

ART. XLIV.—*The Gold of Nova Scotia*; by O. C. MARSH, A. B.,
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ON the Atlantic coast of Nova Scotia is a belt of metamorphic rocks extending the whole length of the Province and varying in width from ten to fifty miles. It is mainly composed of clay slate and quartzite, but in some parts of the district these are replaced by mica slate, gneiss and granite. These strata have a general N.E. and S.W. course and are highly inclined. They have received but little attention from geologists and as no fossils have yet been found in them their exact age has been a matter of considerable uncertainty. Prof. J. W. Dawson, who from his study of this region is best qualified to express an opinion on this point, states that they are probably Lower Silurian, and possibly of the same age as the Potsdam sandstone.*

The general resemblance of these strata to the gold-bearing rocks in other parts of the world had occasionally been noticed, and various explorations for the precious metals had from time to time been made in their vicinity, but I cannot ascertain that gold was actually discovered in this Province earlier than March, 1860, although reports to that effect have been circulated. It was then accidentally found in Halifax county, about fifteen miles from the coast, in the bed of a small stream which empties into the Tangier river. Gold was soon after observed in the adjacent quartz veins also, and in a short time several hundred persons were attracted thither by the reports of the discovery and commenced explorations. The quantity of the gold obtained, however, was so small, that the excitement soon diminished, and but one company continued work for any length of time. In May of that year, the Provincial Secretary, Hon. Joseph Howe, accompanied by Prof. How of King's College, made an official visit to the locality, and on his return published a report which was very unfavorable to future explorations.

The discovery of gold in the Province, although in small quantity, naturally encouraged a further search, and in March of the present year it was again found, on the coast near Tangier harbor, in sufficient abundance to promise profitable employment for a great number of persons, and since that time a large amount has been obtained from that locality. Within the next three months gold was discovered in the same strata at various other places, the most important of which are Rawdon and Douglass, in Hants county; Gold river, near Chester; and Lawrencetown, a few miles east of Halifax. At the latter place there are indications of an extensive deposit of gold, and an association,

* Supplement to *Acadian Geology*, page 53.

organized in London, under the name of the "Nova Scotia Gold Mining Company," has recently purchased a tract of land there, and obtained permission from the government to work it for a term of years. In June last, gold was discovered in a bluff on the coast near Lunenburg, and shortly after the sands on the beach below were found to be unusually rich in this metal. It has also been found quite recently at Lake Thomas, about fifteen miles north of Halifax, and some valuable specimens obtained.

While in Nova Scotia a few weeks since I visited Tangier and Lunenburg, the most important of the above localities, and through the kindness of Mr. S. P. Fairbanks, the Provincial Inspector of Mines, I had an opportunity of examining the gold-bearing strata at these places and in their vicinity. I am also indebted to this gentleman for many interesting facts in regard to the discovery of the gold.

The Tangier mines are situated sixty-seven miles east of Halifax and about half a mile from the coast. Here the out-cropping rocks form a series of low hills, which are covered with a thick growth of spruce and hemlock. The strata which contain the gold consist of clay slate, traversed in various directions by veins of quartz, which is generally very compact. The cellular variety, discolored by oxyd of iron, so commonly found with the gold in California and Australia, appeared to be wanting at this locality. The strata, which are here very much disturbed, had been well exposed in many places by the recent explorations, but the nature of the surrounding country prevented any extensive examination of them. At one point they had a strike of S. 84° E., and a dip of 67° S.

The excavations at Tangier were carefully examined for fossils but without success, as the igneous action to which these rocks have been subjected has probably obliterated all traces of those they once contained. The recent discovery, however, of very perfect fossils, of many new species, near Saint John, New Brunswick, in clay slate which closely resembles this in structure, would seem to indicate that some organic remains may have been preserved in this formation.

The gold at Tangier occurs mainly in the quartz veins, which are in most cases less than a foot in width, but in one instance I noticed it in the argillite near its junction with the quartz. It is disseminated through the matrix in the usual manner,—frequently in isolated particles and masses, and where the quartz is white furnishes specimens of great beauty. One of the largest obtained was prized at three hundred dollars, which was but little above its intrinsic value. Gold has also been found in the soil, and in the bed of a small stream near the mines; but not in sufficient quantity to attract much attention.

The minerals noticed in association with the gold at this locality were mostly iron pyrites and mispickel. The former appeared to be quite abundant, and, suspecting it to be auriferous, I have examined a specimen and find it contains a considerable quantity of gold. The exact amount was not estimated, but it is sufficient to make its separation profitable if conducted with skill and economy. The mispickel at Tangier is frequently found underlying the gold in the quartz veins, and in some cases enclosing it. Chalcopyrite, magnetite, hematite, and galena, also occur in small quantities.

Among the specimens of gold obtained at Tangier I noticed three isolated crystals, which resembled in general appearance those brought from California. The largest of these was about one third of an inch in diameter. It was a rhombic dodecahedron with its edges slightly beveled, and although its faces were marked with delicate striæ several of them were unusually brilliant. The other two crystals were octahedrons, with dull and somewhat rounded faces. One of these was flattened and also much elongated. The smallest crystal was about two lines in length and quite perfect.

The mines at this locality are on the Government lands, and a 'claim,' thirty by thirty-three feet, is rented at twenty dollars per annum. At the time of my visit in August, about seven hundred men were working 'claims,' and a large amount of gold had been taken from the quartz veins, although in many cases at least one third of what they contained was lost by the rude and unsatisfactory methods employed in its extraction. Two crushing mills, however, were then nearly completed, which, although very unlike, were apparently well adapted to the end in view. One of them was very similar to the *arrastre*, a rude instrument used extensively in the silver mines of Mexico, and found to be very effective.* It consisted, essentially, of two large granite boulders, attached by short ropes to a horizontal beam, on either side of an upright shaft, around which they were drawn by a pair of horses. The quartz was put on a paved floor and kept wet, and was crushed by the boulders as they were dragged over it. The other mill was a small sized quartz-crusher of recent invention.

At Lunenburg, which is about seventy miles west of Halifax and one hundred and thirty from Tangier, the gold also occurs in quartz veins traversing the clay slate, which here forms a high bluff, but it is most abundant in the sands of the adjacent beach. Those who first commenced explorations at this place obtained large quantities of gold with very little labor, and their success soon attracted others from all parts of the Province. This locality is known in the neighborhood as "The Ovens," from some

* Ure's Dictionary of Arts, vol. iii, page 677, London, 1860.

deep caverns which have been worn in the bluff by the action of the sea. It is this denuding power which has torn the gold from its bed and collected it on the beach. There is some reason to believe that a large amount of gold derived from the same source exists in the bottom of the harbor, as the sea-weed which is washed on shore has occasionally small particles of the precious metal attached to it. This point will probably soon be decided; as a "Dredging Company" has been formed, and in a short time will commence operations.

The strata at this place are similar in appearance and structure to those at Tangier, and seem to have been equally disturbed. At one point near the shore where they were well exposed the strike was S. 80° W., and the dip about 75° N. Quartz veins pass through the slate in many directions, and are generally found to contain gold, especially those running north and south. Several dikes of basaltic trap were also observed, one of which was seven feet in width and appeared to be conformable to the strata. The auriferous sand on the shore rests on the edges of the upturned slate, which has here been worn out into 'pockets' of various sizes, well adapted to retain the gold as it is washed over them. After these cavities have been apparently exhausted, a large amount of fine gold can be obtained, for several feet beneath them, between the thin laminæ of the slate.

Nearly the same minerals which were noticed at Tangier also occur with the gold at this locality. The mispickel is more abundant, and is usually in very perfect octahedral crystals, some of which are twins and highly modified. The large amount of this substance in the sand on the beach, makes the gold washing somewhat difficult, and with the rude apparatus employed much of the fine dust is lost. Mercury has not yet been used in separating the gold either here or at the other localities.*

It is impossible to form any reliable estimate of the amount of gold obtained in Nova Scotia since its discovery there in March last, as in almost every instance the 'claims' have been worked by private individuals who were generally disinclined to give information in regard to their own success. Nor would the amount alone, if ascertained, be a fair criterion by which to judge the value of the gold fields, since they have in most cases been explored by those who have had no previous experience in

* While at Lunenburg I was informed of a circumstance connected with the discovery of the gold which illustrates the utility of even a little scientific knowledge, and the need of its more general diffusion. Some years since a farmer, living in the neighboring town of Chester, thought he had discovered a valuable copper mine on his land, and at a great expense sunk a shaft about eighty feet in depth. Finding little copper to repay his labor, and having exhausted all his means, the work was finally abandoned. In his excavations he had cut through a large quartz vein richly stored with gold, which he had noticed, but supposed to be merely copper pyrites. The present owner works this copper mine for gold.

searching for gold, and only the rudest methods have been employed in obtaining it. I was informed that gold to the value of \$2400 had been taken from one 'claim' at Tangier, \$1300 from another, and \$480 from a third, although many other 'claims' had yielded little or nothing. I saw in Halifax ingots and specimens of Tangier gold which were valued at about \$2000, and at Lunenburg at least \$250 worth of fine dust which it was said had been washed from a single 'pocket' on the beach.

I have recently analyzed some specimens of gold which I obtained at Tangier and Lunenburg, and the results are given below. The Tangier specimen was taken from a quartz vein, and is very remarkable for its purity. I find it is surpassed in this respect by the gold from only one other locality, viz., Schabrowski, near Katharinenburg, in Siberia.* The Lunenburg gold was in small particles, washed from the sand on the shore. In preparing for the analyses the gold was boiled in chlorhydric acid, fused twice with borax and hammered, and its specific gravity taken. The quantity employed in each case was between one and two grammes, and the analyses were made according to the method used by Rose in his investigations on the gold of the Ural mountains.†

An analysis of the Tangier gold, specific gravity 18·95, gave,

Gold,	-	-	-	-	-	-	-	-	-	98·13
Silver,	-	-	-	-	-	-	-	-	-	1·76
Copper,	-	-	-	-	-	-	-	-	-	·05
Iron,	-	-	-	-	-	-	-	-	-	trace.
										<hr/> 99·94

An analysis of Lunenburg gold, specific gravity 18·37, gave,

Gold,	-	-	-	-	-	-	-	-	-	92·04
Silver,	-	-	-	-	-	-	-	-	-	7·76
Copper,	-	-	-	-	-	-	-	-	-	·11
Iron,	-	-	-	-	-	-	-	-	-	trace.
										<hr/> 99·91

In some specimens of auriferous quartz from Lawrencetown, obtained of Mr. R. G. Fraser of Halifax, I found mispickel, iron pyrites, galena, and magnetite, associated with the gold in the same manner as at the other localities. In one instance a crystal of mispickel had a small particle of gold passing directly through its center. The specific gravity of the gold from this place was 18·60, which would indicate a degree of purity between that of the Tangier and Lunenburg specimens. The quantity obtained was not sufficient for satisfactory analyses.

Mr. Fraser informed me that some time since, in company with several others, he made explorations for gold on Sable island, and found a small quantity in the sand of which it is

* Dana's Mineralogy, Fourth ed., page 9.

† Reise nach dem Ural, page 406. Berlin, 1842.

composed. As this island is more than one hundred miles from the coast, this discovery would appear to indicate that the gold-bearing strata of Nova Scotia extend for a considerable distance beneath the Atlantic ocean.

There is another belt of metamorphic rocks in the northern part of this Province which resembles in many respects that on the Atlantic coast, although it probably belongs to a more recent formation. The Cobequid mountains are in this district, and are mainly composed of talcose and chloritic slates, penetrated by dikes of green-stone, sienite and granite. While passing this range in August last, in company with Mr. W. P. Ketcham of New York, I noticed a close resemblance between these rocks and the auriferous strata which I had just examined at Tangier and Lunenburg. The quartz veins were of similar size and appearance, and contained some of the same minerals which are there associated with the gold. I think it probable that these strata also will be found to contain this metal, although the hasty and imperfect examination, which we then were enabled to make, was not rewarded by its discovery.

A public geological survey of Nova Scotia is much needed, and a considerable part of it could be made with comparatively little labor; as in some parts of the Province the formations are so interesting that they early attracted the attention of scientific men, and have been very carefully studied. The districts, however, in which gold has been discovered, and in which it is likely to be found, have been only casually examined, and a systematic survey would make known their real value and prevent the recent discoveries from proving a misfortune, by impairing more important branches of industry. Now that the monopoly of the "General Mining Association," which has so long obstructed the development of the rich mineral resources of the Province, has been removed, it seems especially desirable that this survey should no longer be delayed. The revenue derived from the rent of 'claims' in the gold fields would probably be more than sufficient to carry on the work and could not well be devoted to a better purpose.

The great extent of metamorphic strata in Nova Scotia, so similar to the gold-bearing rocks in other countries, and the fact that gold has now been found at many widely separated points, would seem to indicate that a new and important source of mineral wealth will soon be added to this already favored Province.

Sheffield Laboratory, Yale College, Oct. 5th, 1861.