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# THE OTTAWA NATURALIST.

VOL. XIII.

OTTAWA, MAY, 1899.

No. 2.

## THE MINERAL RESOURCES OF THE OTTAWA DISTRICT.

By R. W. ELIS, LL.D., F.R.S.C.

*(Continued from April number.)*

While mineral developments are found throughout the Ottawa valley at a number of places, there are two localities in the lower Ottawa basin which have for many years been distinguished for economic production. Of these, probably the most important, as to output, are the deposits of apatite and mica lying to the north of the Ottawa River and between the rivers Gatineau and Lièvre; the other is situated to the south, in the vicinity of the Rideau lakes, and near the line of the Kingston and Pembroke railway, in which districts our great deposits of iron are located. In the great area occupied by the lower or Laurentian gneiss the mineral developments are, in so far as yet known, few, and it may be generally remarked that investigations along these lines in that area have not yet been very successful. The geological horizons therefore, in the crystalline rocks that promise the best results, and have so far been the most productive, are the upper part of the gneiss and limestone formation and the associated Huronian rocks.

Now if we carefully study the rock masses in these areas we find a very extensive development of clearly igneous rocks, such as greenstones, granites, pyroxenes, diorites, &c., and it is generally in connection with some of these masses that our most productive mineral deposits may be looked for. The natural inference therefore is that mineral developments are in some way due to the agency of these latter intrusions.

That many of these intrusive masses are newer than the rocks with which they are associated is clearly shown by the fact that, though they sometimes occur as apparently bedded portions, they quite as often occur cutting the surrounding

strata at all angles. It was to some extent, doubtless, this bedded character that led to the original supposition that these masses were, for the most part, sedimentary in their nature, and this was the view expressed by most writers on this subject twenty to thirty years ago.

#### APATITE.

If we examine any of the mines of apatite, either to the north or south of the Ottawa, we find this mineral invariably associated with pyroxene, which would therefore appear to be its necessary accompaniment. Now the pyroxene dyke or mass which cuts across the strike of the gneiss or limestone must be of more recent date, and the apatite is generally found along the outer margin or near the lines of contact of the intrusive mass and the gneiss. Frequently, however, masses of calcite, often of large size, and of a pinkish or grey color, are found in the mass of the pyroxene, and this frequently contains large crystals of both apatite and mica, leading to the statement by some observers that these minerals occur sometimes in economic quantity in the crystalline limestones. One must however discriminate between masses of calcite which are an integral portion of the pyroxene dykes, and the limestone formation proper, which is an entirely different thing, so that it may be safely stated as the result of the examination of all the known mines of this mineral, that apatite is not found except in association with pyroxene.

As to the origin of this mineral opinions differ, but it is found generally in one of two ways, either as large pockety masses, which sometimes yield a thousand tons or more, or as irregular developments varying in width from a few inches to several feet in thickness. The extent and value of this one of our mineral resources of the Ottawa district, may be gathered from the statistics contained in the official bulletins of the Geological Survey. Thus we find that, in the seventeen years from 1878 to 1894, the output of this mineral from the mines of eastern Ontario was 24,760 tons, with a market value of 260,974

dollars, while from the mines of Quebec the output for the same time was 269,771 tons with a value of 4,749,888 dollars, so that the total product of the phosphate mines of the lower Ottawa district, for this period, was not far from 5,000,000 dollars, which, it must be allowed, is a very creditable sum and only one and a-half million dollars less than the total gold output from all the mines in Nova Scotia in the same time. The placing on the English market, about 1890, of the cheaply mined phosphates of the Southern States, which could be put on ship-board at a cost of about two dollars per ton, caused a speedy decline in the market for the high-priced Canadian apatite, so much so that within the last three years the last of these mines has been obliged to discontinue working entirely, and this great source of mineral wealth is now at an end, and will probably not be again utilized until the exhaustion of the southern deposits has been reached. In mineral development, therefore, we see that progress and profit are simply a matter of supply and demand. In both Ontario and Quebec there are yet great stores of apatite which may some day again find a market, and then we can look to a return of prosperous conditions in this part of our valley and the utilization of some of the large amounts of capital invested in this direction.

#### MICA.

Closely allied to apatite in its associations, and to some extent also in its mode of occurrence, are the deposits of mica. The demand for this mineral has, however, never been so great as in the case of the other, while the industry has not been prosecuted for so long a time. yet from the mica mines of the Ottawa district there was marketed in the nine years from 1886 to 1894, a total value of half a million dollars. The occurrence of mica forms an interesting subject of study, and some facts have been obtained, from a close inspection of many localities, that may be of general interest. Merchantable micas are of two or three varieties, principally muscovite and phlogopite, with the variety biotite. The first is known as a potash mica, the

others as magnesian micas, of which the biotite differs in containing iron as well, and is consequently darker in colour and sometimes quite black. The muscovite is distinguished by its general clearness and lack of colouring, while the phlogopite mica is usually some shade of brown or yellow and is generally known as amber mica. Years ago large sheets of white mica, as it was generally styled as contrasted with the darker coloured or amber variety, were quoted at a very high price, but this distinction seems of late years to have largely disappeared, as is also the case with sheets of extra large size, since this feature of size is now attained by a process already referred to of building up by means of cement and pressure from smaller sizes, so that almost any size required can now be readily obtained.

Of these several varieties, the white or muscovite is usually found in association with intrusive masses of a whitish granite, composed of quartz and white felspar which cuts the gneiss and limestone in the form of dykes or veins; while the amber and black varieties are found in connection with pyroxenes. As a rule the darker the containing rock the blacker the mica, so that in the light coloured pyroxenes the mica is often a light shade of amber. The most perfectly shaped crystals are generally found in a matrix of calcite in the pyroxene; and were it possible to secure perfect crystals at all times there would be much more profit in mica mining than has yet been enjoyed. Unfortunately, however, the greater portion of the crystals are injured by wrinkles, cracks, small punctures or from some other cause, so that it is a fortunate mine that will yield ten per cent. of merchantable mica from its total output.

Crystals are often found in the Gatineau district of very large size, one from a mine near the Cascades being stated to have a diameter of nearly eight feet. Unfortunately these large crystals, owing to their generally fractured condition, have generally but little economic value. One of the largest deposits of this mineral yet found in the Gatineau district is in the township of Hincks. It occurs in a dyke of pyroxene which cuts the limestone of that area and is in turn cut by a dyke of green-

stone. The crystals here were of a large size, sometimes as much as three feet across, and many of them so clear that plates two and three feet long by nearly a foot in breadth were obtained. The mica here was dark coloured as might be expected from the dark colour of the containing rock, and a large quantity of excellent mica was extracted before the deposit was exhausted.

A very pretty purple-tinted mica is also sometimes found in cases where a dyke of light-tinted granite cuts the limestone. but as yet has not been obtained in quantities to be of economic value.

#### IRON ORES.

The iron ores of this district are divisible into several classes and occur at several horizons. The principal workable deposits are magnetites, though several mines have been opened on hematite ores, and sometimes both varieties are associated, as in the case of the Haycock mine and at several points in Renfrew county. Of the magnetic variety there are also two kinds, viz., the titaniferous and the true magnetites, and each of these is found in its peculiar country rock. Thus in the case of the titanium ores it may be said that they usually occur in anorthosite rocks, which are a recent intrusion in the gneiss and limestones, and the amount of titanic acid in these sometimes reaches 45 per cent, which renders the ore practically useless on account of its great refractibility, and the consequent large amount of fuel necessary to reduce it to a state of metallic iron. Attempts have been made from time to time to utilize this ore, but always with disastrous results to those interested.

The true magnetites are found at many points and furnish an ore often of great purity and value for smelting purposes. They occur in the vicinity of Hull where they were mined extensively, and where they were also smelted for some years, though operations in this locality have now been suspended for nearly a quarter of a century. In Bristol also there are large deposits of this ore which have also been extensively worked, but its value is to some extent affected injuriously by a corra...



percentage of sulphur which necessitates a roasting process before it is sent to the smelter. As a consequence the demand for these ores has of late years largely fallen off. The same association of sulphur is found in some of the deposits along the Kingston and Pembroke Railway, and seriously impairs their value as smelting ores, so that the hopes which were raised in regard to their speedy utilization by the building of the Hamilton smelter have not yet been realized. All the ores in this district are not, however, affected in this way, and there are some large deposits of excellent quality ; but on the other hand these are sometimes so far removed from convenient shipment that the price obtainable will not repay the cost of hauling to railway and the subsequent freight to the smelter. It can be easily seen therefore, that though there may be a very large amount of raw material available, this is not always in such a shape as to yield profitable returns. This condition of affairs is unfortunate, and many persons unacquainted with the actual conditions, often wonder why mining is not pursued with greater vigour in certain directions. Investors of small capital, however, generally wish to see some chance of realizing on their investments when once mining operations are commenced, unless as is sometimes unfortunately the case, such investments are made on a limited scale with simply a view to speculation. Such schemes cannot, however, be classed under the head of legitimate mining, and the last investor generally has the experience obtained as his share of the profits.

Improvements are constantly being made in the process of iron smelting, and therefore we may hope that with greater facilities for shipment and reduced expenses in smelting, the greater part of these ores will some day become valuable assets. At present the great barrier to the successful development of the blast furnace industry in this district, is the cost of fuel, and it is to be hoped that some day in the not too distant future, the successful manufacture of compressed peat will go far to solve this difficulty. Smelting with peat fuel has been carried on successfully for many years in Norway and Sweden and also in

Germany ; and there is no reason why methods which are so successful in those countries should not be equally so here, provided the greater cost of labor be not an insuperable obstacle. Figures given by the American expert, Birkenbine, for the Ottawa district, some years ago, placed the cost of manufacture, *even under the then unfavorable conditions, at such a price as to fairly warrant investment at some central point such as Ottawa city, and to make the erection of a blast furnace profitable, but the initial cost of such an enterprise is heavy and investors prefer often to take their chances in some more gilded scheme, even though, as is often the case, the results are not always very flattering.* However this country is as yet comparatively young in mining matters and the attention of foreign capitalists is now only being directed to this portion of the empire as a field for profitable investment, so that it is not worth while to become greatly discouraged over a present depression along certain lines.

#### GRAPHITE.

Among the other mineral industries that at some not far distant day promise to be a very important factor in the country's development is the mining of graphite. We have in the Ottawa district some of the largest and most valuable deposits of this mineral anywhere known, and easy of access, and though efforts have been made in a half-hearted way for some years to turn these to profitable account, such attempts have been so carried on as not to yield satisfactory returns. In such a case we should not attribute the lack of success to any fault on the part of the ore deposit, since this has been thoroughly investigated in the laboratory of the Geological Survey, and the mineral found to equal in quality, for all practical purposes, that from the celebrated mines of Ceylon, which so largely enter the markets of the world to-day. The failure rather seems to be on the part of those who have the mines in charge, and to their lack of enterprise in seeking a market, since the Canadian market alone consumes annually a sufficient amount of this material to warrant the workings of these deposits on a large scale. Thus

from the official bulletin of the Survey we find that in the ten years, from 1886 to 1895, the quantity of graphite produced in all Canada, including the output from New Brunswick, amounted in value to less than 30,000 dollars, while the value of the imports of this material for the sixteen years from 1880 amounted to over half a million dollars. This is certainly a bad showing in the face of the fact that we have more than enough of the the raw material to supply all our own needs and to furnish plenty for export besides. Certain changes now in contemplation may in a few years result in effecting a marked difference in the balance of these figures, but this will only be done by changing entirely the present inoperative system of management. At one mine north of the Madawaska River, not many miles north from the Kingston and Pembroke Railway, there is a wonderful deposit of this mineral, the amount in sight being apparently sufficient if properly handled to supply the market alone for some years, while the great deposits of the Buckingham district have as yet only been opened sufficiently to show their great extent and value.

#### MOLYBDENUM.

The peculiar mineral molybdenum which has recently come into prominence in mining circles, is somewhat widely distributed through the crystalline rocks of the Ottawa basin. In physical features it is sometimes mistaken for flake graphite which it resembles strongly in the field. Along the Ottawa River it occurs in limited quantity in certain of the rocks on Calumet Island, though the extent of the deposit here has never been ascertained, but at or near Haley Station, on the Canadian Pacific Railway, there is a large deposit of this mineral which has been worked for some years in a desultory fashion. Recently, however, the mine has been reopened and a considerable output is now being obtained for shipment. Along the Gatineau River this mineral is found in several of the adjoining townships, but apparently the most important deposit yet located in this direction is in the township of Egan, north of the Desert River, where it appears to have a large development. It

is usually found in connection with white granite dykes which cut the crystalline limestone and associated gneiss of the Grenville and Hastings series, which have a wide extent in this area, both north and south of the Ottawa. The market at present for this mineral is not large, but the demand has increased rapidly within the last three years, so that there is a fair prospect of some of these deposits being utilized at no very distant date.

#### ASBESTUS.

Of the peculiar mineral asbestos, or rather chrysotile, of which you have all heard, though there are limited deposits at several points, they are of such small extent, as compared with the great deposits in the Eastern Townships of Quebec, that it may be safely said we cannot hope to successfully compete with these in the matter of production. In point of fact, the great deposits of this mineral in Quebec have practically closed down the output of the mines for the rest of the world, at least as regard the finer qualities. Asbestos proper is a variety of hornblende, and is found and has been worked for some years in the County of Hastings under the name of actinolite. What passes under the name of asbestos in commerce is a fibrous serpentine or chrysotile which has a soft, beautiful and silky fibre, of great tenacity and strength, so that it can be readily teased out, spun and wove, or made into rope, while the shorter and more imperfect fibre is used for millboard, packing, and for a variety of purposes. Its great value depends upon its capacity to resist combustion, that is, it is practically a fire-proof material.

In connection with some of the limestones of the Grenville series there are certain serpentinous bands which contain small veins of this substance and these have been mined at a number of points, though the small size of the fibre prevents it from competing with the longer material of the Eastern Townships. This Ottawa product is, however, utilized for the manufacture of a celebrated fire-proof plaster which possesses many advantages over the common variety for interior work, and this is rapidly growing in favor with builders, so that the industry promises to

assume large proportions at some time, though there are not the large profits which are obtainable from the mines of the eastern district.

#### GOLD.

The mining of the precious metals has always possessed a charm for many persons, though there is probably no enterprise in which more money has been lost than in the attempt to obtain gold from the hard matrix in which it is usually found. Still there is always a great fascination to most persons in the term gold-mining, though the ideas many people possess on the subject are exceedingly crude. The discovery of gold in any country usually gives rise to much excitement, and this is often in direct ratio to the remoteness of the locality where the find is reported. Gold mining has too large an element of uncertainty in it to be pursued by the ordinary citizen with profit. To say nothing of the capricious nature of this mineral itself there is often the temptation on the part of the unscrupulous miner to salt his claim and thus impose on the ignorance or credulity of his neighbour. Then there is frequently the dishonesty of the assayer to whom the samples selected as a fair test of the property are sent and of these, I regret to say, the making of false returns is sometimes a matter of business in order that more samples, and the necessary fees for testing the same, may come his way. In fact, some of these assayers have been known to boast that they could get an assay of gold from any kind of rock, or even from a piece of brick if necessary; so that the report of a so-called assayer, for there are some that disgrace the name, is not always to be relied on as absolutely correct.

The gold of the Ottawa district may be said to belong to the Huronian belt of rocks which traverse a portion of Ontario in the counties of Addington, Hastings, Lanark and Renfrew, and which also crosses the Ottawa River into the province of Quebec. These rocks have been described in the reports of the Geological Survey under the head of the Hastings series. They have been by some regarded as a portion of the Laurentian

system, while by others they are regarded as belonging to a higher division, the evidence in favour of the latter view being that generally accepted at the present time. The occurrence of gold in certain portions of these rocks was ascertained as early as 1865-66 in the neighbourhood of Marmora, and several mines were shortly after opened in that locality which gave great promise of good returns. Since that date this industry has been pursued with varying success, and with gradually improved methods of treatment this area will yet probably give satisfactory results. As a rule the gold of this formation is associated with various sulphurets which renders its separation from the quartz a somewhat difficult matter, and expensive methods are necessary for its profitable extraction. The difference between this ore and the free milling gold quartz lies chiefly in the fact, that in the latter the gold readily separates from the gangue after crushing and amalgamates easily with mercury, while in the arsenical ores, like those of the Marmora district, as also in some of those from Nova Scotia, the separation has to be secured by expensive chemical treatment.

No definite returns are to hand as to the actual output of the gold mines in this district, but it has varied greatly at different times. Assays from several mines in the Madoc and Marmora district have shown a very high percentage of the precious metal. Lately the gold bearing rocks have been recognized at different points nearer the Ottawa, and assays from some of these localities have given very satisfactory returns. Unfortunately however in many cases the veins of quartz are small and irregular, and there appears to be a good deal of uncertainty as to whether these can be properly manipulated. Small quantities of gold can be obtained by assay from many of the veins which traverse the rocks of this formation.

In the Report of the Geological Survey for 1878-79, an analysis is given of a sample of bluish-grey quartz, traversed by small veins of a light green apatite, which is reported as coming from the Peche Village, township of Wakefield. The results of this assay surpass anything yet found in the rocks of the Ottawa

district, the amount of gold per ton of quartz of 2,000 lbs. being stated at 11.725 ounces and of silver, 52.323 ounces. The size of the sample from which this assay was made was small, and if the vein from which the specimen was taken could be located there would seem to be a prospect for further developments in this direction.

It may not be out of place here to suggest that the attempts to obtain accurate information as to the quantity of gold contained in the quartz veins, which traverse many of the rocks in the Ottawa district, by mere assay of small samples is never likely to prove satisfactory. This can only be done by submitting a large sample of from one to three tons to a special mill test. Such tests can now be readily made in the new mining schools of Kingston or McGill college, and in this way definite knowledge can be obtained as to the commercial value of the ore, and the possibility of obtaining satisfactory results from its extraction.

It is very interesting to notice in connection with the occurrence of gold in this area that the same agencies which have played so important a part in the development of the deposits of mica and apatite, viz., that of intrusive granite or diorite, have also been exerted here. Thus it has been clearly shown that all the most productive mines are situated in close proximity to igneous masses which have penetrated the country rocks, generally composed of schists and slates, and it may be broadly stated that the same general principle applies to all the valuable mining areas both to the east and west. The productive mineral zones of the Lake Superior district conform to this general rule, and the deposits of copper and nickel at Sudbury are also found in intimate associations with great intrusions of granite and greenstone. It would therefore seem to be a well established fact that these intrusive masses have exercised a direct and favorable influence upon the presence of the economic minerals.

In the new group of mines on the Calumet Island, up the Ottawa, the masses of blende and galena are always found con-

nected with the diorites of that area, and the new showing of nickeliferous pyrrhotite on the same island has a large mass of diorite close to the development of the ore. These diorite and granite masses in this locality clearly break through the associated crystalline limestone and associated gneiss.

As for copper, the Ottawa district has as yet failed to produce anything of economic importance, but the silver-bearing galenas of Lake Temiscaming which have been opened up, appear to have a somewhat extensive development, though mining in this quarter has of late years languished. In the Wanapetae district however, which is on the western border of the Ottawa basin, very valuable deposits of rich gold ore have been recently exploited and are now being worked with good prospects of profitable returns.

#### COAL.

Coal, of course, has never been found in the Ottawa country, though scarcely a year goes by without the usual newspaper paragraph to the effect that a large bed of this mineral has been discovered in the area to the north of the upper St. Lawrence. To many, this absence of coal has seemed a mystery, and of late several severe attacks have been made upon the scientific authorities in connection with deposits of so-called coal in the Sudbury district to which the attention of everyone was recently directed. The true coals of the eastern provinces are confined almost entirely to the middle portion of the Carboniferous system, which lies at a much higher position in the geological scale than any of the rock formations of Ontario, which do not reach above the horizon of the Devonian. In one area in New Brunswick in this last formation there is a deposit of graphitic anthracite which has a thickness of several feet and which was persistently boomed for some years, and caused a lot of money to be wasted in an attempt to place it on the market as a first-class fuel. This hope has never been realized from the fact that the mineral contained too great a percentage of ash and graphite to burn well, the amount of residue after combus-



tion being nearly 40 per cent. There are, however, in some of the formations in Ontario and Quebec, notably in the Trenton and Utica, certain black bands of highly bituminous shale which, when ignited in a strong flame will burn till the greater part of the contained bitumen is consumed. The same bituminous character is seen in some of the shales of the lower Carboniferous formation of New Brunswick, and some of these are so rich as to yield over 60 gallons of oil to the ton, and slabs of this material placed on a camp fire will burn for a long time when once ignited. These cannot however be called coal deposits, though they contain so large a quantity of carbonaceous matter, and it would almost be as well to style our mines of graphite coal mines since graphite is also a form of carbon. Thus, the mineral found at Sudbury is certainly a carbon and will burn under certain conditions, but if there is too large an amount of ash it cannot compete readily with the better class of coals which are now used ; and besides the uncertain nature of such deposits, as contrasted with the great beds of the true coals, renders the investment of capital a very risky matter.

This question of Ontario coal came before the Geological Survey in the early days of its existence, and a rather good story is related in the life of Sir William Logan bearing upon the early operations in this direction.

Nearly forty years ago boring operations were commenced near Bowmanville with the intention of finding coal there, in spite of the old geologist's advice ; and after some days pieces of the mineral were frequently obtained. This, to many persons, was quite conclusive evidence that a true coal field had been reached. So much were some of these persons impressed with this discovery that one of Sir William's old friends, the sheriff of the district, came down to Montreal, where our offices were then located, and in a great burst of confidence, produced a sample with the request to know if that wasn't coal. Sir William, ever courteous, replied that it was most certainly coal, and a very good sample of Newcastle coal at that. " But," said the sheriff, " I saw it taken out of the hole myself." " Ah, yes,"

said the old knight, "and if you had been there a little sooner you would probably have seen them putting it in too." A few days after, in taking out some other samples of coal from this hole it was found that these were mixed with bread and cheese, showing that the person who so ingeniously "salted" the property had not been sufficiently careful in the selection of his ingredients. A subsequent investigation showed conclusively that the bore-hole had not even passed through the clay covering, and that the solid rock had never been reached, so that this attempt to start a coal mine in Ontario was a dismal failure. A similar attempt at coal discovery in Quebec was made on the north side of the St. Lawrence, below Quebec city, but a careful examination of this mine also showed it to consist of pieces of the mineral which had been stuck in the clay along the course of a small brook, so that this attempt also fell flat.

It would certainly be a wonderful thing and a great benefit to the industries of this district, if coal in workable quantity could be found anywhere in this area, but until the present geological conditions change very materially, it is to be feared there will never be any very great development in this direction, and the only alternative, if we wish to use our own fuel, is to utilize some of our great deposits of peat.

The question of natural gas and oil along the St. Lawrence has already received some attention, and will doubtless before long be again taken up. The developments along the east side of that river in the vicinity of Nicolet by boring, though carried down to a comparatively small depth, proved that natural gas does exist in that area, and it was obtained in considerable quantity at the first attempt. A large vein of gas was at one point struck at a depth of less than 600 feet, which came out with such force as to wreck the plant and hurl mud and stones many feet into the air. The hole was not however continued down to the Trenton, which was supposed to be the great reservoir of this material, owing to a lack of capital on the part of those interested; but the abandoned hole is still discharging gas in considerable quantity. It is the opinion of those who

have studied this field, which has a very extensive development to the east of Montreal, as well as along the valley of the river northward, that the prospects for obtaining this material in commercial amount are very good. In the lower Ottawa basin the greatest development of the rocks from the Trenton up to the Medina red shales, which is a succession precisely like that where the tests were made at Nicolet, is in the townships of Russell and Gloucester. No attempt has as yet been made to test this portion of the Ottawa basin, and nothing further can be said as to the probability of finding natural gas in this area, except that the strata are apparently undisturbed and there is a heavy capping of shales overlying the Utica and Trenton formations. Further east on the bank of the South Nation River a shallow boring was put down several years ago which produced gas in considerable quantity, and in this respect the area resembles that of the St. Lawrence. Several borings have also been sunk near the line of the Canada Atlantic Railway for water, as also near Caledonia Springs, but these, though they reached a depth at one place of about 800 feet, started below the surface of the Trenton and gave no results as to the presence of gas or oil. The upper formations of the Utica and Lorraine are absent from this portion of the basin, so that the area is not a typical one for tests of this kind. The discovery of natural gas in the vicinity of Ottawa would be of such great importance that one trial, even if attended with failure, should not be allowed to condemn the enterprise. In the case of the boring made within the city limits some years ago, it may be said that no results in this direction should have been expected. The boring started on Trenton limestone and in a part of the formation much broken by faults, so that if ever gas existed in that area it had an excellent chance to make its escape long before the bore-hole was started.

It would of course be rash to state that borings in the Palæozoic formations, south of the Ottawa, would result in finding either gas or oil in profitable quantities; and in this connection it may be stated that, in so far as explorations along these

lines have progressed in the western portion of the province, the best results have been obtained from formations much higher in the scale. Thus the large flows of gas in the western part of the province have resulted from the piercing of the Clinton or Medina, the latter only of which is represented in the Ottawa basin, while the Trenton formation which was pierced nearer Lake Ontario has as yet produced much less satisfactory results. Hunt, while claiming that the petroleum of Canada occurs at two horizons, viz., the Trenton and the Corniferous of the Devonian, shows that the great flows of oil in the Petrolia district proceed from the latter, though it is supposed that in some of the oil fields the true source of the material may be some of the lower formations. In Gaspé, where also there are well marked indications of oil, these seem to be more closely connected with certain beds of the upper Silurian rocks, intermediate between the Trenton and the Devonian.

Of building stones, such as sandstones, limestone, granites, marbles, &c., there is a great variety, and some of the deposits already opened up are of great value. The production of these things depend upon the law of supply and demand, and as the latter is constantly increasing as the country is developed, the enquiries for new quarry locations will also increase. At the Chicago exhibition one of the largest dealers in granite did not seem to know that we had a supply of such material in Canada, and when told that there was an unlimited quantity at readily accessible points, declared that he would investigate these at the earliest opportunity. In fact many of these coarser materials only require to be brought prominently into notice to start a demand, as in the case of the felspars which have only become known as a commercial product within the last three years. Now felspar, which is used in the manufacture of pottery, is being looked for everywhere in the old rocks; and though the heavy freight rates to the United States are a great drawback to its export, except where these deposits are near a line of railway, yet they might easily be utilized here where the raw material is cheap and plenty. If the manufacturers can afford

to carry on a business with this material by paying five dollars a ton, the same industry ought to be a success here where we have the raw material at our doors. What it requires is capital and enterprise with a good amount of push. The felspar which is being mined is found as a portion of some of the many granite dykes that traverse our older crystalline rocks, and the proviso for its usefulness is that it shall be free from iron and mica, its shade of colour, either red or white, apparently not making any difference in its market value.

The brick clays of the district are widespread. Many of the deposits are of excellent quality, and the quantity of bricks and tiles already produced is very large and constantly increasing. This may be seen at a glance by comparing the figures of import in drain tiles, &c., for 1888 with those of 1895. Thus in the former year these were imported to a value of over 100,000 dollars, while six years later so greatly had the home development increased, that these figures had been reduced to 21,000 dollars. The manufacture of terra-cotta has also grown to a comparatively large industry, or from 50,000 dollars in 1888 to nearly 200,000 in 1895. These manufactures from some of our commonest and most widely spread materials show that even in this direction there is yet great room for development; yet on the part of many persons the widespread nature of such raw material is such as to cause them to be considered as almost valueless as sources of mineral wealth. Even of such ordinary things as sand and gravel there is a great possibility of development if only the right characteristics can be found, as may be inferred from the fact that the increase in their export between the years 1887 and 1895 has been no less than 90,000 dollars. These last figures do not of course apply to the Ottawa district alone, but are given as indicating possibilities for future development along the line of some of the most common materials.

The bottoms of many of our lakes in the area to the north and south of the Ottawa are filled with great deposits of shell marl which in some places is being extensively used in the manufacture of cement, and for which there is a large market for a

first-class material ; while as a fertilizer for certain lands it also possesses much value and could, if properly handled, become a source of revenue. In fact along all lines of mineral development there must always be a constant outlook for the chances of a market. It is of but little use to fold one's hands and think these things will develop themselves. They do not appeal to one's fancy so strongly as the flaming stories of the occurrences of gold or silver, but they are very often quite as important factors in the country's development. They certainly afford quite as good opportunities for bringing dollars into the pockets of the manufacturer or capitalist as many of the more showy minerals, while there is much less of the speculative element. The amount of capital necessary to their successful development is very much less in most cases, and there is not so great an element of risk involved in their exploitation.

In this hasty sketch of some mineral resources of the Ottawa district which of necessity has only touched in the briefest way, upon some of the main features of the subject, it will be seen that in this area there is not only a very great variety of material but much of this is in very large quantity and also that the mineral development in so far as it has proceeded, has been fairly satisfactory.

#### CORUNDUM.

There is however one other mineral which I have neglected to mention, and which can hardly as yet be recognized among the sources of our wealth, since its development has not as yet taken place, viz., the new mineral, corundum. The finding of this mineral marks a new era in Canadian mining, and the recent discovery of large deposits in the northern portion of Haliburton, whence it has been traced east for some miles into Renfrew county, is of great importance, not only as marking for the first time the occurrence of this mineral in Canada, in quantity sufficient to be of economic value, but from the great value of the mineral itself, provided the tests now being made prove it to possess all the qualities which belong to the corundum of

commerce. The quantity so far found appears to be sufficient to supply the demand for many years, and there should shortly be a marked development along lines of production. The imports of emery in 1895, which it is supposed this mineral will replace, amounted to nearly 15,000 dollars, but as there is a large quantity from abroad into the United States, it may be expected that the Canadian mines should contribute largely in that direction. The development of this area will be eagerly looked for. The mineral occurs in connection with certain areas of intrusive rocks in the crystalline series, chiefly granites and syenites, which are found over a large extent of country in the vicinity of the Madawaska River to the south of Barry's Bay, which is at the present time the nearest point of shipment, by the Ottawa and Parry Sound Railway. There are large areas of these old rocks, many of which are now very difficult of access, but which will, in process of time, become more readily accessible, and doubtless large stores of mineral wealth, whose existence we can now only conjecture, will be discovered. Many of these valuable deposits are found out only by conditions of settlement or by railroad building, as was the case in the great asbestos areas of the Eastern Townships of Quebec, which were first made available by the construction of the Quebec Central Railway, the areas traversed by that line in this locality being previously regarded as of no economic value on account of the rocky and barren character of the district, yet from a small and rocky patch of a few hundred acres there have been taken in the seventeen years since 1880 almost 6,000,000 dollars worth of asbestos, or almost the entire supply for the world's market.

It may, therefore, be confidently anticipated that as our country becomes more and more developed, fresh deposits of mineral wealth will be disclosed, as indeed is only to be expected in a comparatively new country like this, containing such a vast stretch of mineral-bearing formations. Prior to the building of the Canadian Pacific through the rough country to the north and west of Lake Superior, which had up to that time been almost inaccessible, we had no idea of the great and ever increasing

stores of mineral wealth which have of late years been revealed in that area, and the present development of our western Ontario gold fields was an impossibility. The same remark applies to the great deposits of nickel at Sudbury, which were disclosed by the building of the Canadian Pacific, while it is only in the last three years that the new and valuable finds of corundum have come to light, as a result of the explorations of the Geological Survey.

In all attempts at mineral development there are of necessity a host of schemes placed on the market which are largely speculative. This seems to be an unavoidable evil, but it also, unfortunately and seriously, interferes with the actual business of legitimate mining. Areas practically worthless are placed before the public under high sounding names, and in the rush after speedy wealth many of these are assumed by the uninitiated to be of equal value with those which are clearly of economic importance. The resulting disappointment on the part of the holders of stock in worthless properties tends to bring discredit on whole areas of valuable lands, and results in very serious injury to the mining interests of the country at large.

Another great source of harm to legitimate mining is the misstatements of certain persons, who, under the guise of mining experts, travel the country and pretend to discover valuable mineral deposits, sometimes by the aid of the mineral rod and sometimes by means of experience, supposed to be gained in other mining fields abroad; and it is a curious thing to note that, if the so-called expert or prospector can claim to have been in Australia or California, his dictum is held to be quite conclusive as to the value of any mining property, even if any experience so obtained may only be acquired as the result of shovelling away the accumulated debris from around the surface of the pit. Such experts, it may be said, generally do more harm than good in so far as deciding on the actual value of a mining area, and many owners of comfortable farms throughout this country have speedily lost all their property by following the lead of such blind guides. The peculiar properties of the



mineral rod, so implicitly believed in by many persons, as an agent in mineral discovery, have yet to be proved. There are, however, many people who place the utmost confidence in its working, and who claim to be able to infallibly locate the different kinds of minerals by its use, as well as to determine the extent and value of the ore beds and the depth at which these will be reached. In many cases where the information so revealed has been followed up, dire misfortune has been the result and the money so invested has been wasted.

There is without doubt much wealth hidden in the rocky strata of the Ottawa district, but it requires care in the investigation, and capital and strict business methods in the development, to, in most cases, ensure profitable returns. It is not, as a rule, a profitable thing for men not trained to this line of work, to throw aside their ordinary legitimate business, whether of farming or the mechanical pursuits, to rush after what, in many cases, is a merely chimerical attempt to obtain wealth, by digging out the various ores of copper, gold, silver or iron, when there are surer sources of income nearer home. Ultimate success in mining requires the application of skill and capital, often in almost unlimited amount, and the attempt by the individual, which would almost certainly result in failure, is often attended with success when undertaken by properly organized and equipped companies, working in the right direction and with proper methods.

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UNDER the title "Flora of Ontario" the Education Department of Ontario has issued a list of the flowering plants and vascular cryptogams known to occur in the Province of Ontario. The typographical work and general arrangement of the list could not be improved upon, and its convenient size enables one to carry it into the field.

No more useful or convenient Botanical list has ever been published in Canada.

## BRITISH COLUMBIAN DEER.

The following letter from Mr. J. A. Teit of Spence's Bridge, B. C. is of interest both to the naturalist and the sportsman. Mr. Teit has lived in British Columbia for 15 years, is a careful observer and has had abundant opportunity for studying the animals of that province:—"There are three or four varieties of Western Deer known to me which are distinguishable chiefly by their tails. Now here in the interior there is:—

1st. A deer of large size, one of the largest, if not the largest, variety we have. Some of the old bucks have very large and thick horns, probably their horns grow to a larger size and are thicker than those of any other variety we have. The face is generally slightly concave although with some the reverse is the case. At the same season of the year there are two shades of color to be observed amongst them; some are more greyish others more brownish. Their tail *is white all around from the root down to the tip* which is black. They are the commonest deer throughout the North Western portion of the "Dry Belt" (the Thompson, Bonaparte, Chilcote, &c.) and are also very common in the Similkameen, the Okanagan, and in some parts of Kootenay. Some people call them Mule Deer. Others call them Black-tail and some call them American Deer.

2nd. A deer almost the same as the first and equal or nearly equal in size. Color of the body the same and ears just as long. The under part and the sides of the tail are white from the root down to the tip, which is black. The *back or outer part of the tail* is of the *same color as the body* and this stripe is *continuous from the body until it joins the black tip*. With some of them this stripe on the back of the tail is *very narrow* (about half an inch or less in width.) These deer are not so common in the Dry Belt as the first variety but are found along with them in most places. They are found on the Thompson, Bonaparte and Fraser rivers as far down as the canyon or even below, also around Lillooet and probably in most parts of the interior where the first

variety is found. Like No. 1 they are called Mule Deer by some and Black-tail or American Deer by others.

3rd. A deer of very small size, and with light and rather small horns. The color of the body and markings nearly the same as the first two varieties. It inhabits very bushy parts of the country and is not so timid as other varieties of deer. It is found in parts of the country where the climate is moist. It is the common and probably the only variety of deer on the coast, Vancouver Island and islands of the Gulf of Georgia and is said to be found also in some of the moister and more forested parts of the interior especially near lakes which are wooded. Its tail is the same as the 2nd variety, only the stripe on the back of the tail (which is the same color as the body) is *much wider* and there is hardly any white to be seen at the sides of the tail. These deer are called Coast Deer or Pacific Buck and are also very frequently named Black-tail.

4th. A deer of about the same size as the first variety and very similar to it in every way, excepting the tail which is longer and altogether white. It is found in the "Dry Belt" from the Thompson south, especially in the Similkameen and in some parts of Kootenay. It is called White-tail, Flag-tail Virginia Deer, and Long-tailed Deer. I would like to know the proper names of the four varieties of deer outlined above, and also if there are any other varieties to be found west of the Rockies in these latitudes.

Yours very truly,

J. A. TEIT.

No. (1) Does weigh (when in prime condition) 100 to 150 lbs., bucks 200 to 275 lbs. A few weigh about 300 lbs. or over, and very rare specimens have been obtained which went as high as 400 lbs., and even more. These weights are average and for deer without the entrails removed.

A buck (with entrails removed) weighing 230 to 260 lbs. is considered an average *fine* one. Freaks are sometimes obtained of this kind of deer and also of No. (4). I knew one of the latter,

a doe shot by an Indian, which had two small horns. About three years ago a half-breed shot a doe of No. (1) variety, which had one long horn on one side of the head. There was no sign of any horn on the other side. Whitish or grey colored specimens of Nos. (1), (2) and (4) have been occasionally seen or shot, but they are very rare, and are probably albinos. I saw some time ago a very white specimen of a fawn taken from its mother's body, probably about two or three weeks before its time for birth. The skin had a very few red spots on it. Skins of albino deer, especially fawns, were formerly of some value and prized by Indian medicine-men for making tobacco pouches, etc. They were supposed to bring good luck.

No. (2). The white spot on the throat of this variety is often more pointed at the sides than that of No. (1).

No. (3). These deer are just about half the size of the other varieties of deer. Prime bucks weigh about the same as does of No. (1) and others, and does seldom weigh more than 75 lbs. The profile of this variety on some parts of the coast is frequently slightly convex.

I myself have been accustomed to call the variety first described Mule Deer, the second, Black-tail (of the interior), the third, Black-tail (of the coast), the fourth Virginian or White-tail.

In reply to Mr. Teit's queries Prof. John Macoun, Dominion Naturalist, has written:

"No. 1.—This is the true Black-tailed Deer (*Cariacus macrotis* Say.) Also called Mule Deer.

No. 2.—This form was first seen by Lewis and Clark and from their description was named *Cariacus macrotis* var. *Columbianus* by Richardson. This is also a Mule Deer or Black-tailed Deer. In 1854 Anderson and Bachman changed the name to *Cariacus Richardsoni* and hence the name Richardson's Deer—by which it is generally known.

No. 3.—Lord in his book "The Naturalist in British Columbia" calls the small coast deer *Cariacus Columbianus* and

does not separate the two inland forms, but names them both *C. macrotis*. This, (No.3), is the Columbian or Coast Deer.

No. 4.—This is *Cariacus Virginiana* var. *leucurus*, Dougl. the western form of the eastern White-tailed Deer.

Mr. Teit's descriptions are evidently accurate and he sets out the forms so distinctly that there can be no doubt about the species.

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## ORNITHOLOGY.

Edited by W. T. MACOUN.

### WINTER BIRDS AND EARLY SPRING ARRIVALS.

The abundance or absence of winter birds is often decided to his satisfaction, by the casual observer, just in proportion to the number of pine grosbeaks which he sees during the winter months, and as these birds were not seen this year, notwithstanding the fact that there was such an abundance of food for them, the conclusion naturally arrived at was that other birds were scarce also. This conclusion was correct this winter to a large extent, as during the early part of the winter few birds were seen, with the exception of crows, which have been quite abundant all winter at the Experimental Farm.

The first spring birds were nearly a month later in coming this year than last, and only a comparatively small number have yet arrived. In the following list the winter birds are recorded and also those which have arrived up to the 14th April. It is hoped that all those who sent in their notes last year will continue to do so this season. The notes of any others who are especially interested in birds will be gratefully received.

1898.

Nov. 15—SNOWFLAKE, *Phlectrophenax nivalis*. Flock at Experimental Farm. Mr. Wm. Saunders.

1899.

Jan. 29—AMERICAN GOLDFINCH, *Spinus tristis*. Several feeding on birch at Beechwood. Mr. Geo. R. White.

30—SHARP-SHINNED HAWK, *Accipiter velox*. Mr. Geo. R. White.

- Feb. 5—PINE SISKIN, *Spinus pinus*. Several below Rockcliffe; also flock on 21st. Mr. Geo. R. White.
- 14—AMERICAN GOLDEN EYE, *Glauconetta clangula americana*. Two male birds. Mr. F. W. Warwick, Buckingham, P.Q.
- 20—AMERICAN CROSSBILL, *Loxia curvirostris minor*. Small flock of six feeding on pine cones, and two males and one female feeding on fruit of mountain ash, 10th April. Mr. Geo. R. White. Mr. Lees reports seeing several on the 12th; they were seen by other people at different times, but no other dates have been sent in. Some of the birds were young. The bills of these were not crossed.
- 25—AMERICAN MERGANSER, *Merganser americanus*. Mr. Geo. R. White.
- 25—CHICKADEE, *Parus atricapillus*. A few seen during the winter.
- Mich. 10—AMERICAN CROW, *Corvus americanus*. Mr. Geo. R. White. Crows were abundant all winter, but this was the first date on which they were recorded.
- 15—PRAIRIE HORNED LARK, *Otocoris alpestris praticola*. Dr. Fletcher. March 23rd, Mr. Geo. R. White.
- 17—PHOEBE, *Sayornis phoebe*. One caught; Miss Harmer; April 16th, Mr. W. T. Macoun.
- 22—PURPLE FINCH, *Carpodacus purpureus*. Mr. Geo. R. White. Flock feeding on fruit of mountain ash; 23rd, Mr. W. T. Macoun.
- 22—WHITE-CROWNED SPARROW, *Zonotrichia leucophrys*. Mr. Geo. R. White. One male; probably remained over winter.
- 29—RED POLL, *Acanthis linaria*. Mr. Geo. R. White.
- April 6—BRONZED GRACKLE, *Quiscalus quiscula*. Three males. Mr. Geo. R. White; April 7th, Mr. C. H. Young.
- 6—ROBIN, *Merula migratoria*. Seen by men at Experimental Farm. April 8th, Mr. Geo. R. White; Mr. W. T. Macoun. Recorded first on March 15th, 1898.
- 6—RED-WINGED BLACKBIRD, *Agelaius phoeniceus*. Mr. C. H. Young.
- 6—SONG SPARROW, *Melospiza fasciata*. Mr. C. H. Young. April 7th, Mr. Geo. R. White; Mr. W. T. Macoun. Recorded first on March 11th, 1898.
- 7—SLATE-COLOURED JUNCO, *Junco hyemalis*. Mr. Geo. R. White.
- 7—BLUEBIRD, *Sialia sialis*. H. Fixter. One seen by Mr. Geo. R. White on the 13th.
- 10—TREE SWALLOW, *Tachycineta bicolor*. Mr. Geo. R. White. A small flock of nine near old rifle range. Numerous on 11th.
- 14—TREE SPARROW, *Spizella monticola*. Mr. Geo. R. White. Four seen near city with juncos.
- 14—YELLOW-BELLIED SAPSUCKER, *Sphyrapicus varius*. Mr. Geo. R. White. Five seen near city.

PROGRESS OF GEOLOGICAL WORK IN CANADA  
DURING 1898.\*

By H. M. AMI, M.A., F.G.S.

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\*One or two papers not previously noticed belong to the year 1897.

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**Chalmers, Robert**—*The pre-glacial decay of rocks in Eastern Canada*. Amer. Journ. Sc., series 4, vol. 5, pp. 273-282, April, 1898.

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HONEY BEES ACCLIMATISED.—On the 27th of April, I again visited the bee-tree at Rockcliffe, referred to in the November, 1898, issue of THE NATURALIST and although late in the afternoon was pleased to find that the bees had again successfully wintered, as was evidenced by the marked activity above the entrance of the cavity in the tree. From the large number of bees to be seen coming and going, it seems probable that this colony has wintered quite as well, if not better than the average colony kept under artificial conditions.—P. H. SELWYN.

## NOTES AND REVIEWS.

Mr. W. H. Harrington describes in the April number of "The Canadian Entomologist" six new Ottawa *Proctotrypidæ*.

Mr. W. C. McCalla, St. Catharines, Ont., a member of the Club, goes to the National Park at Banff in June, for the purpose of making a complete collection of the plants of that region. These will be sold in sets at the usual price when he returns.

In his "Notes on some Mammals from Black Bay, Labrador" published in the "Proceedings of the New England Zoological Club," Mr. Outram Bangs describes a new jumping mouse, a new muskrat, a new woodchuck and a new shrew. Mr. Doane, who has been collecting in Labrador for the Bangs collection, will remain there for several years working from south to north. His 1898 collection was made on the Straits of Belle Isle.

The principal articles in the recently published "Bulletin of the Natural History Society of New Brunswick" (No. XVII Vol. IV—Pt. II) are "Notes of a Wild Garden" by G. U. Hay, "The Butterflies of New Brunswick" by William McIntosh, and "Notes on the Natural History and Physiography of New Brunswick" by Dr. W. F. Gonong. Other articles of less importance bring the number of pages up to 94 making this part one of the best yet issued by the society.

## SPRING EXCURSIONS.

The April sub-excursions proved so successful notwithstanding the lateness of the spring that similar outings have been arranged for May. They will be to Aylmer, May 6th, Rockcliffe, May 13th, and to Beaver Meadow, Hull, May 20th. The first general excursion of the season will be to Chelsea on May 27th.

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