which had been examined for gold consist of a fine, somewhat reddish, silicious sand. Those from the tenth lot of the ninth concession of Hungerford, and the sixteenth of the seventh of Madoc, are of a coarser silicious sand, with a reddish ochreous admixture; while fragments of mica-slate and of gneiss are mingled with the silicious earthy soil which I collected on the fifth lot of the second concession of Elzevir, the fifteenth of the fourth, the sixteenth of the sixth, and the seventh of the fifth of Madoc.

I found traces of gold :

1st. In the ochreous matters adjoining quartz, in the fifteenth lot of the second concession of Elzevir, where I remarked in an excavation ten feet by five, and four feet deep a band of quartz, whose outcrop is also visible about one hundred feet to the east, its course being east and west. The Hon. Billa Flint showed me a little button of gold, which he had obtained, by amalgamation, from a small portion of ochreous matter from the same excavation. He also, during my stay in the county, found traces of gold in several other localities in Elzevir.

2nd. In an ochreous quartz, which occurs imbedded in blueish and reddish-white limestones, on the eighteenth lot of the seventh concession of Madoc. Two contiguous

excavations have been made, one four feet square, and four feet deep, the other eight by ten, and fifteen feet deep.

3rd. In an ochreous matter, and also in a cavernous quartz, holding orthoclase feldspar, both from an excavation about eight feet by ten, and fourteen feet deep, on the shore of Mud Lake, on lot sixteen of the sixth concession of Madoc.

4th. In a ferruginous earth, associated with fragments of white quartz and black tourmaline, from a depth of two or three feet, on the fifteenth lot of the fourth concession of Madoc.

During my stay in the County of Hastings, numerous specimens, rich in visible gold, were shewn to me as having come from different localities, more or less remote from the Richardson mine. A person gave me two portions of rock coarsely pulverized, which he assured me he had collected on the nineteenth lot of the fifth, and the eighteenth lot of the seventh concession of Madoc. The first of these gave me, by a mechanical assay, for 1310 grains of rock, not less than 509 grains of gold, and the second from 385 grains of rock, 89 grains of gold. In conclusion, I have only to repeat, what I had the honor to inform you by my letter from Belleville, that the discovery of a deposit of gold of extraordinary richness, on the eighteenth lot of the fifth concession of Madoc, was, in my opinion, an established fact, and one that could hardly be exceptional in the region,—that this discovery, as well as that of the presence of distinct traces of gold, both in quartz and in the ochreous matter extracted from shallow excavations, made in several localities in the County of Hastings, was sufficient to give a favorable character to the region, and finally, that I anticipated successful results from the excavations which will probably be made next spring on a large scale, in that region.

I have the honor to be, Sir,

Your most obedient servant,

A. MICHEL.

