

But I may venture one more observation. I see that the motto of this City is "*E Mari Merces.*" This being the case, one would naturally expect that some little attention and encouragement would be bestowed by the citizens on one great source of this wealth, viz:—the Fisheries. Exhibitions of fruit and flowers are annually held in this city, and liberal rewards bestowed on successful competitors. This is all very well, and no doubt encourages horticulture and increases the number of conservatories. But when did we ever hear of a fish-show, or of prizes being offered for the best specimens of fresh and *well-cured* fish? Fishermen are expected to go on, hazarding their lives and eking out a mere subsistence in hopeless poverty and self-denial, almost unthought of by their superiors, whilst they keep up the most lucrative branch of industry in the Province; and though Agricultural Societies are gotten up, and fostered by Government, in order to encourage and teach the farmer, and supply him with the best stock and implements, we have yet to hear of the very first effort to teach or encourage the poor fisherman. But if we are to see our fish-trade expand under the contemplated treaties, this indifference must be shaken off, and a vigorous effort made to develop a great source of wealth which as yet is only in its infancy.

ART. V. THE AURIFEROUS DEPOSITS OF NOVA SCOTIA. BY P. S. HAMILTON, CHIEF COMMISSIONER OF MINES.

(Read Feb. 6, 1866.)

IN coming before the Institute this evening, with a few remarks upon the "*Auriferous Deposits of Nova Scotia,*" I must say that my selection of a topic has been rather an acquiescence in the expressed wishes of others, than a deliberate choice of my own. I say this because of the difficulties which, according to what knowledge I have been able to gather, beset the scientific aspects of the subject; and which utterly preclude my producing a paper satisfactory to myself. I will therefore be brief and confine myself to the statement of a few facts upon the extent of the Nova Scotian Gold Fields, and the distribution of gold therein, and upon some geological and mineralogical phenomena connected with their deposits,

hoping that these facts, may be some slight aid to others in pursuing further researches into the subject.

The outlines of the well marked geological districts, which comprise the Gold Fields of Nova Scotia, are already pretty generally known. I will only briefly state that they consist of two distinct districts, of different geological ages. We have upon the Atlantic Coast the Lower Silurian rocks, forming a band which extends the whole length of the Nova Scotian peninsula. This district is not less than fifty miles in width at its western extremity, gradually narrowing as it proceeds eastward, and finally coming almost to a point at Cape Canso. The other district—the Devonian, and Upper Silurian—forms several comparatively lofty and isolated ridges. One of these extends from Digby County, along the south side of the Annapolis valley, to the vicinity of Windsor. Another commences at Cape Chiegnecto, forms the Cobequid Hills, and, with a slight divergence from its original course, proceeds eastward to the Strait of Canso, throwing off spurs north-eastward to the Gulf of St. Lawrence, and south-westward on both sides of the Stewiacke River. In the Island of Cape Breton, nearly the whole of Victoria County, a large portion of Inverness, and several detached eminences in Cape Breton and Richmond Counties, belong to the same formation. Among the gold bearing formations of this Province, I might also include the Trap ridges, considerable as to extent; for auriferous quartz has been discovered and to some slight extent mined, in the Trappean headlands of Partridge Island, and Cape D'Or; but I will leave this geological district out of further consideration.

The extent of the two larger districts which I have indicated, comprises, in the aggregate, a large proportion of the surface of Nova Scotia. I would roughly estimate the area of the Lower Silurian district, at 7,000 square miles, and of the several tracts of the more recent formation at 3,000, in all 10,000 square miles. The whole area of the Province of Nova Scotia, amounts to about 18,600 square miles. It must not be assumed that this large area is throughout auriferous. I will observe, parenthetically, that judging from what is already known, there is every reason to believe that future explorations will prove the greater part of this area to be rich in metalliferous deposits of some kind.

As to gold, I will begin with the Devonian district. The several ridges of high lands which come under this denomination have, as yet, been but little explored for gold; nor is it probable that they will be, to any great extent, for some time to come. These hills are, for the most part, in the interior of the country; their rocks are rarely exposed, being covered with a pretty deep soil, from which has arisen a heavy growth of timber. Gold has been found in the alluvium, brought down by many streams which take their rise in these hills. It has seldom been discovered, as yet, in quartz *in situ*; but, for the reasons just referred to, quartz *in situ* has seldom been seen in this geological district. In Wagamatkook, which is a proclaimed gold district, about the head waters of the river of the same name, in Victoria County, quartz has been mined to some small extent. The little done here in this way did not afford as good promise of profit, as has been met with in quartz mining elsewhere in the Province; but it cannot be considered a fair test of the productions of the district. Most of the gold obtained at Wagamatkook, has been taken from the beds of the streams which flow down from the hills; and the quantity thus procured indicates the presence of numerous auriferous quartz veins in the vicinity. Gold has been discovered in the sands of nearly all, if not all, the streams of Victoria and Inverness which take their rise in these metamorphic hills. It has also been found in the same formation at Cape Porcupine, near the head waters of the Musquodoboit and the Stewiacke, and, I believe, at Five Islands and elsewhere; so that gold may be sought for, with not unreasonable expectations of success, in any part of this geological district.

We have more reliable *data* as to the auriferous character of the better known Lower Silurian coast band; but even with respect to this, they are as yet very incomplete. We know that in the Lower Silurian district there are found bands of quartzite, seemingly nearly parallel with each other, alternating with various slates, extending in a general easterly and westerly direction. These bands are intersected by various masses of granite, in some places extending quite across the whole formation, but more frequently forming detached masses protruding through and surrounded by the stratified rocks just named. In this quartzite, and in a less degree, in some of the slates, we find numerous veins of quartz; and these

veins—especially those of the quartzite—we find to be auriferous. Of the number of the quartzite bands and of the latitudinal extent of each, little is yet known. It has indeed been stated that, between the Atlantic coast and the northern confines of this metamorphic district, there are six of these bands; that these represent six lines of upheaval, or east and west anticlinal axes; and that the slates found alternating with the quartzite are, in fact, superimposed upon it. This may be correct; yet I cannot but entertain doubts as to some of the particulars. First, a transverse section quite across the rocks of this metamorphic district has never yet been exposed to the eye of any man. Secondly, the supposed continuation of these quartzite bands from one known gold-bearing tract to another, as represented by the authority just referred to, is now seen to be not borne out by the facts—at least, not in every instance. Lastly, in one at least of these bands represented as embracing a single anticlinal axis, I have found several of such axes. From a general acquaintance with the country and not from actual survey, I am inclined to the belief that these quartzite bands are much more numerous than they have been represented; and that in the aggregate they form the largest portion of the width superficially of this metamorphic district, skirting the Atlantic.

Longitudinally, this quartzite, with its auriferous quartz veins, can, except when interruptions are caused by the granite dykes already mentioned, be traced the whole length of the Nova Scotian peninsula. Gold has been taken from quartz veins at Yarmouth, and on the shore of Chedabucto Bay, and, I might add, at every intermediate point where diligent search has been made for it in the proper formation. The quantity of quartz embraced in this great length and breadth of quartzite vein-stone, must be something enormous. I speak of it in comparison with the bulk of the enclosing rock. Of course we have no sufficient *data* from which to estimate this quantity. The opinion I have just hazarded is based upon observations of the few cross cuttings in the rock yet made, in the few localities of this Province where gold mining is yet carried on; and these openings have in many—I believe I might say, in most instances, been made at mere hap-hazard. On one occasion I myself removed carefully the drift, so as to expose a cross section of the surface merely of the bed rock, for a distance of about one

hundred and sixty feet. Within that distance, I discovered over thirty quartz veins, ranging from an inch to fifteen inches in thickness. The whole number of veins would average not less than six inches, or say fifteen feet in all, thickness of quartz, to one hundred and sixty feet of enclosing rock, the dip being here nearly vertical. In another instance after counting and measuring the quartz veins exposed within a distance of two hundred and fifty feet, I estimated their aggregate thickness at twenty-five feet; and yet, as within a part of the distance of two hundred and fifty feet, there was no exposure of the bed rock, the actual thickness of this quartz may have been considerably greater than what I have stated. In both of these cases, the quartz veins exposed, or the greater number of them, were known to be auriferous from examination made at the several spots where laid bare. In other localities, quartz veins of five, ten, and even up to thirty feet in thickness, are found. But I will not multiply instances. Those which I have specified do not, I think, exhibit a much greater thickness of quartz in proportion to that of the enclosing rock, than will be found generally throughout these quartzite bands. As already intimated, I thus judge solely from what is shown in excavations already made, and in Gold Districts of many miles apart. The surface of the gold-bearing rock of Nova Scotia, is for the most part concealed by a thin covering of drift and vegetable matter. Consequently it is an incident of no unfrequent occurrence for a miner, by some accident, or lucky blunder, to stumble upon a quartz vein of exceeding richness, the existence of which he never suspected, but which had lain almost within arm's length of where he and others have been toiling, perhaps with indifferent success, for months or years previously.

There is good reason to believe, then, that this quantity of quartz within easy reach of the miner, in Nova Scotia, is immense. The great economic question to be considered is: to what extent is it auriferous? It would be a sweeping and perhaps incredible statement to aver, that all of these quartz veins bear gold; and yet, so far as one can venture to hold any opinion at all, upon a subject upon which it is so difficult and dangerous to generalize, I rather incline to the belief that they all are more or less auriferous. Certainly the result of my own observations tends to that conclusion. I have seen and gathered some facts, concerning a great

number of these quartz veins that had been opened for the purpose of mining, or at least "prospecting." As to the results, individually, of these examinations, I must admit that I do not speak from notes taken on the several occasions; but speaking from memory I can recal no instance where I have seen a quartz lode fairly tested, which did not prove to be auriferous. I have seen a shaft sunk upon a previously untried lode, to a depth of sixty feet without a "sight" being discovered; and then the quartz has become exceedingly rich. In many instances very rich quartz lodes have been temporarily abandoned as non-auriferous, because the miner has happened to commence operations upon a poor section of the outcrop of the vein. It is possible that there are many other abandoned lodes, which will hereafter prove to be highly auriferous. Many quartz veins worked in Nova Scotia, have proved to be very rich in gold. The statistics of the Department of Mines show that, for four years past, the average yield of gold per ton of quartz has exceeded that of any other gold-quartz mining country.

The phenomena observable in connection with these auriferous deposits are almost wondrously various, and are oftentimes very puzzling to the man of science, as well as to the practical miner. These seekers after truth—and something more—are virtually in accord upon one point. Both wish to know the law of Nature by which gold has been deposited in quartz; for that law once being known, gold can be found without any waste of time, capital, or labour. But the miner, of course, looks solely to the end: the man of science, we must assume, regards only the means. I will briefly mention some of these phenomena, many of which are seeming inconsistencies of Nature.

Most of the auriferous quartz lodes which have yet been opened and mined upon in Nova Scotia, have the same strike and dip generally as the rock enclosing them. They are what some mineralogists call "beds," in contradistinction to "true veins," which cut the enclosing *strata* transversely. Yet these "true veins," or "cross leads" as the miners here call them, are found in all the mining districts. As a rule, they are considered unproductive and are not worked. Yet, in the Ovens Gold District, most of the gold obtained from quartz has been out of these cross leads; and in Oldham, a cross lead was accidentally struck, two years since,

which proved exceedingly rich, being in this respect, an exception to all other such veins in that district. Again, there are localities where little gold can be found, except at the point of intersection of the “main” and “cross leads”; whilst at that point, the expectation of a rich nest is not usually disappointed. There are A veins, the ridged tops of which are found beneath the surface of the enclosing quartzite, and which rapidly widen as they descend; there are V veins, which are wide at the outcrop, and as rapidly narrow down to nothing as they descend; and there are veins which extend with nearly parallel sides for a long distance, both vertically and longitudinally. There are also the beds of what is called “barrel quartz,” which, when laid bare, exhibit a striking resemblance to great piles of prolonged trunks of spruce trees, from ten to fifteen inches in diameter, with the bark still on,—the corrugations of these quartz beds, and of the compact enclosing rock fitting into each other, as closely and accurately as the thread and groove of a male and female screw. Veins are found to be segregated—that is, they thin out to nothing in every direction. I am strongly of the opinion that they are all segregated veins. In some veins the quartz is of almost snowy whiteness, relieved only by the glitter of the golden nuggets it encloses. Such is the case with some at Tangier, whence beautiful specimens for ornamental purposes have been obtained. In other veins, foreign substances largely prevail. The rather celebrated “blue lead” of Sherbrooke, consists in great part of a blue slate, thoroughly pervaded—I may say—by a vitreous looking quartz; hence the name of the lode. Other veins exhibit a variety of metallic substances. Among them mispickel, or arsenical pyrites, usually predominates. It is often found in large masses, and sometimes the lode is more mispickel than quartz. This substance has been ascertained to be largely impregnated with gold; and considerable quantities of it are now carefully saved and sent abroad for more economical treatment than can be given to it here. The rich and well known “Hattie Lead” of Wine Harbour, like some others, is enclosed in a comparatively soft friable rock—so much so that a large portion of the miners’ work has there been done by the pick-axe and crowbar, without the aid of blasting powder. The quartz itself partakes somewhat of the same character; and I have seen large specimens taken from this vein in which the

apparently shattered quartz was literally held together by clamps of gold. But this lode is erratic in its course, and does not seem to extend far longitudinally. On the other hand, at Old Tangier, the veinstone, where it has been operated upon, is of unusual hardness; whilst there the quartz veins are very regular and of long continuation, and the gold seems to be pretty equally distributed through them. The same contrast has been observed in Australia, between quartz lodes enclosed in hard, and those enclosed in soft rock.

What part of the quartz lode is most rich in gold? To answer this, as far as I can, is to point out some more of the vagaries of Nature. Early in the history of Nova Scotian Gold mining, I observed this fact.—Upon a quartz lode on and along which three or four mining companies were at work, their properties being contiguous, I had an opportunity of noticing operations daily for some months. This was a rich lode upon the whole; but the distribution of gold throughout the quartz was very uneven, and this in a manner most bewildering to the miner. I at length found that there were pretty distinctly marked sections of the lode which were much more rich than the intervening sections. These richer “streaks,” as they have been called, did not run horizontally, nor vertically, as the miners first supposed when they found that there was an inequality in the distribution of gold, but *obliquely*. Upon a subsequent examination of several other auriferous quartz veins—some of them among the most noted in the Province,—I found that precisely the same rule applied to them. I supposed and am still inclined to suppose, that I had established a theory; but I would not venture to insist upon the universality of the application of this theory. In some veins, the greater portion of the gold is found in “nests,” or “pockets”; and these pockets seem to be distributed, without regard to any rule whatever. In others, the gold is, with less extremes of variation, distributed throughout the vein, both longitudinally and vertically.

If we take cross sections of auriferous quartz veins and examine them, we shall find almost as great a diversity in the distribution of gold. In one case, we shall find the gold nearly all upon one side of the vein. Another lode, precisely similarly circumstanced, will show it upon the opposite side. In a

third—these cases are more rare—it forms a plane, or leaf, in the middle of the lode. Again, it will be mostly found in the slate “casing” of the vein, and not in the quartz itself. In most cases which have come under my notice, however, the gold is scattered throughout the thickness of the quartz and casing; and is sometimes quite invisible to the naked eye. Until very recently, it has almost invariably been found that quartz lodes became richer in gold as they descended. Facts have lately come under my notice which tend to show either that this rule does not apply to all lodes, or that at least it does not apply to all beyond a certain depth.

I would like to conclude with some remarks upon the theories, which have been offered to the world as to the origin of gold in quartz; but to do so with any justice to the subject at all, would extend this paper to unreasonable limits.* I will only now say, with some hesitation indeed, and with all deference to the opinions of the many learned men who have discussed the subject, that the quartz veins of Nova Scotia, on a careful examination of them, seem to me to present serious difficulties, to the adoption of the theory that gold was deposited there from aqueous solution; and also to the adoption of the opposing theory, that its presence there is the result of igneous action. I suspect, perhaps with improper incredulity—that the secret of the formation of auriferous quartz deposits, yet remains to be divulged.

ART. VI. NOTES ON THE WEATHER AT HALIFAX, NOVA SCOTIA,
DURING 1865. BY COLONEL MYERS.

[*Read Dec. 4, 1865.*]

THE cold of the winter of 1864–5, seems for the most part to have expended itself during the latter part of December, 1864; and January, 1855, began, and continued throughout, mild and serene. The mean temperature was 22°, one degree less than that recorded on the same month of the previous year.

High winds prevailed during February, but the weather generally fine and mild for that month. Mean temperature 24°, being 2° less than in 1864.

*Perhaps I may, in some future paper, recur to this branch of the subject, which must be by far the most interesting to the scientific mind; but it is the most perplexing to deal with.