GEOLOGICAL SURVEY

OF

CANADA.

REPORT OF PROGRESS

FOR THE YEAR 1845–6.

Montreal:
LOVELL & GIBSON, PRINTERS, SAINT NICHOLAS STREET.
1847.

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MONTREAL, 1*st May*, 1846.

SIR,

I have the honor to transmit to you the accompanying Report of the Progress made in the Geological Survey of the Province, in the year 1845-6, and request you will do me the favor to place it before His Excellency, the Governor General.

I have the honor to be,
Sir,
Your most obedient humble servant,

W. E. LOGAN,
Provincial Geologist.

To the Honorable D. Daly,
Provincial Secretary,
&c. &c.

TO HIS EXCELLENCY

LIEUTENANT GENERAL THE RIGHT HONORABLE

CHARLES MURRAY, EARL CATHCART,

OF CATHCART, IN THE COUNTY OF RENFREW, K. C. B.,

GOVERNOR GENERAL OF BRITISH NORTH AMERICA,

AND

CAPTAIN-GENERAL AND GOVERNOR-IN-CHIEF

IN AND OVER THE

PROVINCES OF CANADA, NOVA SCOTIA, NEW BRUNSWICK, AND THE ISLAND OF PRINCE EDWARD, AND VICE-ADMIRAL OF THE SAME,

&c. &c. &c.

MONTREAL, 1*st May*, 1846.

MAY IT PLEASE YOUR EXCELLENCY,

In conformity with my duty as Director of the Geological Survey of the Province, I have the honor to place before Your Excellency, a Report of the Progress made in the investigation during the past summer.

In reporting to the Government on the Progress made in the year 1843, a short and very general sketch was given of some of the main geological features of a considerable part of the Province, as connected with the physical structure of the bordering States of the American Union on the one hand, and the Sister British Colonies, on the other. In this description it was considered convenient to divide the subject into two parts; and drawing a line in continuation of the Hudson River and Lake Champlain Valleys, to the vicinity of Quebec, to consider the area to the west of it separately from that on the south of the St. Lawrence to the east, in consequence of important differences in their geological conditions. Each area was represented as belonging to a great trough of fossiliferous strata resting on supposed primary rocks, and containing coal measures in the centre; but in neither case has it yet been found that the profitable portion of these measures comes within the limits of the Province.

The conditions in which these two areas differ are the general quiescence and conformable sequence of the formations of the western division; and the violent contortions, and unconformable relations prevailing among those of the eastern; and as the Survey proceeds, the propriety and convenience of this division, for the purposes both of investigation and description, appear to me to be more fully confirmed.

The eastern area, comprising all that part of the Province which lies to the eastward of the divisional line assumed, and to the south of the St. Lawrence, including, however, the Island of Anticosti, covers a space of about 40,000 square miles; the western—extending to the limits of the Province in an opposite direction, and bounded on the north by a line skirting the St. Lawrence, the Ottawa, the Mattawa, Lake Nipissing, and the French River to Lake Huron, and thence along the northern shore of this Lake to Sault Ste. Marie on Lake Superior—may spread over 50,000 square miles. These divisions, however, do not exhaust the Province. There still remains what may be termed Northern Canada, extending from the British limit on Lake Superior to Labrador, and lying between the northern boundary of the east and west divisions, and the height of land separating the Hudson Bay waters from those of the St. Lawrence. This portion, nearly three times as large as the other parts together, may comprehend 250,000 square miles.

In the geological examination of extensive areas nothing is more essential for the economy of time in working out details than to obtain, as early as possible in the investigation, some approximate view, however defective, of the prominent relations of their general features, to be subsequently perfected as circumstances may permit. But over a surface so widely spread out as that of Canada, so much of which is still covered by primeval forest, even the most partial reconnoissance must necessarily occupy much time. In the western division, the section examined across the country from Lake Huron to Lake Erie by Mr. Murray, in the year 1843, and reported on by him, gives the sequence of the formations, in their order of superposition, and in some detail their subordinate mineral masses capable of economic application. His Report supplies a partial knowledge of the boundaries of those formations for some distance on each side of the line of exploration: but their general geographical distribution throughout the district, though vaguely known, is

still to be followed out and determined with precision. In the eastern division the sequence of the rocks, as displayed in the Gaspé District—where the coast section affords the fullest and best exhibition of them,—and their general relation to the coal deposit of New Brunswick, have been ascertained and pointed out. Their range has been partially traced, but the disturbed condition of the strata will naturally render the complete examination of the district difficult and tedious. In continuation of the previous season's labors in this division, the time of my Assistant, Mr. Murray, has been engaged during the past summer, and I have now the honor of transmitting to Your Excellency his Report of the Progress effected.

A section having thus been made across the western division, and another across the eastern, shewing the nature of the deposits that are to be sought for in each; it appeared to me expedient that one should be made across the northern country, for the purpose of ascertaining some of the prominent features which might characterise it. This great northern area is drained by many considerable rivers. Of these the Ottawa and the Saguenay are the largest. The Saguenay is placed more nearly in the middle between the extremes of the area, but several considerations induced me to select the Ottawa for the line of exploration. The Ottawa is the larger river of the two, yielding in magnitude only to the St. Lawrence itself, and it therefore promised greater facilities of navigation in remote parts. It is more extensively connected with the commerce of the country, and while its greater proximity to my starting point, and the steamers plying on the lower part of it, would save time, a supply of provisions and Indians could be more readily procured and more easily transported. I was influenced also by the feeling that should it become necessary for me, as seemed probable, with a view to geological results, to delineate topographically any part beyond the point to which the river had been previously surveyed, either for the purpose of Township settlements or of Timber allocations, the map that might result would prove of greater utility to the interests of the Province than the produce of a similar measurement on the Saguenay.

Persuaded that the topographical part of the investigation might be made available for the purposes of the Crown Land Department, I was induced to propose to the Hon. D. B. Papineau, the Commissioner at the head of it, to unite with me, as an Assistant, at the joint

expense of his Department and the Geological Survey, a Provincial Surveyor, familiar with those parts of the river already mapped, who might have paid some attention to the rocks of the district, and whose acquaintance with localities would enable him to save much time in the geological branch of the investigation, by pointing out facts known to him, which it might otherwise require much search to discover; and a communication made by Mr. J. McNaughtan of Bytown, in 1842, through the Surveyor General's Office, in reply to various questions circulated on behalf of the Geological Survey, and subsequent conversations with him, having made me aware that he could be of essential service on the Ottawa, with the consent of the Commissioner of Crown Lands, it was arranged that he should accompany me.

Supplying ourselves with provisions we were enabled to forward them up the Ottawa first by steam propellers to Bytown, and thence by steamboats plying on the Lakes Chaudière and Chats, with the assistance of waggon conveyance established at the portages, as far as the Falls of the Calumet, a distance of about 175 miles. Four Indians were hired at Caughnawaga, and with the aid of the gentlemen in charge of the Hudson Bay Company's Posts, at Lachine and the Lake of the Two Mountains, we obtained a couple of excellent birch-bark canoes. I have to express my obligations to Mr. McTavish, in charge of the latter Post, who, in addition to the trouble he took with respect to our craft, materially assisted the objects of my research by presenting me with a collection of specimens obtained from the interior of the country on the higher part of the river in the vicinity of the Grand Lac, which are of value as shewing the nature of the rocks over a very considerable area, not easily visited; and to the Governor, Sir George Simpson, I was indebted for a general and very serviceable letter of recommendation to all the Agents in charge of the Company's Posts.

Visiting several parts on both sides of the Ottawa for the examination of the strata, and making an excursion up the Rivière à la Graisse, and another a short distance up the Rivière du Nord, we proceeded in our canoes as far as Grenville; from this we took advantage of the steamer to Bytown, having on a previous occasion examined the interval. Spending a few days there it was my good fortune to enlist in my favour the aid of Mr. McDermott, Provincial Surveyor, who most obligingly undertook to keep a register of ba-

rometrical observations at stated periods of the day until my return, with a view to a more exact determination of such heights as it might be expedient to measure in the interior of the country; and for this purpose one of my instruments was left in his possession. In investigating the vicinity, Mr. McNaughtan guided me to several points of geological interest in Nepean, and the assistance of Mr. Blasdell, and Mr. Hayworth enabled me to see others in Hull.

Again taking to our canoes, we coasted along the north shore of the Chaudière Lake to the Chats, where a few days were spent in examining different spots in Fitzroy, Torbolton and Bristol Townships; and having had the misfortune to lose one of my thermometers, and break another, I was accommodated at the Chats with the loan of an excellent pocket instrument, through the kindness of Dr. Dubord, without which much inconvenience would have been experienced in barometrical measurements. Ascending the Chats Lake, we made an excursion up the Mississippi River to Packenham, where Mr. Dickson, the founder of this thriving village, who takes an interest in geological phenomena, was so obliging as to accompany me to several spots in the vicinity, and to supply me with a small collection of specimens illustrative of the rocks of the Township; another excursion was made up the Madawaska River to the High Falls, a distance of about thirty miles from the mouth; a third up the Bonnechère to Jessop's Rapids, about the same distance; and having examined both shores of the Chats Lake, we proceeded by the Chenaux to Portage du Fort, the highest point on the Ottawa to which steam navigation at present reaches; thence we ascended by various rapids and portages to the Falls of the Calumet, where we were very kindly received by Mr. Gerrard Nagle, in charge of the Timber Slide constructed there by the Board of Works, who obligingly pointed out the locality of several minerals met with in blasting the limestone rocks occupying the river, for the seat of the slide. Having made a complete circuit of the Calumet Island by the Roche-fendue Channel, the Muskrat Rapids and Moore's Slide, we loaded our canoes with our provisions, which had arrived in safety at the head of the Calumet Portage, and continued our expedition, examining the shores of the Coulonges Lake, including the vicinity of the Fort, where we touched, to the mouth of the Black River; whence we proceeded by Pocket's Rapids and the Allumettes Falls, to the flourishing settlement of Pembroke, making a short excursion up the Muskrat

River on our arrival there. From this we examined the south shore of the Upper Allumettes Lake to the mouth of the Petewawe, and crossing over to Fort William, where we were welcomed by Mr. Brown of the Hudson Bay Company, in charge of this Post, we skirted the north side to the entrance of the Deep River. This splendid reach of the Ottawa was examined on the north side, and portaging at the Joachim Falls, we reached the mouth of Bennett's Brook, about five miles further up the river.

This constituted the highest point to which the Ottawa had been surveyed. It is somewhat under 150 miles above Bytown, and in the investigation of the country, as we passed through it, I was indebted to Mr. NcNaughtan for the use of a map on the scale of four miles to an inch constructed partly from his own original Surveys and partly from compilation, which, being the only one I had seen representing the measured parts of the Ottawa and its tributaries with fidelity, proved of great value.

With a view to connect the geological features which might present themselves in higher portions of the river, it was considered expedient, in continuing our exploration, to dial and measure our course. In the determination of our distances we availed ourselves of Rochon's micrometer telescope, the instrument which had proved so serviceable and expeditious a means of measurement, on my previous year's exploration across the Peninsula of Gaspé, by the Chat and Cascapedia. A theodolite was used to determine our bearings; and proceeding from point to point on one side or other of the river, the form of that opposite was ascertained by cross-bearings on fixed objects from the extremities of our lines. Where rapids existed, the difference of level between smooth water at the foot and head was ascertained by means of a good levelling instrument and staff, with readings to the hundredth part of a foot; and the general rise in such parts of the stream as afforded no serious impediment to the progress of our canoes, was computed from the flow of the current. The quality and attitude of the rocks were registered as we advanced, after being minutely examined wherever occasion required, and Mr. McNaughtan materially aided the work, by entering in his field-book an eye-sketch of the river and banks, preserving many minor turns which would otherwise have been lost in the subsequent delineation. The measurements of the day were plotted in our tent at night, by which means we were always prepared by the inspection of our map the

better to understand the geological relations of separate parts, and to take advantage of the conclusions such relations might suggest. This part of our Survey occupied seven weeks ; and, notwithstanding the weather was of the most unfavorable description for upwards of one half of the time, there having been scarcely a day without rain, we were enabled to add to the topographical delineation of the country 150 miles of the main trunk of the Ottawa to the head of Lake Temiscamang, thirty miles of the upper part of which required a double share of measurement, in consequence of its breadth, which widened out to six miles ; and about fifty miles on the chain of lakes constituting the Mattawa or Little River, (a tributary falling in on the right bank seventeen leagues above our starting point,) including the portage to Lake Nipissing, and a few miles on the shore of this on each side of the *débouché* of the Rivière à la Vase, which belongs to the Huron waters.

In our excursion up the Mattawa to Lake Nipissing we were indebted to the Agent in charge of the Hudson Bay Company's Post at the mouth of the river, for the loan of a canoe of a size more easily managed than the larger one of our own, and its lightness saved our men some fatigue at the numerous portages we had to cross in ascending and returning. On reaching Fort Temiscamang, another of the Hudson Bay Company's Posts, situated about eighty miles above the mouth of the Mattawa, we experienced the attention of Mr. Severight, in charge of the Post, who, in addition to extending to us his hospitality, supplied us with much useful information, presenting us with a Register of Meteorological Observations, shewing the monthly mean temperature, with the state of the weather at the Fort for two years, to the end of October last ; and permitting us to copy an eye-sketch of 200 miles of the main trunk of the Ottawa, from its sources to Lake Temiscamang, where our own Survey ceased ; being the joint production of Mr. Cameron and Mr. McKay, gentlemen whose intimate knowledge of the interior renders their delineation of much value. Mr. Cameron, after having been many years connected with the Company, has, I believe, returned to Britain; but Mr. McKay is still in their employment, and his presence at the Post afforded us an opportunity of obtaining from him an addition to the map, comprising a considerable area on both sides of Lake Temiscamang, including the sources of the Rivière du Moine and Keepawa on the east, and those of the Montreal and Metabeechuan on the west,

together with Lake Temagamang, the waters of which flow into Lake Huron by Sturgeon River and Lake Nipissing. On the sketches of this gentleman I am disposed to place considerable reliance. He appears to possess a remarkable precision of memory and facility of delineation in representing geographical facts. It is surprising to observe the close resemblance which his figure of Lake Temiscamang bears to that resulting from our admeasurements, and taking this as a criterion of the probable accuracy of other parts, I cannot but consider myself fortunate in the obliging readiness with which Mr. McKay has given me the benefit of his knowledge and skill. We were also indebted to Mr. Robert, and his brother, Mr. Naldo McConnel, the former residing about eight and the latter about sixteen leagues above the Mattawa, whose avocations connected with the timber trade have carried them much into the woods, for sketches of some of the interior water communications in the country on the east side of the Ottawa, ranging some distance below and above their *chantiers*.

As a test of the general correctness of the topographical part of our Survey, it may be remarked that there appear to be no discrepancies of any moment, between our latitudes by observation and by account; they agree to within about thirty seconds at our starting point, the mouth of the Mattawa, the mouth of the Vase on Lake Nipissing, and the mouth of the Keepawa, about twenty-one leagues above the Mattawa on Lake Temiscamang, but we were not so fortunate as to obtain any observations at the most northern part of the lake, to which our measurements extended. It gives me pleasure to state that these measurements on the Ottawa and the various geographical details we have been enabled to collect, have been made available to Mr. Bouchette in the construction of a new edition of his Map of Canada, shortly to appear before the public; the details will fill a space which has hitherto been a considerable blank in the representation of that part of the Province to which they belong; and the past season's work of my Assistant, Mr. Murray, will contribute to the same map a correct delineation of the Matan, the St. Anne, and the St. John Rivers, three considerable streams in the District of Gaspé, in addition to the Chat, the Great Cascapedia, and the Bonaventure, in the same District, surveyed the previous year.

GENERAL CHARACTER OF THE RIVER.

The Ottawa and its tributaries discharge the waters of an area which cannot fall much short of 80,000 square miles. The hydrographical basin which contains them may be described in general terms as bounded on the east by a line commencing at the lower extremity of the Island of Montreal, and running about 230 miles in a nearly direct course, to a point about half a degree north of the intersection of the 48th parallel of North Latitude, and the 76th meridian of West Longitude, constituting in this distance the water shed between the Ottawa streams and those of the St. Maurice and Saguenay. From this point where the source of the river is to be found, the boundary turning to the westward, runs for 300 miles along the height of land dividing the waters of the Hudson Bay Territory from those of Canada, to the vicinity of the intersection of the 48th parallel of Latitude with the 82d meridian of Longitude. The western limit stretching from this corner to within a few miles of the most eastern part of Lake Nipissing, thence to the Townships of Tudor and Grimsthrope, in the Midland District, and further on to the Township of Hinchinbrook, separates it from the streams tributary to Lakes Huron and Ontario; while the southern line, passing between North and South Crosby to Elizabeth Town, thence to the Township of Lochiel, in the Eastern District of Upper Canada, and forward to Vaudreuil in Lower Canada, leaves but a small space between it and the St. Lawrence.

The general shape of this area is that of an irregular rhomboid, with its long diagonal pointing northwestwardly, and roughly parallel with three sides of the rhomboid, the north, the west, and the south; at a distance seldom exceeding twenty and sometimes not over eight leagues, the great artery of the region runs, presenting a length of between 600 and 700 miles. Taking its source in the northeastern corner, it heads with the Saguenay and the St. Maurice, and, flowing in a general course a little to the south of west, it widens into several considerable lakes, and is fed by several tributaries from the north before it reaches Temiscamang, at a distance of about 250 miles. One of the intermediate sheets of water about equally removed from Temiscamang and the source, is called the Grand Lac, and it is represented on Messrs. Cameron and McKay's sketch, as possessing a deeply indented form, divided into three

long narrow transverse belts of water, the most eastward of which measures about forty miles in a north and south direction, with a breadth varying from one to ten miles, while the middle has a N. E. and S. W. length of fifty miles, by an average breadth of five or six miles; and the western, which is parallel to it, with a length of thirty, has a breadth varying from two to twelve miles. These belts are united with one another by straits, which connect the eastern and middle by their centres, and the middle and western towards their southwestern parts, while fifty miles in a S. E. and N.W. bearing would span across the whole three. On the north side of the lake, near the extremity of the tongue of land between the eastern and middle belts, the Grand Lac Post of the Hudson Bay Company is situated. Another of the expansions on this portion of the Ottawa, with an east and west length of forty-five miles, has a breadth of two to twelve miles. Its western extremity is removed from Temiscamang about fifteen miles, and in the eastern twelve of these there are no less than fifteen portages on the river, giving to this part of it and to the lake, the names of the Rivière and Lac des Quinze. The western end of the lake turns up into a twelve mile reach northwardly, which is the exit of a tributary coming about forty-five miles from the height of land, and constituting the main route to Abbitibbe House, on Abbitibbe Lake, which flows by Abbitibbe River into Hudson Bay, at Moose Fort, from Temiscamang the distance to the House being about 100 miles, and to the Fort about 250 more.

The foot of the lowest of the fifteen portages which have been mentioned, was the highest limit attained by our canoes. Three of the portages, however, were visited on foot. The second is about twenty chains from the first, and about thirty-five chains from the third. At each, the waters of the stream contracted to a space not exceeding forty to fifty yards, are precipitated over a step in the rock; and the first of these steps occasions a beautiful cascade, which, falling obliquely across the channel into a considerable basin below, presents a face of about 100 yards, with a height of twelve feet. The average breadth of the stream between the rapids and below them is between 200 and 300 yards; but just at the entrance into Lake Temiscamang it attains a quarter of a mile; and the Quinze, splitting into two main channels, sends two smaller ones to unite with the waters of the Blanche joining the Lake two miles to the westward; while these various channels cut up the deltas of the two rivers into a multitude of low

marshy islands. The upper extremity of the lake is divided into two deep bays, giving a rude resemblance to a high-heeled foot in an inverted position, with the toe turned eastwardly; from heel to point of which there is a distance of twelve miles, with a breadth of about five or six at that part representing the ancle. In addition to the Rivière des Quinze and the Blanche—which latter flowing from the north, is stated to be navigable for canoes for sixty miles without a portage, and in the six miles of it examined has an average breadth of 60 to 100 yards—the eastern bay is supplied with several smaller streams, one of which, called the Otter, comes about forty miles from the southeast, and all of them, presenting marshy land at their mouths, give the whole bay a fringe of this character. The western bay has one principal stream, which, flowing from the northwest, exhibits at its mouth a breadth of about thirty yards; a marshy fringe borders the upper part of this bay also.

Lake Temiscamang is an extensive strip of the Ottawa, which, with a length of sixty-seven miles, gradually diminishes from the six miles breadth at the ancle of the foot to which the northern end has been compared, to a width of about 500 yards at the southern extremity. It is pinched in, however, to about one-fourth of a mile at the Hudson Bay Company's Post, which is situated twenty miles down the lake, where two bold gravel hills, standing opposite to one another, run in upon the water; again, about thirty-five miles farther to a width of 200 yards, at a strait called La Galère, and a third time to the same breadth ten miles still further on, where an island occurs. At each of these narrow parts a current is perceptible, and at the Galère its strength is considerable. But the whole length of the lake offers an uninterrupted navigation, and the depth of the water appears to be sufficient for respectable sized craft. Two considerable islands, and a few smaller ones exist in the part above the fort; but any seen below, with the exception of that causing the lowest current, are too small to require notice. The general bearing of the upper portion of the lake, which has a comparatively straight and rocky shore on the west side, and displays many bays on the east side, to a point four miles below the fort, is about S.S.E. The succeeding eight miles bear rather to the west of south, and from the elbow occurring at the end of this distance, the lake again assumes the bearing of the upper part, maintaining it, without attention to some minor curves, to the foot; and the river holds the same general course to the junc-

tion of the Mattawa, nearly thirty-five miles below. At the elbow mentioned two tributaries enter together on the right side of the lake, forming marshes at their mouths. The smaller is called the Metabeechuan, and coming from the southwest for a distance of about fourteen miles, appears to empty a narrow and deeply indented lake, with a northwest and southeast length of about five leagues. The other has the name of the Montreal River, and taking its source at the northern height of land, it would appear to flow for about sixty miles in an easterly direction, and then sixty miles more to the lake in the bearing which this assumes below. About six miles below these tributaries occurs the Keepawa on the opposite side. Its source is in a lake about sixty miles to the eastward, which gives origin also to the Rivière du Moine, flowing southward, and joining the Ottawa within four miles of the point from which our measurement commenced. Mr. Naldo McConnel informed me that each of these twin-rivers, at its exit from the parent lake, has water enough to permit the navigation of canoes. The Keepawa, though its source is but sixty miles from Temiscamang, appears to wind through a length of about ninety miles before reaching it, being in this space merely the connecting links of a succession of lakes; one of which, to within about six miles of the mouth, occupies a length of nearly fifty miles in a general bearing from the south of east, and offers a very irregular and ramified shape, studded with great and small islands. It has the same name as the river, and it is closely joined by other lakes, one of which is called the Mangachigan, poured in by short connecting channels from the north; and the area in which the whole are comprised, equal to about 2,500 square miles, presents an intricate labyrinth of waters, with every part of which even the oldest of the Indian hunters are scarcely acquainted. The elevation of Keepawa Lake, as estimated by our Assistant, Mr. McDougal, who examined the river up to the commencement of still water, a distance of six miles, is about 150 feet above Temiscamang, and one of the several cascades and rapids which occur in the interval, gives about 120 feet of the amount.

Immediately below Lake Temiscamang there occurs a serious impediment in the navigation of the river in the existence of a succession of violent rapids, which occupy a distance of six and a quarter miles, with very little intermission of quiet water. The stream is crooked and seldom 300 yards in breadth the whole way, though frequently con-

tracted to 100, and sometimes to fifty yards. Little solid rock, however, is seen in the contracted parts, and the whole obstruction seems due more to an accumulation of boulders, gravel and sand; but the effect of these is very probably assisted by the rock at no great distance beneath, for hills present themselves on each side of a bolder character than the banks afford further up. The hills appear to be part of a moderately high range here crossing the stream, but leaving between their flank and the margin a varying space on the left bank of one quarter to one half a mile, occupied by the detritus, with a surface sufficiently even to offer good ground for a road, should one hereafter be required. This collection of rapids bears the appellation of the Long Sault, and the total fall from the head to the foot is forty-nine feet, which, although the water is swift all the way, occurs chiefly in five distinct leaps, with a name to each, producing five portages to voyageurs going up stream; but canoes shoot the whole in descending, unless under particular conditions in the height of the water, which greatly varies at different periods of the year. Marks of a flood were seen at the lowest portage, fifteen feet over the level prevailing when we passed up; and Mr. R. McConnel informed us that the water was then three feet above its lowest summer height.

To the Long Sault succeeds a beautiful stretch of navigable water, having the name of the Seven League Lake, though measuring but seventeen miles. The breadth varies from half a mile in the upper to a quarter of a mile in the lower part, and the banks, which are not indented with any great irregularities, are rather rocky and moderately bold, presenting a pretty constant height of 100 to 200 feet, with the exception of such gaps as admit a few tributary streams, one of which, called the Siconaguisipi or Black Stone River, falls in on the right side about six miles and a quarter from the Sault. Mr. R. McConnel has built a comfortable *chantier* on its delta, which appears to be composed of sand, and juts out into the lake a couple of hundred yards. This stretch of the Ottawa presenting a slight curve, with the convex part to the south-west, is comparatively still water, a gentle current being perceptible only in some parts of it; but the remaining twelve miles to the mouth of the Mattawa, with a bolder curve in a contrary direction, the lower extremity of which is nearly north and south, has a swift current most of the way, and displays three powerful rapids, at intervals of

about three miles and a half from one another, at each of which the river is contracted to a narrow space, and is impeded by ledges of solid rock projecting from the sides, or starting up in small islands. The upper one, called the Mountain Rapid, gives a fall of five feet five inches; the second, called the Erables, shews a descent of thirteen feet; and the third is divided into two steps, with the names of the Chaudron and the Cave, which are leaps of six feet, and five feet nine inches respectively. In the parts intermediate between the rapids and below them, the banks are bold, precipitous and rocky, with an average separation of a quarter of a mile from one another, and the river, particularly towards the latter portion of the distance, runs in a section across a range of hills rising to heights of about 400 and 500 feet.

After cutting through this range and meeting with the Mattawa, the river changes its course from the general bearing mentioned of two points east of south, to an average one not many degrees south of east, maintained to the spot at which our measurement commenced at Bennett's Brook, leaving out of consideration all the curves of the stream. The water is swift for the chief part of the distance, and close below the mouth of the Mattawa there is a rapid, which with a slope existing in the course of a mile, gives a descent of five feet. Between this and the succeeding rapid, a space of eighteen miles and a half occurs, in several parts of which a strong current prevails, particularly at a strait about ten miles down, very difficult to stem with a canoe, where an island at the mouth of a tributary entering on the right, confines the channel to less than eighty yards; and another, five miles and a half still further on, where a cluster of islands on the left produces a second contraction. Down to this point, the north side is bold and mountainous, presenting a continuation of the range north of the Mattawa; but the south side is flat, and one or two clearings have been made in it. The breadth of the river is rather less than a quarter of a mile above the first strait, and rather over it between the two, and in the remainder of the distance to the rapid. In these three miles, flat land occurs on both sides of the stream, which, turning more southward than the average bearing, leaves the hills on the north and approaches another range. It then bends to the north of east, and three rapids occur in the space of two miles and a half. The upper one is termed the Levier, giving a fall of eight feet; the middle is just below the mouth of a tributary falling in on the

left, called the Maganasipi, or River of Round Stones, and offers a descent of nearly nine feet, while the third, entitled the Deux Rivières, is a step of thirteen feet. Though obstructing ledges of solid rock rise above the water in the upper and middle rapids, and are boldly displayed on the left bank of the lower one, a vast accumulation of boulders, with, in some places, a flat sand-covered surface about twenty feet high, chiefly constitutes both margins of the river, particularly the left one; and these boulders are seen to pave the bed of the Maganasipi near its mouth, where it cuts through the mass, as if they had been placed in position by the hands of skilful workmen, after a selection made to preserve uniformity of size.

Ten and a half miles of smooth water succeed these rapids, with a breadth varying from 200 to 600 yards, but generally exceeding a quarter of a mile; of which more than one half the distance runs about east, and the remainder south of it. Bold land occupies both sides, more particularly the north, on which it extends all the way, being apparently a continuation of the range mentioned as seen on approaching the Levier from above; it probably crosses the river in the vicinity of the Deux Rivières. Continuing in the direction of the latter part of this smooth stretch of water for a mile and a half, and then running, with a sudden turn northward nearly at right angles to it, a mile further, the river with a strong current above presents in middle distance and lower down, a fierce, violent and crooked rapid, which obstructing ledges at the elbow split into several narrow channels, driving the main body round a great cauldron-shaped space, where the rocks on the right are swept clean of nearly all loose material. There is an abundance of boulders, however, on the same side in the upper part, where a considerable island, formed by a narrow circuitous channel, is composed of them; and all the way down on the left, where they constitute a considerable block of land rising into a ridge standing between the river and a valley, with a brook and marsh ranging in a nearly direct line from still water above to still water below, and cutting off the elbow made by the course of the stream and rapid. This rapid is called the Roche Capitaine at the elbow, and the Maribou lower down, and the total fall from head to foot, as tried along the portage and winter road which runs in the depression inside of the boulder ridge, is forty-two feet ten inches. In the remainder of the distance to Bennett's Brook which is about twelve and a half miles in an E. S. E. bearing, the

current is swift all the way, but strongest at four points where it is obstructed by clusters of islands. The first of these is at Islet, about one mile forward; the second at McSwirley's Clearing, two and a half miles further; the third at Riley's Clearing, the same distance forward; and the fourth at Bennett's Clearing, five and a half miles still further on, being about one mile above the brook. The breadth of the stream is in general over a quarter of a mile, and it is bounded on the north by a continuation of the range of hills noticed farther up, which is cut through in a few places by tributaries, two of which are the Little and Great Bear Brooks, and a third and much larger is the Rivière du Moine, joining the Ottawa under four miles from our starting point, and presenting at its mouth, where there is a clearing, a width of between forty and fifty yards.

The Rivière du Moine is the largest tributary joining the Ottawa below Lake Temiscamang in the distance which came within our measurements, its length from the lake, which is the source common to it and the Keepawa, being not far from ninety miles; but the Mattawa, which has already been mentioned several times, though less than half its length, is from its position perhaps destined to become of much more importance, having been oftener than once thought of as affording the best line for a Canal, to connect the waters of the Ottawa with those of Lake Huron by Lake Nipissing. The general course is very much in the direction the Ottawa assumes after their junction, and it flows in the same geographical depression which the main stream occupies to the Levier Rapid. In a straight line from its source to its mouth, the distance is thirty-six miles, and forty miles following its bends. It consists of a chain of lakes united by short and slender streams, flowing from one to another, and the farthest extremity of that forming its summit level, called Trout or Turtle Lake, approaches in a continuation of the general direction of the chain within three miles of Lake Nipissing towards the northern part of its eastern extremity. The surface of Trout Lake is twenty-five feet in height, over Nipissing, but what the lowest elevation in the land is in the three miles between them was not ascertained, the canoe route from the one to the other, to which we adhered, being to the south of this line and the distance greater. This route in coming from Lake Nipissing is up the Rivière à la Vase, the mouth of which offers an unfavourable entrance, being rendered dangerous by the presence of sands and low flat rocks in front, while

the coast is straight and offers no shelter. The land on both banks of the stream, however, is low, and continues of that character to a deep bay southward of the river's mouth for some distance from the Lake. The lowest height of land on this canoe route is twenty-four feet five inches over the level of Trout Lake, in the rise to which from Nipissing there is a step of twenty feet, where the Vase falls over a hard ledge, and solid rock is displayed on the portage near the height of land in question, separating the waters of Trout Lake from those of the Vase, which flows in soft and sometimes marshy ground, all the rest of the distance. Trout Lake has a total length of eight and a half miles. The greatest breadth is two miles, but it is split into two parts longitudinally by an island measuring nearly four miles in length, and many others are found toward the upper extremity, while the lower end runs into a deep narrow bay, so that the superficies of the water is not over seven square miles. The distance from this to the succeeding lake, which may be called Lower Trout Lake, is not over fifty yards, and the interval, composed of boulders and loose material, is cut through by three narrow channels which let down the water one foot. The length of Lower Trout Lake is four miles, and the greatest breadth not over half a mile ; but its upper extremity constitutes a deep narrow bay in the same ravine as the foot of the higher lake, and its area does not attain a square mile. The next lake in the descent, is called the Talon : its surface is thirty-one feet four inches below that of the Lower Trout Lake : the stream uniting the two flows northward from the latter at about a mile from its eastern extremity, and passing through a deep and rocky defile in the first half of the distance, in which five rapids occur at pretty regular intervals of half a mile, it winds through an alluvial flat for the remainder ; the whole length being four miles in a general curve, which, from a north course at the commencement, assumes an east one at the end, arriving at Talon lake at its north-western extremity. This connecting stream formerly constituted the regular canoe route, but voyageurs at present proceeding to the eastern end of the Lower Trout Lake, pass by the Portage de Mauvaise Musique to the Lac des Pins, which is a small sheet of water ten feet higher in level, and thence 300 yards across the Portage des Pins to Talon, striking it in a bay over a mile below its upper extremity. The general bearing of Talon Lake is N. W. and S. E., its length is seven miles, its average breadth over half

a mile, its superficial area being about four square miles. It has a general contour of bold land about it, with the exception of a few small flats on the border at the head, and one on the north side half way down; while towards the lower end on the same side, the hills which approach the margin higher up turn off to the eastward, leaving a mile and a half of level country between their base and the stream which issues from the lake. In this stream about ten chains from the lake, there is a short, narrow, rocky crook, with a sudden descent of ten inches; and forty-five chains farther occurs the Talon Cascade, which is the greatest single fall on the river; the height is forty-two feet three inches. The water is precipitated over a hard reddish syenitic gneisoid rock, which on each side continues on an equal level with the banks above the fall, a considerable way beyond it, constituting a deep ravine; parallel with which to the right hand there is another ravine equally deep, and worn farther back by the stream at some remote period, in a thick nearly vertical white crystalline calcareous bed, which while it would afford material for burning into lime, would be more readily excavated than the gniess for the purposes of any work. About 100 yards beyond the fall, the two ravines unite into one, which forms a natural canal for sixty chains, and then opens out into a small lake carrying us half a mile farther forward in the general direction maintained from Talon Lake, which is precisely that of Talon Lake itself. The stream then turns northward, and in less than two miles in this direction it regains the base of the hills, which turned off from Lake Talon, by a narrow crooked channel, descending two strong rapids in its course and falling over a considerable precipice at the end of it, each occasioning a portage. Of the portage rapids above the Cascade, the upper one gives a descent of six feet four inches, and the impediment producing it appears to consist chiefly of boulders. The lower one caused by a solid ledge which pinches up and crosses the stream occasions a fall of eight feet six inches, and produces the Portage de la Prairie. But both above and between them there are minor rapids giving an additional descent of four feet four inches. The interruption of the canoe navigation at the Cascade is called the Portage des Paresseux, and the fall in the stream, which is a single leap with a short slope above, is thirty-four feet. At this point, the river turns eastward and maintains the bearing to its mouth. From the foot of the Cascade, the water, confined within bold and sometimes nearly per-

pendicular walls of rock, forms a beautiful natural canal for two miles and a half, widening gradually from about three chains at the west, to about ten chains at the east end, where three narrow gaps, one of which resembles a natural dock, are cut sideways through a not very wide barrier of rock, separating this piece of still water from a small narrow bold-shored lake lying parallel to it on the south side, the eastern end of the one running past the western end of the other. The eastern gap which is the main connecting one between them, shews a difference of four inches in their levels, and it unites them about half way down the small lake, the length of which is a little over a mile. Immediately below this lake there occurs a rapid and portage giving a descent of five feet; then another rocky-banked natural canal of three quarters of a mile, 500 yards beyond which, after passing a shallow, we reach the mouth of the Amable Dufonts River, falling in on the right, the only tributary worth noticing that joins the Mattawa. Within a distance of five furlongs, beyond this tributary, two more portage rapids occur on the river, each of which exibits a descent of six feet; and to them succeeds a lake bearing more resemblance to a canal, being five miles and three quarters long, with a breadth of between three and four chains, gradually increasing to one of twenty-five chains, with the exception of the last half mile, which again closes into something over the first mentioned width. From this, a narrow rocky channel with a crook in it, not over thirty-two chains in length, and twice compressed to a width of twenty yards, displays the Plain-Chant Rapids, which give a fall of seventeen feet and a half in two leaps, a small and a great one, the latter alone of which occasions a portage. The remainder of the river to the mouth is a distance of two miles and a quarter, in the latter half of which, apparently possessing not much depth, there are two small rapids, pro ducing a fall of one foot nine inches; and between this part of the stream, which turns up northward just at the junction, and the Ottawa, the land is flat to a point which would strike the main river, below the rapid mentioned as existing on this, near the mouth of the tributary.

This flat land, at the mouth of the Mattawa on the south side, is of good quality, producing a mixture of hard and soft wood, the species of trees observed by us being black birch, maple and some elm, with white pine and cedar; it seems to extend some

distance, both east and west. In the former direction, it descends the river as far at the Levier Rapid. Many boulders were seen to rest upon it occasionally along the margin, but in two places in this part of the stream, stratified blue limestone occurs in beds presenting no great slope; and it appears probable it may be owing to the spread of this under the area that both the eveness of the surface and the fertility of the soil are to be attributed; for it has been ascertained to be a very general rule in many parts of the country, that a good soil is found to accompany this rock. Two or three clearings have been made on the margin of the Ottawa, in this part, and some of those persons connected with the lumber business, express intentions of effecting others. To the westward, the tract appears to reach the Amable Dufonts River, and it may be a portion of the fertile country described as existing on the south side of Lake Nipissing.

On the north bank of the Mattawa, a range of mountains of no great elevation runs nearly the whole way from Trout Lake to the mouth; and between their base and the margin of the water there are occasional good mixed-wood flats, on one of which, at the head of Lake Talon, elm, ash, and maple trees, with a few oaks were seen, while marsh land in the same vicinity yielded good meadow hay: but the slopes produced soft wood chiefly, the prevailing species being red pine, some of the groves of which appeared of good size. On an excursion out to the northward from the foot of Upper Trout Lake, Mr. McNaughtan crossed the mountain range at the distance of about a mile, and from one of its summits observed an extensive spread of flat hard-wood country, running in an east and west direction, with a breadth of about five miles, which, on advancing into it, he found in such spots as he examined to possess a good soil, consisting of loam in some places and clay in others; and the timber, which was of good growth, was in a great measure composed of black birch, maple and basswood. Trees of the first species were frequently thirty inches in diameter, and of the other two, from twenty-four to thirty inches, and sometimes more. Probably associated with this tract of good land, is another described by Mr. R. McConnel, as existing at a distance of five miles back from his residence, on the west side of the Seven League Lake, running in a southwesterly course, to the vicinity of the Mattawa. How far this tract may extend northward is uncertain, but from such evidence

as I could collect, it appears to me not improbable it may reach as high as the Galère on Lake Temiscamang, though it is not there much nearer the lake than it approaches the river lower down. Another tract of good country exists at the head of Lake Temiscamang. Its limit southward is probably associated with a change occurring in the quality of the rock formations of the district in the vicinity of the mouth of the Montreal River, on the right side of the lake, and a few miles higher up on the left. The unbroken monotony of the hard syenitic gneiss, constituting so much of the banks of the lake and main river further down, here ceases ; a more distinctly stratified set of rocks, of a less crystalline and more easily disentegrating character, presents itself. The ranges of the hills become more determinate, the valleys wider, and many of them are occupied by clay lands. This diversity of hill and dale, however, is seen chiefly on the east side of the lake ; for though the same stratified rocks prevail on the west, the coast is in general high, precipitous, and in some places nearly 200 feet vertical. The difference arises from the circumstance that the coast on this side runs nearly in the strike of the formations, keeping in the continuity of the same quality of strata for a considerable distance, and the range of hill and valley, though not visible from the lake, may be nearly parallel with the coast in the interior. At the very extremity, both sides of the lake present a favorable aspect ; good stratified limestone there makes its appearance, constituting the two large islands which have been mentioned, and the promontory separating the east and west bays. Its escarpment does not exceed 100 feet, and it runs northward into the interior, with an even continuity of height, which can be followed by the eye for six or eight miles. The slopes formed by this and other hills, are clothed with poplar and maple, of which few trees appear to have over sixty years of age, though the solitary and blackened branchless stems of stately pines starting up to heights of 100 feet from amidst the younger wood, give evidence that a heavier growth of timber, which existed within a moderate period, has been swept away by fire. Of the quality of the land northward in the interior, some evidence is derived also from the rivers ; for while at the mouth of the Blanche, for example, the land was ascertained to be good, producing elm, poplar, maple and basswood, mixed with some balsam fir, it could be gathered from the great quantity of white sediment held in suspension by its waters,

giving the river its name, that it must flow through an alluvial valley; and the extent of its delta which displays a marked protrusion into the lake, renders it probable that this alluvium may reach to a considerable distance. The marshes arising from the sediment deposited by the rivers at their mouths, as has already been mentioned, are extensive. They produce an abundant supply of good meadow hay, and so valuable a provender does this prove for the purposes of the lumbermen lower down, that it is occasionally transported in double barges sixty-seven miles, to the foot of the lake, and then run down the rapids of the Long Sault on cribs, for the winter support of the oxen used in hauling timber.

But in the district that came under our examination, though some species of hard-wood trees are found on the flat lands and occasionally clothe the higher grounds, the proportion which they bear to timber of a soft description is quite insignificant. Red and white pine form the staple wood of the country, and the banks of the Ottawa and its tributaries may most emphatically be said to constitute one of the most important pine timber regions any where to be met with. The endless succession of forests of both species mentioned, presented to our view in the whole of our exploration above Bytown, would seem to be almost inexhaustible, and it appears to me that in the higher parts of the main stream visited by us, the quantity of red pine preponderates over that of white. The greater value of the former causes it to be sought for at greater distances than the other. We found chantiers established for the purpose of cutting it, as high as the Galère, on Lake Temiscamang, where lumberers were then in full operation; and we observed a deserted one several miles above the Hudson Bay Company's Post, where red pine had been prepared two or three years ago, by the Messrs. McConnel, whose enterprise has carried them farther up than any other lumberers on the river. We were informed the time occupied in conveying the timber from this distant point to Quebec, was, under favourable circumstances, just two months. No white pine timber has yet been carried from any place higher than Bennett's Brook, which is about 140 miles lower than the other spot, but as settlement creeps up the river, and increases the facilities with which provisions and material for the uses of the woodsman, with fodder for his cattle, can be supplied, it will gradually be sought at higher points.

On the Ottawa the occupations of the lumberer and the farmer have been a great encouragement to one another, and while the advance of settlement has enabled the lumberer to push his enterprise further and further up the stream, it is mainly in consequence of the trade in its timber that the banks of the river are so fast filling up with inhabitants. The wants of the lumberman afford to the farmer a ready market for his produce at high prices, and present a great encouragement for location wherever good land occurs; while this has been found in sufficient abundance to establish many thriving settlements in localities, which but for the timber trade, might have been overlooked for some time to come. These settlements once established, producing enough for their own consumption and something to spare, may ultimately constitute a back country of considerable importance to the prosperity of those points at the mouth of the river, conveniently situated for supplying the wants of its inhabitants; and Montreal as the principal of these may hereafter find the vallies of the Ottawa and its tributaries of essential benefit in assisting to support the eminence she has attained among the cities of British North America.

Below the Joachim Falls, which, as has already been stated, are situated about five miles further down than Bennett's Brook, several clearings occur on the south side of that fine navigable reach of the Ottawa, called the Deep River, which there stretches twenty-four miles in an almost perfectly straight line: at the foot of it also there is a block of settled land, not yet surveyed, behind Fort William, on Lake Allumettes, and many locations have been cleared on the Allumettes Island, which has been now recently surveyed; but the village of Sydenham (including Campbelltown, which is part of it) at the mouth of the Muskrat River, in Pembroke Township, may be considered the highest centre of settlement on the river. The distance above Bytown is about eighty-five miles by land and ninety-five by water; and in addition to many neat and substantial houses, with stores for the sale of merchandise, it possesses a grist and two saw mills, and several respectable tradesmen there find full occupation in their several arts. In the grist mill there were ground in the season previous to our visit 12,567 bushels of wheat, 13,789 bushels of oats, 5,659 bushels of Indian corn and pease; and as there is another grist mill at the foot of the Allumettes Island, which probably may have done equal work, about 25,000 bushels of

wheat, one half of which is fall sown, may be considered the quantity of this species of grain raised from the clearings in the vicinity. But the grain to the cultivation of which the cleared land is chiefly devoted, is oats. It is found a more profitable crop than any other, in consequence of the great demand the necessities of the timber trade occasion. Sydenham constitutes a market for a considerable quantity of oats brought from lower points on the river; and in winter this and other descriptions of grain, with flour and barreled provisions, in addition to the regular supplies of these last commodities, carried up systematically by the principal timber merchants, by the Ottawa, are brought from localities on the St. Lawrence as low down as Brockville. The ordinary price of wheat is 6s per bushel, and that of oats 3s per bushel. Hay is sometimes brought from equal distances, and its ordinary price is from £6 to £7 per ton.

The quantity of calcareous rock, prevailing between Bytown and the Mattawa River, as will be seen in connection with the geological part of the subject, and the general direction it takes through the district, makes it extremely probable a considerable amount of good land will be found in the valleys that lie between the Ottawa and Lake Huron; and the latitude of the region being much the same as that of the country between Montreal and Three Rivers, its climate will probably be very similar; for its greater elevation does not seem to be of so important an amount as to produce a likelihood of much difference in temperature, particularly if there be any foundation for the general opinion entertained that the climate rather improves proceeding westward.

With a view of shewing the general height of the area that has been examined, an attempt has been made to compute the elevation of different parts of the Ottawa to Temiscamang and of the Mattawa and the Vase to Nipissing. The heights of the rapids and cascades to the head of the Joachim Falls are chiefly derived from the facts ascertained by the Ordnance Department and the Board of Works in the surveys made for the canals to Bytown, and the timber slides the rest of the way; while above the Joachim they have been determined by my own admeasurements. But that no more reliance may be placed on these than they merit, it may be necessary to state, that though the levelling was performed with an instrument of the best quality furnished with a telescope of twenty one inches, none

of the work was checked by a repetition. The staff however used was a flat one with two sets of numbers, one on each side. On the one they ran from zero to seventeen feet divided into hundredth parts, and on the other from seventeen as zero to thirty-four; so that in reading off, the one set was a check upon the other of such a nature that the final digits were never the same, and as both numbers were entered in separate columns in the field book and brought out the same ultimate results, it is not likely any wrong figures were set down from erroneous reading.

The allowance made for the rise in the navigable parts of the river is estimated from the rate of the current observed and the volume of water derived from its breadth and supposed depth, but as no measurements were made to ascertain either the depth or the rate with accuracy the allowance can only be considered an approximation.

It may be proper to remark that as the waters of the river were gradually rising during the seven weeks our work occupied, some differences in the relative levels of separate parts might be found on any future trial, but this ought not greatly to affect the total result. It may be the case that Lake Temiscamang was six feet higher when we reached it than it was when we commenced our measurements at Bennett's Brook.

It is to be hoped that on some future occasion a check upon the height of Lake Nipissing may be obtained by an accurate measurement of the fall in the French River to Lake Huron, the elevation of which above the level of the sea has been pretty well determined. The Canadian estimate gives to it the height of 595 feet. This is seventeen feet higher than is stated by the surveyors of Michigan who give it no more than 578 feet. In the height of Lake Erie the American and Canadian estimates agree to within one foot, the former making it 565, and the latter 564 feet, and it appears to me that a fall of thirty-one feet from Huron to Erie would produce so violent a current between Huron and Ste. Claire to which the chief part of the fall (judging from the difference in the breadth of the channel above and that below the latter) would necessarily be confined, as to render it almost unnavigable. The Michigan Surveyors make Lake Ste. Claire five feet above Erie, and Huron eight feet above Ste. Claire, which is probably near the truth.

In the mean while until obtaining data of a more precise description a comparison of the height of Lake Nipissing as resulting from my own estimate, with the height resulting from a computation founded upon an estimate of the various falls on the French River by Mr. William Hawkins in his report to the Commissioners of the Lake Huron and Ottawa Survey in 1838, and an allowance for the supposed slope of the intermediate parts navigable to canoes of six inches to the mile which probably exceeds the truth, bringing the two to within three feet, induces me to hope that no great error will be found in the work.

Levels of the Ottawa above the waters of the St. Lawrence at Three Rivers, which is about the highest point affected by the action of the tides:—

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
Rise from Three Rivers to Montreal Harbour, as stated in the report of the Hon. H. H. Killaly, President of the Board of Works, in 1845,..	90	12	9	12	9	Montreal.
—— from Montreal Harbour to Lake St. Louis at Lachine, from the same report,.....1 Lock 13.3						
2 " 13.3						
3 " 8.6						
4 " 9.0						
5 " 0.9						
——	10	44	9	57	6	Lachine.
—— in Lake St. Louis from Lachine to Ste. Anne, ...	13	0	6	58	0	
—— in the Lock at Ste. Anne,.....		3	0	61	0	
—— in the Lake of Two Mountains from Ste. Anne to Carillon,.....	23	0	8	61	8	Carillon.
—— from Carillon to Blondeau,						
1 Lock, up 10						
2 " " 11						
— 21						
3 " down 13						
—	4½	8	0	69	8	

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
Rise in the Chute à Blondeau Canal,		4	0	73	8	
—— in the Grenville Canal from the head of Blondeau to the head of Grenville Canal,.....1 Lock 3						
2 " 3						
3 " 8						
4 " 8						
5 " 7						
6 " 6						
—	6½	35	0	108	8	Grenville.
—— in the navigable part of the Ottawa, between Grenville and the entrance to the Rideau Canal, Bytown, ...	58½	9	4	118	0	Bytown.
—— from the entrance to the Rideau Canal to the Chaudière Lake, viz:						
Rise in the Rideau Canal to Dow's Swamp: 1 Lock 11						
2 " 10						
3 " 10						
4 " 10						
5 " 10						
6 " 10						
7 " 10						
8 " 10						
— 81						
Fall from Dow's Swamp to Chaudière Lake,.....18						
—	6	63	0	181	0	Chaudière.
—— in Chaudière Lake, from the foot to Fitzroy Harbour, at the head, supposed to be 1 inch per mile,...	25	2	1	183	1	
—— from Fitzroy Harbour to Chats Lake, as ascertained by levels taken up the Mississipi Channel by the Board of Works in 1845—49.96 say.....	3	50	0	233	1	Chats.
—— in Chats Lake, from the head of the Rapides des Chats to the foot of the Chenaux, supposed to be 1 inch per mile,.....	15	1	3	234	4	
—— from the foot of the Chenaux to Portage Dufort, a strong current prevailing all the way, supposed to be 12 inches per mile,.....	5	5	0	239	4	Port. Dufort.

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
Rise in the rapid at Portage Dufort,		17	0	256	4	
—— between the head of Portage Dufort Rapid and the foot of the Sable, a strong current prevailing all the way, say 1 foot per mile,...	5	5	0	261	4	
—— in the Sable Rapid and two small ripples above,.....	0½	6	2	267	6	Sable.
—— between the Sable and the Mountain Chute,.....	1¼	1	0	268	6	
—— from the boom at the foot to dead water at the head of the Mountain Chute, according to Mr. Gerrard Nagle,.....		15	0	283	6	Mountain.
—— from the head of the Mountain Chute to the foot of D'Argis Rapid, say 8 inches per mile,.....	1	0	8	284	2	
—— in the D'Argis Rapid,.....		5	0	289	2	D'Argis.
—— from the head of D'Argis to the foot of the Calumet Falls, say 8 inches per mile, ...	1¼	0	10	290	0	
—— in the Calumet Falls, according to Mr. Gerrard Nagle: From dead water at the foot of the Falls to the foot of the middle slide, 26.3 From the foot of the middle slide to dead water at the head,..... 39.7	1	65	10	355	10	Calumet.
—— from the head of the Calumet Falls to the head of the Calumet Island, a considerable current prevailing the whole distance, say 6 inches per mile,.....	13	6	6	362	4	
—— from the head of Calumet Island to Fort Coulonges, including about 1 foot at La Passe Rapid,..	5	2	8	365	0	Ft Coulonges.
—— in Fort Coulonges Lake, from Fort Coulonges to the mouth of the Black River, quiet water all the way, say 2 inches per mile,....	8	1	4	366	4	Black River.
—— from the mouth of the Black River to the Chapeau Rapid, swift water, say 6 inches per mile,.....	6	3	0	369	4	
—— in the Chapeau Rapid,.....		2	0	371	4	Chapeau.

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
Rise from the Chapeau to the Culbute, swift water all the way, say 6 in. per mile,.....	5	2	6	373	10	
—— in the Chute Culbute from the foot of the current to dead water at the head, according to the Board of Works,.....		19	7	393	5	Culbute & L. Allumettes.
—— from the head of the Culbute Rapid by Upper Allumettes Lake and the Deep River to the foot of the Joachim Falls. The current in the Deep River is so moderate that, with a very gentle wind, rafts are sometimes carried up stream without sails. The rise is supposed to be 2 inches per mile,.....	32	5	4	398	9	Joachim.
—— in the Joachim Falls from the Deep River to dead water at the head, according to Mr. Gerrard Nagle, ...	1	23	3	422	0	
—— from the head of the Joachim Falls to the mouth of Bennett's Brook, say 3 inches per mile,.....	4	1	0	423	0	Bennett's Br.
—— from Bennett's Brook to the mouth of the Rivière du Moine, a strong current prevailing most of the way, say 6 inches per mile,.....	3½	1	9	424	9	Moine River.
—— from the Rivière du Moine to the foot of Islet Rapid, a strong current prevailing at Riley's clearing and at McSwirley's clearing, say 5 inches per mile,.....	8	3	4	428	1	
—— from the foot of Islet Rapid to the Roche Capitaine Rapids, or that part of them called the Maribou, allowing 1 foot for the Islet,	1	1	5	429	6	Islet.
—— from the foot to the head of Roche Capitaine,.....	2	42	10	472	4	Roche Capitaine.
—— from the head of Roche Capitaine to the foot of the Deux Rivières, quiet water nearly the whole way, say 3 inches per mile,.....	11	2	9	475	1	

	Distance. Miles.	Rise. Feet.	In.	Total Rise. Feet.	In.	
Rise from the foot of the Deux Rivières Rapid to the head of the Levier Rapid, viz:						
Difference of level between smooth water at the foot and smooth water at the head of the Deux Rivières Portage,..... 13.38						
Difference of level between the head of the Deux Rivières Portage and the mouth of the Maganasipi,..... 8.85						
Difference of level between the mouth of the Maganasipi and the head of the Levier Rapid,..... 8.09						
	3	30	4	505	5	Levier.
—— from the head of the Levier to the foot of the Mattawa Rapids, being swift water nearly the whole distance, supposed to be 6 inches per mile,.....	18	9	0	514	5	
—— from the foot of the Mattawa Rapids to the mouth of the Mattawa River,.....	1½	5	0	519	5	Mattawa.
—— from the mouth of the Mattawa to the foot of the Cave Rapid, a considerable current about midway up, say 4 inches per mile,....	2½	0	10	520	3	
—— from the foot of the Cave to the head of the Chaudron Rapid, viz:						
Rise in the Cave,..... 5.75						
Rise in the Chaudron, 6.00						
	0¾	11	9	532	0	Chaudron.
—— from the head of the Chaudron to the foot of the Erables Rapid, say 3½ inches per mile,.....	3½	1	0	533	0	
—— from the foot to the head of the Erables Rapid,.....	0½	13	0	546	0	Erables.
—— from the head of the Erables to the foot of the Mountain Rapid, say 3½ inches per mile,.....	3½	1	0	547	0	

	Distance. Miles.	Rise. Feet.	In.	Total Rise. Feet.	In.	
Rise from the foot to the head of the Mountain Rapid,.....	0¼	5	5	552	5	Mountain.
—— in the Seven League Lake from the head of the Mountain Rapid to the foot of the Long Sault Rapids, say 2½ inches per mile,...	17	3	6	555	11	
—— from foot to head of the Long Sault Rapids:						
1st or Lower Leap,..... 6.92						
Intermediate,...1⅞ mile, 2.50						
2d Leap,..... 6.06						
Intermediate, 1 2/16 mile 2.20						
3d Crooked Rapid,..... 6.38						
Intermediate, 1 1/16 mile 0.23						
4th Leap,..... 15.82						
5th Upper Rapid,..... 8.34						
	6	48	5	604	4	Long Sault.
—— from the head of Long Sault Rapids to the mouth of the Opimika River, above the Galère Current; there is a perceptible current only in two places, say 3 in. per mile,	12	3	0	607	4	Galère.
—— from the mouth of the Opimika River to the head of Lake Temiscamang, say 1 inch per mile,.....	55	4	8	612	0	Temiscamang.
	492½					

Levels of the Mattawa from its junction with the Ottawa, 519 *feet* 5 *inches above the surface of the St. Lawrence at Three Rivers, to Trout or Turtle Lake:—*

	Distance. Miles.	Rise. Feet.	In.	Total Rise. Feet.	In.	
Height above Three Rivers,.....				519	5	
Rise from the mouth of the Mattawa to the foot of Plain-Chant Rapids, including a rise of 1 foot 8 inches in two small rapids, allowing 4 inches per mile,.....	2½	2	6	521	11	
—— from foot to head of Plain-Chant Rapids:						
1 Rise,..... 15.98						
2 do. 1.60						
	0½	17	7	539	6	Plain-Chant.

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
Rise in Long Lake from the head of Plain-Chant Rapids to the foot of Portage à la Rose, say 3 inches per mile,.....	5½	1	4	540	10	
—— from the foot of Portage à la Rose to the head of Portage du Rocher, above Amable Dufonts River:						
1 Portage à la Rose, Rise, 5.90						
Intermediate, ... 0.20						
2 Portage de la Compagnie,..... Rise, 5.80						
Intermediate,..... 0.80						
3 Portage du Rocher, Rise, 5.05						
——	2	17	9	558	7	Du Rocher.
—— from the head of Portage du Rocher to the foot of Portage des Parresseux, say 3 inches per mile in addition to a small fall of 4 in.	3¼	1	2	559	9	
—— from the foot of Portage des Parresseux to the foot of the Talon or Hang Falls,						
1 Port. des Parresseux, Rise 33.99						
Intermediate,..... 0.25						
2 Port. de la Prairie,...Rise 8.55						
Intermediate,..... 0.95						
3 Portage,.....Rise 6.30						
Intermediate,..... 0.10						
4 No Portage,.....Rise 3.34						
Intermediate, ... 0.33						
——	2¾	53	9	613	6	Foot of Talon.
—— from the foot of Talon or Hang Falls to the foot of Talon Lake,						
1 Portage de Talon, Rise 42.23						
Intermediate,..... 0.25						
2 No Portage,.....Rise 0.85						
——	0¾	43	4	656	10	
—— from the foot to the head of Lake Talon by the old canoe route, say 1 inch per mile,.....	7	0	7	657	5	Lake Talon.
—— from the head of Lake Talon to the foot of Lower Trout Lake the difference of level ascertained						

	Distance. Miles.	*Rise.* Feet.	In.	*Total Rise.* Feet.	In.	
by the new canoe route, the distance by the old route, viz:						
Rise from Lake Talon to Lac des Pins,.....	42.19					
Fall from Lac Des Pins to Lower Trout Lake,..	10.89					
——		4¼	31	3	688	8 Lr. Trout L.
Rise from Lower to Upper Trout Lake, say 1 inch per mile in addition to a rise of 1.1 at the outlet of the Upper Lake,.....		3¼	1	4	690	0
—— from foot to head of Upper Trout Lake,.....		8	0	0	690	0 Ur. Trout L.
		39¾				

Levels from the surface of Upper Trout Lake, 690 *feet above the waters of the St. Lawrence, at Three Rivers, to the surface of Lake Nipissing:—*

	Distance. Miles.	*Rise & Fall.* Feet.	In.	*Total Rise.* Feet.	In.	
Height of Upper Trout Lake,.....				690	0	
Rise from Trout Lake to the height of land between it and the Vase River on the Canoe Portage,.....	0½	24	5	714	5	Ht. of Land.
Fall from the Height of Land to the Rivière à la Vase at the end of the Portage,.....	0¼	22	11	691	6	Vase.
—— from Trout Lake Portage on the Vase to Lake Nipissing,						
Fall at 1st Portage,.....	3.14					
Intermediate,.....	1.00					
Fall at 2nd Portage,.....	20.88					
Intermediate,.....	1.50					
——		4¼	26	6	665	0 Nipissing.
		5				

Levels from the surface of Lake Nipissing, 665 feet above the waters of the St. Lawrence at Three Rivers, to that of Lake Huron at the mouth of the French River :—

	Distance. Miles.	Fall. Feet.	In.	Total Rise. Feet.	In.
Height of Lake Nipissing,.....				665	0
Agreeably to the estimate of Mr. William Hawkins in his Report to the Commissioners of the Lake Huron and Ottawa Survey in 1838, the Falls on the French River are :					
1 Chaudière Falls (upper,)		10	0		
2 Chaudière do. (lower,)		15	0		
3 Rapid, ...		3	0		
4 "		3	6		
5 "		3	0		
6 "		8	0		
7 "		2	0		
8 "		3	0		
9 "		6	0		
10 "		3	0		
				56	6
Allowance for the supposed general slope of intermediate parts of the River, say 6 inches per mile,.....	55	27	6	84	0
To the level of Lake Huron,.....				581	0
The ascertained height of the surface of Lake Huron above the sea according to the Michigan Surveyors is,.....				578	0
Making a difference of.....				3	0

TABLE shewing the Monthly Mean Temperature, (Farnh. Therm.) for two years, at the Hudson Bay Company's Post on Lake Temiscaming, Lat. 47° 19′ N. Long. 79° 31′ W., 630 feet above the level of the Sea.—from a Register kept by Mr. Severight.

1843–4.										1844–5.									
Month.	Sunrise.	Noon.	Sunset.	Mean for each Month.	Clear Sunshine.	Clear and Cloudy.	Cloudy.	Cloudy and Rain.	Cloudy and Snow.	Month.	Sunrise.	Noon.	Sunset.	Mean for each Month.	Clear Sunshine.	Clear and Cloudy.	Cloudy.	Cloudy and Rain.	Cloudy and Snow.
1843.										1844.									
November,.....	$24\frac{6}{30}$	$29\frac{6}{30}$	27	$26\frac{2}{3}$	3	10	5	2	10	November, ...	$24\frac{16}{30}$	$31\frac{4}{30}$	$28\frac{4}{30}$	28	4	7	8	3	8
December,.....	$18\frac{28}{31}$	$26\frac{5}{31}$	$22\frac{25}{31}$	$22\frac{1}{2}$	2	10	13	1	5	December,....	$11\frac{23}{31}$	$19\frac{14}{31}$	$16\frac{8}{31}$	$15\frac{5}{6}$	9	8	8	...	6
1844.										1845.									
January,.....	$-1\frac{13}{31}$	$12\frac{24}{31}$	$10\frac{2}{31}$	$7\frac{1}{6}$	13	5	6	...	7	Jauuary,.....	$8\frac{19}{31}$	$17\frac{23}{31}$	$13\frac{18}{31}$	$13\frac{1}{3}$	6	15	3	1	6
February,.....	$8\frac{24}{29}$	$28\frac{6}{29}$	$19\frac{23}{29}$	19	7	9	6	...	7	February,.....	$11\frac{15}{28}$	$24\frac{25}{28}$	$20\frac{4}{28}$	$18\frac{5}{6}$	7	8	5	3	5
March, ...	$13\frac{18}{31}$	33	$25\frac{10}{31}$	$23\frac{1}{3}$	14	8	5	...	4	March,.....	19	$34\frac{25}{31}$	$28\frac{20}{31}$	$27\frac{1}{2}$	9	10	3	2	7
April,.....	$33\frac{17}{30}$	$53\frac{28}{30}$	$45\frac{3}{30}$	44	23	1	2	4		April,.....	$26\frac{18}{30}$	$43\frac{16}{30}$	36	$35\frac{1}{3}$	5	11	...	8	6
May,.....	$42\frac{4}{31}$	$57\frac{14}{31}$	$50\frac{14}{31}$	50	12	8	...	11		May, ...	$38\frac{6}{31}$	56	49	$47\frac{5}{6}$	13	7	5	6	
June,.....	$56\frac{9}{30}$	$70\frac{22}{30}$	$61\frac{6}{30}$	$62\frac{2}{3}$	11	4	3	12		June,.....	$51\frac{18}{30}$	$69\frac{25}{30}$	$62\frac{6}{30}$	$61\frac{1}{6}$	12	7	5	6	
July,.....	$58\frac{6}{31}$	$72\frac{11}{31}$	$66\frac{15}{31}$	$65\frac{2}{3}$	9	8	3	11		July,.....	58	$75\frac{7}{31}$	$67\frac{17}{31}$	67	8	12	...	11	
August,.....	$56\frac{26}{31}$	$71\frac{9}{31}$	$63\frac{25}{31}$	64	10	6	...	15		August,.....	58	$76\frac{16}{31}$	$67\frac{9}{31}$	$67\frac{1}{3}$	15	10	...	6	
September,....	48	$63\frac{15}{30}$	$56\frac{15}{30}$	56	13	7	1	9		September, ...	$48\frac{7}{30}$	$58\frac{5}{30}$	$53\frac{14}{30}$	$53\frac{1}{3}$	1	8	2	19	
ctober,.....	$34\frac{6}{31}$	46	$42\frac{9}{31}$	$40\frac{5}{6}$	11	8	1	5	6	October,.....	38	50	46	$44\frac{2}{3}$	11	10	3	7	

SEQUENCE AND DISTRIBUTION OF THE FORMATIONS.

Metamorphic Series.

That part of the Ottawa which lies between its tributary the Mattawa, and a point about three miles south of the mouths of the Montreal and Metabeechuan rivers, appears to cross the axis of an anticlinal arch, which separates the rim of the great southern trough of fossiliferous formations of which the western geological area of Canada has been heretofore described as forming but a part, from a northern trough whose strata, partially seen in Canada, probably run under the waters of Hudson Bay; but whose general relations cannot be fully understood until a great collection of facts shall have been accumulated beyond the northern bounds of the Province.

The lowest rocks which this undulation brings to the surface are of a highly crystalline quality, belonging to the order which, in the nomenclature of Lyell, is called metamorphic instead of primary, as possessing an aspect inducing a theoretic belief that they may be ancient sedimentary formations in an altered condition. Their general character is that of a syenitic gneiss. Their general colour is reddish and it arises from the presence of reddish feldspar, which is the prevailing constituent mineral. The feldspar, however, is often white, and frequently of a bluish grey. The rock is in no case that I have seen without quartz. Hornblende is seldom absent, and mica very often present. The prevailing colour of the quartz is white, but it is often transparent or translucent. The hornblende is usually black and sometimes green. The mica is often black, frequently brown, and generally of a dark tinge. The rock (carefully distinguished from dykes) is almost universally small grained, and though the constituent minerals are arranged in parallel layers, no one constituent so monopolises any layer as to exclude the presence of others; but even in their subordinate arrangement there is an observable tendency to parallelism. A thick bed of reddish feldspathic rock, for example, will in section present a number of short dashes of black hornblende or black mica, all drawn in one direction, destitute of arrangement apparently, except in regard to their parallelism; or, it will be marked by parallel dotted lines composed of these minerals. The continuation of these lines will be interrupted irregularly, and before one ends another will commence above or below it, the lines interlocking among one another. Sometimes thin continuous parallel black belts will run in the rock

for considerable distances; or, it will be barred by parallel streaks of white quartz or white feldspar, in which, as well as the red part, these dark and dotted lines will occur. The same description of arrangement will be found where the whole ground of the rock is white instead of red, and then the red feldspar will occasionally constitute streaks. There is no end to the diversity of arrangement in which the minerals and the colours will be observed, but there is a never failing constancy in respect to their parallelism. But this, though never absent, is sometimes obscure.

While the subordinate contents of beds will be thus arranged, masses will be divided into beds shewing nearly as great a diversity. The beds will be sometimes very thick, and these usually are of the red variety of rock; at others they will be thin, and the hornblende or the mica, or both, will be the dominant minerals, or equal the others in quantity. In this case, the mass will present a light or dark grey colour, and the mica, rendering the rock fissile, will cause it to yield good flagging or tile stones. The reddish feldspathic masses are stronger and more solid than the others, yielding less to the influences of the weather, and when their bulk is considerable they rise into hills, and largely prevail in all the ranges we met with. The thin bedded rocks often constitute the vallies.

What the thickness of the whole volume may be, has not been ascertained. The dip of the strata was usually at high angles, and toward the Mattawa it appears to point more generally southward. But there evidently exist many undulations, often accompanied by contortions. Some of the undulations give northern and sometimes eastern dips, but how many of them there may occur before reaching the anticlinal axis, it is difficult to decide. It is not supposed, however, that these undulations have any dependent connexion with the anticlinal axis, or that its position will be pecularily marked by any of them. The arch is of too gentle a nature to have produced any palpable change in the slope of the highly tilted strata, and it is probable that these had assumed their twists and undulations before the existence of the arch, and that the forces producing it operated on the wrinkled mass merely as a whole, without, in any very perceptible degree, affecting the relation of its parts.

To the south of the Mattawa and of the Ottawa in its continuation after the junction of the two streams, important beds of crystalline limestone become interstratified with the syenitic gneiss, and their

presence constitutes so marked a character that it appears to me expedient to consider the mass to which they belong as a separate group of metamorphic strata, supposed from their geographical position and general attitude to overlie the previous rocks conformably. The limestone beds appear to be fewer at the bottom than at the top of the group, but whether few or many, they are always separated by beds of gneiss which in no way differs either in constituent quality or diversity of arrangement from the gneiss lower down, except, in regard to the presence of accidental minerals, the most common of which are garnets.

The limestone beds are in general crystalline in a high degree; occasionally they are composed of an aggregation of rhombohedral crystals of calcareous spar, with faces equal to an inch square. They are in general coarse-grained; sometimes they may be termed saccharoidal, but it rarely happens they are so fine in texture as to be entitled to the character of compact. Their general colour is white. They are sometimes barred with grey in the direction of the strata, and are occasionnally wholly grey. It sometimes occurs that they are partially flesh or salmon coloured, but I have never seen this tinge diffused throughout a bed, or extending to any great distance in it. It is seldom that the beds are found wholly composed of pure carbonate of lime. Several accidental minerals are usually associated with this, and they may vary in quantity and kind in different parts of the horizontal and vertical extension of the group. The most frequent minerals imbedded in the calcareous strata, independent of such as may belong to the dykes, which occasionally traverse them, are apatite, mica, serpentine, tabular spar, scapolite, pyroxene, hornblende, tremolite, chondrodite, idocrase, quartz, sphene, specular iron, iron pyrites, copper pyrites, and graphite.

When one of these calcareous beds, or a collection of them, is traced to some distance, and then compared with those of the gneiss above or below, with which it is associated, the stratigraphical relation of the two is readily made out; and it is perceived that the limestone layer taken as a whole is conformable with the gneissoid strata, and parallel with those bands and streaks, with which they are marked. This relation, however, is not so evident when only small portions are compared; for it often happens, that while an over or underlying mass of gneiss will exhibit very regular and even

lamellation, the subordinate divisions of the calcareous bed in contact with it will display contortions of the most complicated descriptions; which appear to be more important in proportion to the body of limestone in which they occur. When this is great, gneissoid beds of several inches or even a foot thick, which mark the subdivisions, will be bent and folded in a very extraordinary manner; or partially broken up, its fragments will be surrounded by the limestone: sometimes large disjoined masses, eight or ten feet in diameter, of a gneisoid quality, assuming something the character of vast nodules, with concentric layers of the constituent minerals, and much charged with pyrites, will be surrounded by the limestone; and several of these, occuring in succession and standing near to one another, will be in the continuation of a bed of the same quality; while one instance was observed where the limestone of a bed appeared to have an uninterrupted connexion with rock of identical quality, filling up a crack or fault in the gneiss, at right angles to the general direction of the strata. Notwithstanding these irregularities however, it appears to be the case that the calcareous strata, taken in the large, are parallel to the gneissoid beds and alternate with them in a well marked system of stratification.

As an instance of the mode in which the beds succeed one another, the following section may be given as measured at the High Falls, on the Madawaska, where the dip of the strata is pretty constant in direction, being from twenty to forty degrees east of magnetic north, and varies in inclination from fifteen to thirty degrees. The beds are given in descending order.

	Feet.	*In.*
Gray speckled syenitic gneiss of a slaty character, occasionally striped with darker and lighter colours, caused by a greater or less predominance of hornblende and black mica; some of the beds have the appearance of white splashes upon them, arising from the presence of small patches of white feld-spar. Towards the bottom some of the layers have thin lines of reddish colour arising from red feldspar,	32	0
Gray speckled syenitic gneiss much of the same quality,	26	0
Gray syenitic gneiss in three bands of 5 feet each, and red gneiss in 3 bands of 2 feet each,	21	0
Measures concealed, with the exception of some reddish syenitic gneiss at the top,	23	0
Reddish syenitic gneiss with black hornblende and mica,	3	0
White crystalline limestone,	3	0
Gray syenitic gneiss,	15	0

	Feet.	In.
Measures concealed,.....	34	0
Reddish syenitic gneiss not well displayed,.....	20	0
Measures concealed,.....	37	0
Reddish syenitie gneiss composed of red feldspar, translucent quartz and black hornblende, which run in lines in the side section, the hornblende forming dotted black lines on the red feldspar. There are occasional layers of red feldspar without the black lines, and there are a few irregular layers more large-grained than the rest in regard to all the constituent minerals,.....	51	0
Reddish syenitic gneiss; thin black layers of an inch are of occasional occurrence, the colour being derived from the presence of hornblende; the rock splits in the direction of these layers. Iron pyrites occurs in crystallized patches irregularly, giving a rusty brown colour by its decomposition to a portion of the beds,	84	0
Reddish syenitic gneiss of much the same quality,.....	105	0
Black syenitic gneiss and white crystalline limestone in alternating layers. The gneiss is composed of black hornblende, black mica and greenish white feldspar and quartz. The limestone holds gold-coloured mica and graphite in small crystals. The beds are irregularly arranged, and there are occasional lumps like altered nodules in them, wearing into knobs,.....	8	0
White crystalline limestone, much of it consisting of transparent calcareous spar, with gold-coloured mica and graphite in small crystals. Lumps of a rusty brown colour holding mica are irregularly displayed in the bed, and in the weathering of the rock there appear dotted lines of relieved crystals, probably of a silicious character (serpentine and tremolite) which are very small, but altogether give to the bed the aspect of a surface painted with what artists term a dry brush. These dotted lines run above and below the rusty coloured lumps, giving place to them and enclosing them,.....	2	0
Dark-coloured syenitic gneiss, with limestone as before, constituting a wedge shaped mass which fills up a hollow in the bottom of the reddish gneiss previously mentioned,.....	2	0
Dark-coloured syenitic gneiss with white crystalline limestone as before,.....	4	0
Gray syenitic gneiss with dirty white bands of a quartzose character, and two bands of limestone with much black mica,.....	2	0
White crystalline limestone with a band of rusty syenitic gneiss in the middle, of 6 to 8 inches thick. There is more mica in the limestone than before, and it has an uneven upper surface,.....	4	0
Gray thin bedded slaty gneiss with more translucent quartz and more black mica, but less hornblende than before. The beds are separated by thin layers of limestone, and there is a good deal of hornblende on the surfaces on which the limestone rests, made perceptible by weathering into relief in exposed parts,	12	0

	Feet.	In.
Gray thin bedded slaty gneiss,	12	0
Reddish syenitic gneiss similar to that previously mentioned,	139	0
White crystalline limestone, holding crystals of mica and graphite, and having a layer of dark mica at the top two inches thick, and another at the bottom with a layer of green fibrous actynolite between the mica and the limestone, both above and below. These layers of tremolite are two inches thick, and the fibrous structure runs across them; massive pyroxene is associated with one of the layers,	1	0
Reddish syenitic gneiss,	15	0
Gray slaty gneiss with more mica and quartz,	34	0
Gray slaty gneiss, in some places nearly black with hornblende and mica; a layer of white quartz in part of it; and 2 or 3 feet at the top is limestone, which decomposes fast, probably from the presence of iron pyrites. There are many lumps of harder quality than the rest in the decomposing part, and much mica in its disintegrated ruins,	33	0
Light-gray gneiss, dividing into beds of 3 to 8 inches. It appears to be more quartzose than usual. Some of the beds are nearly altogether composed of crystals of translucent quartz. Here there appears to be a disturbance of some kind; approaching it there is a mass of very large-grained rock, with red feldspar and translucent quartz, without hornblende or mica. It indistinctly crosses the beds, the ends of which, becoming as it were fused into it, are obliterated,	31	0
Measures concealed by soil and herbage,	49	0
Dark-gray gneiss, obscurely exposed,	21	0
White crystalline limestone, with very few crystals of mica and graphite,	6	0
Dark-gray quartzose rock, separated into layers by partings of mica,	10	0
Dark-gray gneiss, with two small bands of crystalline limestone,	13	0
Dark-gray gneiss of a slaty character, with black bands, of which the colour is derived from the presence of hornblende, and mica prevails where the rock is most fissile,	25	0
Black slaty gneiss, with much hornblende; the lower part has much black mica with white layers, composed of white feldspar and transluent quartz,	51	0
Gray syenitic gneiss, with black streaks of mica and black patches of the same,	42	0
Measures concealed by trees,	80	0
Light-gray syenitic gneiss; the beds are very quartzose; they have a few specks of green hornblende and black mica, with opaque white feldspar, and some few streaks of red feldspathic quality, dividing into layers of 2 to 6 inches,	10	0
Measures concealed by trees and moss,	63	0
Reddish syenitic gneiss,	39	0

	Feet.	In.
Gray syenitic gneiss, interstratified with crystalline limestone,	15	0
White crystalline limestone, containing abundant small crystals of mica and graphite, and interstratified with irregular curly layers, of which some are very quartzose, and some are dotted with lines of black hornblende and mica,	19	0
Reddish syenitic gneiss, of much the same quality as before,	56	0
Measures concealed by the river,	7	0
Reddish syenitic gneiss,	17	0
Reddish syenitic gneiss, not well exposed,	18	0
Dark-gray or nearly black thin layers composed of black hornblende chiefly, with some black mica and some crystals of white quartz and feldspar; interstratified with limestone, having many twisted layers and many patches and spots displaying tremolite or serpentine, as well as some with hornblende and mica: near the bottom there is an irregular layer of limestone from 1 to 2 feet thick,	25	0
White crystalline limestone, with a few dark corrugated bands of gneiss,	12	0
Dark-gray gneiss, consisting of black hornblende, black mica, and white feldspar and quartz,	25	0
Total,	1351	0

In this section the gneiss preponderates over the limestone. None of the calcareous beds are of great thickness; but a little higher in the series, on Calabogie Lake, on the fourteenth lot of the first concession of Blythefield, a bed of white crystalline limestone upwards of 100 feet thick is displayed, with syenitic gneiss above, and a very black mass of highly crystalline hornblende rock below, the upper portion of which consists in part of very black slate rendered fissile by the presence of yellow mica between the layers. This mass of hornblende, which in some parts has much the aspect of a fine greenstone, and in others has a small quantity of quartz in it, may be upwards of 200 feet thick, and it is again underlaid by limestone. In other instances the amount of the calcareous rock greatly surpasses the gneiss: at the Chenaux, for example, a succession of white crystalline limestone strata, on the left bank of the Ottawa near the boundary line between Clarendon and Litchfield, presents a breadth of 600 yards, with but a moderate interposition of the harder rock. The dip is N. N. E., at an inclination of ten to twenty degrees, giving a thickness of 400 feet and upwards, of which not much more than twenty per cent consists of gneiss; and it is probable the section is but part of a larger

amount of the same description of rocks interstratified with one another much in the same proportion. In the same vicinity, on the road between the Chenaux House and McDonald's Church, on the twenty-fourth lot of the first concession of Clarendon, there is a considerable display of similar rocks, the breadth of which, unless there be sharp undetected folds, would give a thickness of 4000 feet, and about two-thirds consist of crystalline limestone.

There is a great development of it also in the vicinity of the Falls of the Calumet; but in the mineral condition of this, there is a peculiarity not displayed in the section at the High Falls. It consists in the presence of serpentine, which is disseminated in the calcareous beds; this is of various shades, from dark bottle green to light oil green, but it is frequently of a rosin colour, and a dull buff white, and sometimes inclined to the colour of opal or a milk blue. It appears to occur generally in sub-globular forms, having no distinct separation from the surrounding calcareous mass, and gradually passing towards the centre into enclosed substances differing from the exterior; often the interior is a hard close-grained and intimate mechanical mixture of pure white hornblende and calc-spar, with a specific gravity of about 3.0, while the exterior calcareous mass is coarse-grained. Mica is often present in the serpentine with iron pyrites, but in such cases these minerals do not appear to be confined to it, but to extend to the exterior limestone. Other peculiarities exist in the calcareous rock of the vicinity: at the ferry-landing on the right bank of the river near the foot of the Falls, in a set of large-grained crystalline limestone beds, barred with gray in the direction of the layers, and holding graphite and gold-colored mica, several well marked and rather regular spheres of still larger grain are loosely enclosed, but they are not surrounded by serpentine; on the road approaching the head of the timber slide there is seen some very beautiful sky blue calcareous spar in very large cleaveable forms, in which crystals of quartz and of phosphate of lime are imbedded; but whether this spar belongs to the strata or to a vein could not be determined. Lilac and pinkish scapolite occur in the limestone beds of the Calumet. Pyroxene and tremolite also are present; but of this last mentioned mineral considerable quantities exist in many places. The largest display was observed in the Township of McNab, on the road between White Lake and the Madawaska, where a bed of several

feet thick seemed to be composed almost entirely of it. The mineral there occurs in long acicular or prismatic crystals often radiating, the interstices among which are filled with the carbonate of lime.

Both of the metamorphic groups which have been described are frequently traversed by important dykes and veins. In the range of my examination, however, those of the upper group were the better observed; and while they seemed to present characteristics of a more marked description, there was a greater diversity in their mineral quality than in that of the lower. One of the qualities is granitic, but the quantity of mica is generally very sparing, and very frequently wholly absent. Of the remaining constituents the feldspar is red, and the quartz either opaque white, or colourless and transparent; and the arrangement of these minerals is sometimes of that peculiar kind which is termed graphic, a section of the rock in a particular direction exhibiting the quartz disposed in forms resembling the characters of Hebrew writing. As an example of this, a great granitic dyke comes upon the Allumettes Lake at Montgomery's Clearing, about four miles above Sydenham. It is a large grained rock consisting of red feldspar, white quartz, with black or bronze-colored mica. The crystals of mica are large, but by no means abundant, and some parts of the dyke bear the graphic character. The breadth of the dyke is fifty to one hundred feet, and its course is N. 70° W. and S. 70° E., magnetic, being transverse to the strike of the metamorphic strata which it breaks through. In the Roche-Fendue Channel of the Ottawa, in the Township of Ross, at the mouth of a deep recess, a dyke is seen composed of red feldspar and white quartz, with a few crystals of tourmaline or schorl in parts of it, but no mica was observed. Its breadth is nine feet, and it stands up like a wall above the gneiss, which it cuts in the direction of the strike, its course being N. 20° E. and S. 20° W., with its underlie to the eastward.

In the lower part of the Madawaska River several dykes of a porphyritic character are conspicuously displayed. They consist of greenish white compact feldspar with crystals of transparent quartz, and are generally transverse to the calcareous and gneissoid strata which they cut. One of them stands up boldly from the metamorphic strata at the foot of an island below the junction of the Wabo Lake tributary, and being in a part of the river's bed which is flooded at high water, and is then swept by a violent rapid, while it is dry at low water, the dyke is washed quite free from any covering

of gravel, and exibits a clean cast of all the irregularaties of the crack from which it protrudes. It runs transverse to the strata some short distance up the stream, and then suddenly splits into three branches, which recede from and approach one another and occasionally touch again. Looking up the stream, two of the branches occupy the channel to the right of the Island which has been mentioned, while the other runs up on the left side of it, and the limestone strata through which they cut, have been deeply worn away from the whole three.

An instance of a dyke of a very different mineral character from any of the preceding, occurs at the Ragged Chute, near the High Falls, on the Madawaska: the breadth of it is not less than 150 feet; its course is about N. E. and S. W., which is transverse to the stratification, and it appears to be chiefly composed of pyroxene, of a light greenish-white colour, associated with calcareous spar, green hornblende, mica, quartz, feldspar, and black tourmaline. The pyroxene constitutes the great body of the dyke. The crystals are confusedly aggregated; some of them appear to radiate, and smooth faces six inches in breadth, may be followed in the direction of the cleavage, to a length of fifteen inches or two feet.

At the mouth of the Mississippi Channel, at the Chats, in the fragments of a rock which were probably derived from a vein or dyke in the vicinity, though I could not discover its position, brown and black tourmaline, in radiating triangular prisms, occurred in abundance, imbedded in translucent quartz, associated with carbonate of lime and mica; small crystals of the brown tourmaline were found imbedded in the white crystalline limestone, immediately near; and large crystals of the black were observed, in combination with quartz and feldspar, in a vein at the Horse Shoe Fall of the same neighbourhood. Large well defined crystals of black tourmaline, imbedded in quartz, associated with calcareous spar, occur also in a vein not far from Mr. Hayworth's lot, in the seventh concession of Hull.

In the vicinity of Grenville, a vein occurs in micaceo-plumbaginous limestone composed of feldspar, tabular spar, pyroxene, sphene, and quartz, with small quantities of serpentine and mica. It carries a workable quantity of plumbago. In Fitzroy, and in the seigniory of the Petite Nation, galena occurs in veins in this formation, associated with calcareous spar; and yellow copper ore is found, in the same

relation, in the vicinity of Beverly in Bastard, near the separation of the waters of the St. Lawrence and the Ottawa, while traces of it, under similar circumstances, were met with in McNab.

From the vicinity of Quebec, the formation to which the metamorphic limestone belongs, ranges along the St. Lawrence, at a distance from its margin varying from ten to twenty miles. Reaching the seigniory of Argenteuil, on the Rivière du Nord, it makes a turn towards the valley of the Ottawa, and as we ascend this river, the first of its calcareous beds which meets us on its bank, is seen above Grenville, while the last occurs about half-way up the Deep River, between Fort William and the Joachim Falls, and again at the Portage de Talon, on the Mattawa. The formation must therefore be obliquely crossed by the river between those points, or rather between the Deep River and Hull. This is in accordance with its general strike, which appears to be about east and west; and the parallelism of the Mattawa, and as a continuation the Ottawa to the Joachim Falls, with the Petewawe, the Bonnechère, and that part of the Madawaska west of the Bathurst District, shewing the probable prolongation of the formation in that direction, and exhibiting the bearing of the geographical undulatious resulting from the harder and softer qualities of its lithological composition, is in harmony with the stratigraphical features that present themselves from Hull to Chatham, on the north bank of the main stream. The chief tributaries on this part, however, run across the stratification, and present as striking a parallelism in that direction, particularly in the case of the Gattineau and the Lièvre, on both of which the formation is known as far up as eighty miles. As may be inferred, the principal ranges of hills are composed of the gneiss of the formation, and particularly the red feldspatic part of it, while the calcareous strata are seen in lower elevations or in the valleys. The highest of these hills ascended by me was in the vicinity of Mr. Hayworth's farm, in Hull. The house of this gentleman stands on comparatively flat land, extending southwardly to the margin of the Ottawa, a distance of several miles. Immediately behind it, rises a hill, composed of highly inclined south-dipping alternate layers of grey gneiss and white crystalline limestone, repeated for the breadth of a mile to the dividing line between the seventh and eighth concessions near Loon Lake which lies in a deep valley, running with the concession line just E. and W., and sepa-

rating this limestone range from one composed of red feldspathic rock, the highest peak of which was found by barometrical measurement to be 955 feet above the Chaudière Lake, or 1136 feet over the level of the sea.

Fossiliferous Rocks of the Southern Trough.

On the south side of the great anticlinal axis, the rocks on the Ottawa, succeeding the two metamorphic groups which have been described, belong to those at the base of the American fossiliferous series of formations. They rest unconformably on the metamorphic rocks, the contortions and dykes of which they were sometimes seen to cover in a quiet and nearly horizontal attitude, while they were nowhere observed to be tilted up to a very high angle. The lowest is a sandstone of a partially calcareous character, passing by a diminution of the arenaceous mixture into the next, which is a limestone becoming bituminous at the top; and the third is a bituminous shale. The succession and fossils which the upper two of these formations present, leave no room to doubt that they are the Utica slates and Trenton limestone of New York; and the only difficulty in the comparison of the lowest, arising from the want of fossils, and the inadequacy of mere mineral condition to prove the identity of formations, is to determine whether after leaving the lower part of the river, it should be considered the equivalent of the calciferous sand-rock merely, or be taken to include also occasionally a part of the subjacent Potsdam sandstone. It appears to me doubtful, that any great mass of rock so completely silicious as the sandstone of Potsdam is described to be, occurs on the Ottawa much higher up than its mouth; but by whatever equivalents in the New York series, the Canadian inferior arenaceous strata are represented, it will be convenient for the present to class them all together.

In the valley of the Ottawa the whole three formations under description, from the base of the arenaceous deposit to the summit of the bituminous, do not, it is probable, afford a greater total thickness than 1000 feet. To the northward it has not been ascertained that they reach beyond the immediate banks of the river; but in a westward direction the upper formation is known to extend to the vicinity of Bytown, while the middle and lower ones prolonged from the main body of the area to which they belong, in finger-shaped troughs, and in patches disjoined by considerable intervals,

were found to attain the Mattawa, a distance of 150 miles farther. In no instance was the limestone, which is well stored with fossils, found to rest on the metamorphic strata without the intervention of the calciferous sandstone, in which, for the present, is included only that portion of the series that is nearly destitute of organic remains; and the lithological character of the whole three formations, excluding the more silicious part at the very base, seems to be maintained with considerable uniformity throughout the district.

Commencing at the junction of the St. Lawrence and Ottawa, and pursuing the latter against the stream, sandstones show themselves composing the Cascade Island, Isle Perrot, and various points on the right bank of the river in the Seigniory of Vaudreuil, from the Cascades to the Pointe du Grand Detroit, as well as the upper extremity of the Island of Montreal at Ste. Anne, and one or two points on the left bank of the river below the Indian village on the Lake of Two Mountains. These sandstones appear to be the continuation of strata which come across the County of Beauharnois from the vicinity of Chateauguay, in the State of New York, being seated on the crown of the arch which causes the strike of the formation to sweep round from the valley of the St. Lawrence to the the valley of Champlain. There is no doubt therefore they are the Potsdam sandstones. At the localities indicated on the Ottawa, they are generally of a light colour. They are sometimes coarse and frequently fine grained. At the Pointe du Grand Detroit, for example, the beds which are nearly horizontal, have a general yellowish hue in fresh fractures, though exteriorly they have partial stains of red. Some of them are a coarse mixture of translucent quartz and opaque white feldspar, holding many pebbles of quartz, not a few of which would weigh over three ounces. About a mile above this, on the land of Mr. Cameron, an exposure of the strata exhibits a fine grain with a very siliceous aspect, and a whitish yellow colour occasionally merging into a pure white. The beds vary in thickness from two inches to three and four feet, and splitting into regular parallelepipeds would yield good building stone. They often display ripple mark on their surfaces. Their dip is south at an angle of about five degrees, and they spread over a breadth of about two acres inland. Some of the beds of this, as of the other localities of Vaudreuil and Isle Perrot, appear to be of a quality fit for the purpose of glass making.

On the north side of the river the formation crops out and leans against the south flank of Mont Calvaire, which consists of a gneissoid portion of the subjacent metamorphic rocks, and constitutes a dome in the geological ridge running from their mountain masses in the State of New York, to those on the Rivière du Nord, where the elbow occurs carrying their strike from the direction of the St. Lawrence to that of the Ottawa. If there should be no dislocation connected with this ridge the sandstone formation will probably altogether encircle the gneiss related to Mont Calvaire; but the fact has not yet been ascertained.

The formation would also be expected to lean against the metamorphic hills, along the foot of which the Rivière du Nord flows from the Seigniory of Rivière du Chêne to that of Argenteuil. In apparent agreement with this, a band of sandstone, running parallel with the stream, and not far from its south bank, is seen at various points in the whole distance. Its strata produce good building stones, and some of them are used as household fire-stones, but I have been informed none of them are capable of resisting strong heat for a long time when used in the backs of fire-places. From a quarry near Mr. Montigny's house, on the Rivière du Ch[illegible]e road, stones from this band were procured for building St. Jérôme Church; and about a mile and a half to the westward, a little before reaching the division line between the County of Terrebonne and that of the Lake of Two Mountains, an escarpment of the rock crosses the road, keeping on the south side of it to the westward, with another parallel ridge about four acres south. The stone is here whitish in colour with many small yellow specks. It is free and fine grained, and the thickness of the beds varies from a few inches to three feet and upwards. But the best exhibition of it on the run, is in an escarpment which occurs about 600 yards to the south of the second bridge above La Chute Mills. The escarpment 150 feet in height presents two steps, and the sandstone is seen in the lower and part of the higher, where it is capped by forty feet of limestone of an arenaceous quality. The dip is south at an angle of six degrees, and the thickness of the sandstone would equal about 300 feet. In the strike of this sandstone about twelve miles to the westward on the St. Lawrence, and about two miles below Grenville, a considerable mass of the same quality is seen. But this has an arecaceo-calcareous deposit both below and above it, and induces the opinion that

the band all the way from the Seigniory of Rivière du Chêne belongs to the calciferous rather than the Potsdam sandstone. In the Grenville section the deposits in ascending succession, are first a set of beds of a shaly calcareo-arenaceous quality, of various shades of gray to black: abundance of fucoids are found in some of the layers, and toward the top the deposit assumes a less shaly character, and is not so readily crumbled by the action of the weather. Next follow the sandstones which have been mentioned. They have many small cylindrical cavities, suggesting the probability that they were once occupied by organic forms which have been dissolved. To these succeed gray yellow-weathering beds with a subconchoidal fracture. Many of them have the aspect of cement-stone, and some of them have, it is said, on trial, been found fit for hydraulic purposes. Either partially interstratified with these or succeeding them, beds occur with much the same aspect, but probably more argillaceous, which are marked by abundant geodes of opaque white calcareous spar. The general dip of these various deposits is so moderate that it is difficult to estimate their exact thickness. Those above the sandstones occupy the north bank of the Ottawa all the way from the Grenville Canal to Carillon, including the vicinity of Isle aux Chats on the Rivière du Nord. They appear occasionally quite flat, and even sometimes shew slight undulations, which, producing gentle slopes northward, serve to keep them on the surface for a direct breadth of about four miles across the strata. The first good fossiliferous limestone met with, which may be considered an ascending continuation of the previous section, is found on the south side of the Ottawa, on the land of Mr. Ross, on the twenty-seventh or twenty-eighth lot, within 400 yards of the rear of the first concession of East Hawkesbury. It is of a gray colour, the beds are from two to three feet thick, and cutting into large blocks, suit well for building-stone and for lime burning.

Good fossiliferous limestone is also known about eight miles south of Ross's quarry, at Mr. McDonald's Mills, on the Rivière à la Graisse in the middle of the fifteenth lot of the seventh concession of the same township. It is gray in colour and presents beds of one to two and even four feet thick; and would yield excellent stone for burning or for building. The dip of the strata is about S. 10° W.<4°, and the contained fossils consist of trilobites, univalve and bivalve shells, orthoceratites, encrinites and corals. Lower down

on the river at the French Rapids, about two miles east of the boundary line between the Upper and Lower Provinces, a set of calcareous strata, exhibiting about forty feet of thickness, occur: they are very arenaceous; their colour is gray, weathering to yellow exteriorly, and they exhibit a sub-conchoidal fracture. Some of the beds are separated by black shale which may be partially bituminous, and contain geodes of calcareous spar, but no fossils. These beds would run in behind Mr. McDonald's quarry a considerable distance; and still further down the stream at the Village of Rigaud, not far from its mouth, strata appear which would be still deeper in the section. They consist of very arenaceous limestones underlaid by light-gray even bedded and fine grained sandstones. These beds dip about S. 5° E.$<$4°, the slope being towards Rigaud Mountain, which rises at no great distance. On the Rivière à la Graisse, the intervals between the points mentioned as showing the quality of the strata, and indeed the chief part of the country around, which presents a very horizontal surface, with the exception of Rigaud Mountain, are covered by tertiary clays and sands, and it is difficult to meet with sections. One, however, is found, on the Rivière Raquette, where it flows across the gore between the Seigniories of Rigaud and Vaudreuil. The strata consist of gray yellowish-weathering arenaceous limestones, of which the dip is about S. 55° W.$<$3°. Their strike, combined with that of the rocks on the Graisse, would about carry them to a junction with the arenaceous limestones of the French Rapid, and they would thus appear to run under Rigaud Mountain. This Mountain is composed of syenitic trap-porphyry, the general quality of the rock, at least on the two northern points, being a dark-gray mixture of fine grained hornblende and quartz, with large crystals of light reddish-yellow feldspar; and from the attitude of the strata in its vicinity, it would seem to be an overflow.

It is not improbable that the Rigaud sandstone may be a continuation of that of Vaudreuil, and appertain to the Potsdam formation. But how the section of the Rivière à la Graisse is to be brought into harmony with that of Grenville, of which it is no doubt a partial repetition, I am not yet in possession of facts enough to explain. The supposition of a fault running from the vicinity of Plattsburgh, across the extremity of the upper end of the Island of Montreal, and up the Ottawa, and producing a downthrow on the northeast side would, perhaps, solve the difficulty.

About a mile to the northward of the fucoidal layers, seen near the head of the Grenville Canal, after an interval in which no strata are visible, the metamorphic rocks come upon the waters of the Ottawa, and run along its northern bank across the Township of Grenville and the seigniory of the Petite Nation, leaving no room for the overlying formations, which in this part are in the river or on the south side. Across the succeeding Townships of Lochaber and Buckingham, the metamorphic strata do not quite attain the margin; but they are seen, within half a mile of it, where the road traverses the twelfth lot of the third concession of the former, and again in the latter, on the Basin of the Lièvre, about two miles up from its mouth. A narrow strip bordering the river is thus left, and it is occupied by the arenaceous limestone, whose strata are seen along the water's edge in the upper side of Buckingham, and above and below the mouth of the Blanche in Lochaber; as well as upon the road in the first lot of the fourth concession of the township where the rock is geodiferous; and on the upper extremity of Papineau Island, below Presqu'isle.

The country on the south side of the Ottawa, opposite this fifty mile stretch of the river, presents but few exposures of the strata. These are concealed by blue tertiary clays, sometimes overlaid by sand, which spread far and wide into the interior, reaching quite across to the St. Lawrence, with a uniform surface, nearly horizontal, still chiefly covered by forest. The area is drained by the South Petite Nation River, which takes its source within about a mile and a half of the St. Lawrence, in the Townships of Edwardsburgh and Matilda, and after meandering through a length of ninety miles, is about ninety yards wide at its junction with the Ottawa, in Plantagenet. The water-shed from which it flows produces so little of an inclined plane either way, that while its height is about 140 feet over the waters of the river to which it is tributary, it has been ascertained by a survey of Mr. Duncan McDonald of Greenfield and Mr. McNaughtan, that it is not more than thirty feet over those of the St. Lawrence above the Gallops Rapids, the level of which is attained by the Petite Nation, before it has reached to a point nine miles distant from its source. Lake Ontario is stated to be about nine feet over the St. Lawrence at the Gallops; so that any stoppage in the river below the Gallops which would raise the surface of Ontario beyond twenty-one feet over its present level

would send a broad sheet of its waters, with a violent current, down the valley of the Petite Nation, an accident which, judging from the apparently undisturbed condition of its clay banks, has not happened since the country rose from beneath a tertiary ocean. Limestone strata, I am informed, exist in a horizontal attitude at the source of the stream; and they are found exposed at moderate inclinations or free from any in a few rapids, usually affording good mill sites, which succeed one another at considerable intervals down to the mouth; while these intervals present long deep winding navigable ponds, cut through the tertiary clays, which constitute their banks to the height of ten, twenty, and sometimes even thirty feet.

The first exposure of the strata, ascending, occurs about three miles above the mouth, at Jessopp's Falls, where the stream has cut its way through limestone rock, rising to the height of twenty feet on its banks, and is let down three feet over a crossing ledge. The beds, dipping about south at an angle of five degrees, are fossiliferous. Their colour is grey, their thickness six inches to three feet; they would yield fair building stones, and burnt in a kiln close by, they produce good lime. At Hatfield Mills, about four miles higher on the stream, limestone strata are again exposed. They occupy twenty feet in the bank, and appear to be nearly flat. The slight inclination they possess is to the south, and they are said to pave the stream, for nearly three miles up, but the chief part of this distance is now covered over by the mill pond. Fossiliferous limestone, displaying orthoceratites, and fit for building or burning, is again seen on the river at the High Falls, in the sixth concession of Cambridge. The general dip is here northward. Approaching the fall from above, the water runs on the surface of a nearly horizontal bed, which suddenly bends to an inclination of about four degrees; and down the face of this, it rushes without a break for about 300 yards, while about a quarter of a mile below, another flat bed occurs, forming another shallow rapid. Solid calcareous strata again occur at Chrysler's Mills, in the tenth concession of Finch, where there is an exposure of about ten feet in depth. The beds are so flat that it is difficult to say whether they have any dip at all. They vary in thickness from six inches to two and three feet. Some of them are gray and others are black. The latter are sufficiently hard to take a good polish, and might occasionally yield fair slabs

of black marble. Other exposures of limestone are said to exist higher on the stream but they have not come within my observation.

The facts ascertained on the Petite Nation are of too meagre a description to afford the means of determining the precise relations that the various strata observed bear to one another as parts of the calcareous deposit to which they belong; or how near the highest of them approach the bituminous shales overlying them all, no evidence of the presence of which was any where obtained. But proceeding further up the Ottawa sections of a more satisfactory kind are met with, and at Bytown the development of the formations is more full than anywhere else on the river.

From the Township of Buckingham the upward course of the Ottawa diverges from the strike of the metamorphic rocks, and turning southwestward, attains its greatest distance at the head of the Rapides des Chênes; thence veering northwestward, it comes upon them again in the fifth concession of Eardley, rather less than half way up the Chaudière Lake. The most southerly point these rocks attain in their line across the Township of Hull is about the rear of the tenth to the fourteenth lots of the fifth concession, leaving about five miles between them and the extreme front. Above the Lièvre, the south bank of the Ottawa becomes bolder than lower down; it assumes a height of about 200 feet, and among the precipices connected with the Chaudière Falls, both sides display important vertical sections, serving to illustrate the deposits overlying the metamorphic formations.

The arenaceous limestones of the lower of these, interstratified with some more silicious layers, but still of a calciferous quality, are seen at the margin on both sides of the stream in the vicinity of Kettle Island, but a fault occurring between that point and the Rideau Falls lets down the strata on the west side,—how much is not ascertained,—and the more calcareous and fossiliferous rocks that succeed, usurp the whole cliff round to the ravine occupied by the Canal and to the Barrack Hill beyond. The face of this hill exhibits a vertical section of 182 feet of the formation: most of the beds in it are well adapted for lime burning, and many of them have afforded material for building, having been used in the construction of the locks of the Canal. Several of the beds, however, appear to be of a nodular description, with short partial and irregular thin patchy partings of shale, which, yielding readily to the weather,

much disfigure smoothly dressed blocks after they have been exposed for some time; some good material, however, is seen in the piers of the Suspension Bridge. The formation does not display its whole thickness in the Barrack Hill Cliff, for it occupies some breadth on both sides of the river, and extends at right angles to the strike of the measures, from the sixth lot of the fifth concession of Hull to St. Louis Dam, constructed across Dow's Swamp in the rear of the thirty-ninth and fortieth lots of the first concession of Nepean, Ottawa front, where it meets the overlying bituminous shales. The general dip of the strata appears to be about S. E. in direction, but the inclination is very small. Taking into account some few irregularities that occur, it probably does not exceed two or at most three degrees, which would give to the whole deposit a volume of about 300, and certainly not exceeding 400 feet. On lots thirty-four and thirty-five of the broken concession Ottawa front, there are some strata which present the aspect of stone fit for water-lime. One of them in particular yields the material which has been manufactured into cement by Messrs. Wright of Hull. The bed is ash grey in colour when fresh broken, but it weathers to a dull yellow; its fracture is sub-conchoidal with a scaly surface, and a blow from a hammer will bruise the stone, even when it does not effect a fracture, to the depth of nearly half an inch. The dip of the strata at the spot is very moderate, probably not two degrees: the strike carries the bed into the land southwesterly; but in the other direction it runs into the water, and probably keeps in the river a considerable distance. Though the strata have much the appearance of the arenaceous beds below the good fossiliferous limestone, their position in regard to certain beds immediately near holding *Isotelus gigas*, *Leptena deltoidea* and other fossils, induces the suspicion they may belong to the higher formation, though I have not been able to detect them in the cliffs between the Barrack Hill and the River Rideau, which abound in the fossils characteristic of the Trenton limestone.

The bituminous shales, which rest on the previous formation, were met with in two localities in the neighbourhood of Bytown. One of these, as already indicated, was at the extremity of St. Louis Dam, and the other is about two miles up the River Rideau, near the eastern extremity of lots C. and D. concession D. of Nepean. There is evidently a dislocation at the former spot, being a downthrow to the southwestward, bringing the shales abruptly

against the limestones of the lower deposit; but as this does not appear to effect the least partial disturbance of the general dip at the point of junction, it is probably of little value; and the two localities in regard to one another being much in the direction of the general strike of the neighbouring strata, a line between the points may be considered to indicate the outcrop of the deposit. As in other parts of the Province where this deposit has been met with, the shales are black in colour, giving a brownish streak. They are thinly laminated and brittle, and the amount of bitumen in them is usually sufficient to yield a flame when they are placed on a fire. This property has in this instance as in others produced delusive expectations of coal in the district, the mineral condition of the deposit having been compared to that of similar shales which will sometimes constitute the roof of a workable coal seam, or be found interstratified with true coal measures. But mere black bituminous shales are not an indication of coal measures, any more than blue argillaceous shales, or sandstones, or limestones, which are all occasionally interstratified with such measures, and must, almost inevitably, with mineral coal, compose the mass of them, for shales, sandstones, and limestones constitute nearly all the unaltered sedimentary rocks of the globe. The colour and mineral quality of rocks do not afford the means of identification in localities distant one from another, without a reference to a traced-out succession or organic contents; and the remark is peculiarly applicable in this part of America, where no less than four formations are strongly marked by the presence of black bituminous shales. The highest is the coal formation; the next is one about 3,000 feet below it; the third is 3,000 feet still lower; and the fourth further down still, being the next in succession. The black shales of Bytown are contemporaneous with the last-mentioned shales, and as indicative of their age they are marked by *Triarthus Beckii* and other fossils which characterize the Utica slates of New York. There is not a sufficient exposure at Bytown to give the means of determining the thickness of the deposit there.

Above Bytown the lower and middle unaltered sedimentary formations run out into long parallel ramifications, separated from one another by narrow metamorphic ridges. The most north-easterly of them runs from Nepean on one side of Lake Chaudière, Hull and Eardley on the other, through March and Torbolton, occu-

pying a breadth of about three or four miles on the west side of the lake, and is prolonged through the front of Onslow, Bristol, Clarendon and Litchfield, up to the road leading from Portage Dufort to the Calumet Falls, in detached patches, lying on the strip of flat surface which occupies the left bank of the Lac des Chats. This is separated from the second by a metamorphic ridge of between three and six miles wide, extending from the Chats to the southeast corner of March, where it comes to a point. Carried out from the limestone, which forms the subsoil of Huntley, the second occupies a breadth of seven miles on the Mississippi, from within two miles of Hubble's Falls to about three miles beyond the village of Packenham; and covering part of Fitzroy and Packenham, extends to MacNab, where it comes out upon the Chats Lake above the mouth of the Dochart. The axis of the succeeding divisional ridge runs from MacNab, at the exit of White Lake, to about the mouth of the Indian River, near Packenham, where, with an average breadth of about three or four miles, it diminishes to a point. The third calcareous branch, wholly comprehended within the Township of Packenham, with a base extending from Joe's Creek, a tributary of Indian River, to the mouth of the latter, converges to a point before reaching White Lake. There is litttle doubt other ramifications exist to the southwestward, but my examinations did not reach farther in that direction. To have extended my inspection in that direction at the time would have carried me too far from the main line of exploration, and I was induced to leave it for another occasion, through the additional circumstance that I am aware the district has already been carefully examined by Dr. Wilson, of Perth, (absent from Canada at the period of my visit,) whose zeal in the cause of Canadian mineralogy and geology is known beyond the precincts of the Province, and through whose promised aid in the part with which he is familiar it is my hope to abridge the work of investigation at a future opportunity.

In the first, or Chaudière branch, or trough, the upper formation occupies chiefly the high ground, which rises to 200 or 300 feet over Lake Chaudière, between it and Rivière Constance, in March and Torbolton, and again in the northwestern part of Torbolton, facing Onslow; while the lower is seen in the sandstones and arenaceous limestones occupying the margin of the lake on both sides in the lower half, on the right bank, and occasionally on the left in the

upper half, and on both sides at the upper end. Approaching the Chats, Whetstone Point affords a thirty feet section of a very arenaceous part of the deposit. It is composed of alternating beds of free and fine-grained sandstone, of a whitish colour, and of fine silicious conglomerate, with white translucent quartz grains not larger than swan shot, both of which are divided by bands of green shale, with some fucoidal remains in them. The fine-grained beds yield very good whetstones, and they are used for such by the Indians. These arenaceous beds follow the bank up the lake, and are again met with on the Carp River, at Mr. Sheriff's mills, where they have been used for building the foundation of the mill; and though the stone appears of rather a shaly character, I was informed it had stood the test of frost for eight years. The quality is much deteriorated by short thin green flakes, which occupy small patches in the direction of the beds. Inferior grindstones have been made from some of the beds. At this place the sandstone is underlaid by beds of arenaceous limestone, of a gray or bluish gray, weathering to yellow, some of which have the aspect of water-lime, and would deserve a trial for such, should any be required for hydraulic purposes for works in the vicinity.

In the second, or Packenham trough, the best exposure of the strata met with was in the vicinity of Mr. Dickson's mills. The measures have there a general very slight dip to the eastward of north, but to the eye they appear nearly flat, and between the summit of the quarry, which is worked in the face of the hill on the south side of the stream, and the beds at the water's edge below the mills there is a thickness of about seventy feet of fossiliferous limestone. The general colour is gray, but at the bottom some beds of a peculiar dark snuff brown are met with, which, taking a good polish, have been worked for marble. Some of these lower strata, particularly one in the bed of the river, and under the carding mill near the bridge, are highly bituminous. The bitumen is probably derived from the organic remains, which, consisting of trilobites and univalve and bivalve shells in the upper beds, present a great preponderance of corals and orthoceratites in the lower, with the latter of which the very bituminous bed is very abundantly supplied. It often happens that on fracturing the orthoceratites they exhibit internal druses in the chambers of the fossil, from which a yellow, and sometimes black, bituminous fluid issues; and as some of the specimens are

large, exceeding eighteen inches and two feet in length, the quantity of the liquid is often copious. Above the mill, the arenaceous limestones are brought in by an upthrow fault, running probably with the strike of the measures, and yielding a fine spring in a dingle behind the church. The first beds exhibit a very singular rough surface, being raised into warts or hummocks, much chopped exteriorly by short cuts or cracks. They are very numerous; some of them are three feet in diameter, and they appear to result from some peculiarity in the structure of the rock, which, without fossils, is marked by geodes of calcareous spar. To the southwest other arenaceous beds rise from beneath, and approaching the Indian River they present in the middle of the ninth lot of the tenth concession of Packenham a more silicious character, giving sandstones of a general dull white colour in fresh fractures, with brownish streaks and uncertain brownish spots; a red stain invests some of the cracks. The rock is thick bedded, and in one place shews a face of ten feet high, while the dip is N. 40° E. < 4°. The same sort of rock is again seen in the middle of the eighth lot of the tenth concession, where it has a smooth *moutonné* surface, displaying parallel grooves running in a N. and S. direction.

Still further up the general valley of the Ottawa than the extremities of the finger-shaped troughs which protrude from the grand area to which the formations under description belong, they are continued in considerable outlying patches. One of these occupies a breadth of twenty miles, extending from the mouth of the Fort Coulonges River to within a short distance of Lake Doré, and a length of twenty-two miles from the upper part of Calumet Island to the head of that of Allumettes, covering a small part of Mansfield, nearly all Westmeath, a fragment of Ross, a corner of Bromley, the whole of Stafford and Pembroke, the breadth of a mile adjoining these on the western side of the Bathurst District line, and all but the upper extremity of Allumettes Island. This outlier is cut nearly into two parts by a metamorphic ridge, on the east side of Muskrat Lake and River, which has a parallel bearing with the ridge lower down. The second outlier is about sixteen miles long from the vicinity of the Third Chute of the Bonnechère River to a point half way between Mud Lake and Golden Lake, and eight miles broad from the south-east flowing part of Snake River, below Lake Doré, to a point less than half way between the Bonnechère and Clear

Lake. It is pierced by a short ridge which rises parallel with the Bonnechère opposite the mouth of Hurd's Creek (issuing from Clear Lake) and Jessop's farm; and it is separated by another narrow ridge from the former outlier. In a southeastern continuation of this patch a flat surface prevails down Constance Brook, which falls into Calabogie Lake; and on the south side of this lake there is a small outlying patch of the lower deposit, extending about a couple of miles in the direction of the upper part of White Lake. All the dividing metamorphic ridges mentioned run parallel with one another. A third outlier is found still further up the valley, at a distance of seventy miles, just below the junction of the Mattawa and Ottawa. Its strata were seen in two places above the Levier Portage, with an interval of twelve miles between them; it lies on the south side of the river.

On the Fort Colonge side of the Allumettes division of the first-mentioned outlier there appears to be less of the arenaceous deposit than in the opposite one. Indeed it is perhaps wanting altogether. The following is a descending section of the strata at the point at Romain's Clearing, on Lake Coulonges, about two miles above the Hudson Bay Company's Post. The dip of the beds is about S. 10° E. < 11° to 20°, and they rest unconformably on the metamorphic rock, which consists of the red variety of syenitic gneiss:—

	Feet.	*In.*
Gray limestone	23	0
Gray nodular limestone	50	0
Gray yellowish-weathering arenaceous limestone	27	0
Gray limestone, with corals, encrinites, and bivalve shells (*Leptena deltoidea*). There is a band of arenaceous limestone at the bottom	27	0
Gray partially nodular limestone, with corals	20	0
	147	0

At Pointe Sèche, on the same side of the lake, but nearer to Fort Coulonges, there is great abundance of organic remains, trilobites, univalve and bivalve shells, orthoceratites, encrinites, and corals, which appear to be in the run of the same beds as those of Romain's Point. They are all replaced by silex, with the exception of the trilobites, consisting of two genera, *Isotelus* and *Calymene*, not an individual specimen of which was in such a condition. The same fossils, generically and specifically, and in the same mineral condition, are found also above Romain's Point, at Pocket's Rapids, in the bed of the river. Many of them are recognized as belonging to the

Trenton limestone, but there are several which appear to be new even in genus. One orthoceras was met with five feet long, but it could not be removed from its bed.

A section on the other side of the Allumettes division of this outlier is exposed at Allumettes Falls. The highest visible part is on the Allumettes Island side of the Falls; it consists of

	Feet.	*In.*
Gray, yellow-weathering, arenaceous, and bituminous limestone.....	2	0
Gray calcareous shale, with fucoids.....	8	0

To this succeed the whitish coloured sandstones composing Morrison's Island, some of which have been used as grindstones. The thickness of the beds is uncertain, but the dip being but small, namely N. 45 E. < 1° to 2°, they may be stated at 20 or 30 feet. In continuation of these, is the section of Beckett's Island, where the dip seems to be about N. 25 E. < 6°; it is as follows:—

	Feet.	*In.*
Whitish sandstone in thin layers, of a grit which would be fit for grindstones in thicker beds.....	5	0
Whitish coarse-grained sandstone, or more frequently a conglomerate, with translucent white quartz pebbles, of various sizes up to half an inch in diameter. This bed holds a considerable number of a species of *Lingula*, which lies confusedly mixed up with the pebbles; very few of them are broken, and many of them have both valves together.....	6	0
Red and green shale, and perhaps some red sandstone—not fully seen.....	20	0
Gray limestone, weathering yellow. Some of the beds have a scaly sub-conchoidal fracture, and look like stone fit for water-lime. There is one bed in particular with this aspect, about the middle of the deposit, just below four inches of bituminous shale.....	30	0
Measures concealed by the water, probably similar in quality to the preceding.....	10	0
Coarse conglomerate, consisting of the ruins of the metamorphic rock beneath, in pebbles and angular fragments, cemented together by limestone. The pebbles and fragments consist of white quartz, reddish and greenish feldspathic gneiss, black micaceous rock, and some of a calcareous quality.....	4	0
	75	0

The rock supporting these beds is red syenitic gneiss. It is composed of red feldspar, sub-transparent colourless quartz, black mica, and black hornblende. The dip of the gneiss is S. 50° E. < 25°; and there follows the conglomerate bed an exposure of 300 yards across the strike, equal to 370 feet in thickness.

In the second, or Bonnechère outlier, the strata at the Third Chute consist of arenaceous limestone, apparently without fossils. Where the beds are exposed at the Chute the dip is N. 45 E. < 5°, but there is probably some irregularity in the direction, and the inclination is more than the average of the vicinity, for a little higher on the stream, but before reaching the Bathurst District line, the measures are so nearly flat that it is impossible to say which way the dip inclines. At this spot the rock, of which six to seven feet are exposed in the bank, is composed of red and green calcareo-arenaceous shales, with a bed of whitish sandstone on the top. They are no doubt equivalent to the red shales of the Allumettes Falls, and probably overlie the arenaceous limestone at the Third Chute. At the head of the Fourth Chute the beds dip S. 20° W. < 3°. They consist of fossiliferous limestone, and overlie the beds lower down. The fossils are similar to those at Packenham. Ledges of good limestone are met with at Jessop's Rapids, which occur in about mid length of the deposit. The strata are very fossiliferous, and the fossils so thoroughly resemble in every respect—genera, species, and mineral condition—such as have already been collected on the shore of the Bay of Quinté, in Canada West, and near St. Johns, on the Richelieu River, in Canada East, that specimens cannot be distinguished even after the attention has been drawn to the fact that they have been found in different localities. According to the New York nomenclature some of the genera are *Isotelus, Calymene, Orbicula, Strophomena, Orthis, Delthyris, Atrypa, Nuculites, Pleurotomaria, Trochus, Bellerophon, Orthoceras.*

The outlier which is on the south side of Calabogie Lake, in the valley as it were of the previously mentioned one, appears to consist, as far as examined, of arenaceous limestone, without fossils, and to belong to the lower deposit.

The strata of the remaining outlier were seen rather over two miles above the Levier Rapids. The beds, of which the aggregate may have amounted to seventy feet, were from a few inches to two feet thick; their colour was buff, and they would apparently yield good building stone, but are rather arenaceous for the best quality of lime. Fossils are scarce in them. Some remains of univalve and bivalve shells were too much worn to determine even their genera, but a peculiar coral, common at Pocket's Rapids, was met with. It resembles *Receptaculite de Neptune* of De Blainville.

In another locality, six miles below the Mattawa, the beds were gray, and contained encrinites.

Rocks of the Northern Trough.

The succession of rocks in ascending order, met with on the north side of the great anticlinal axis, after crossing sixty-three miles, (measuring on the Ottawa from the mouth of the Mattawa,) occupied by the unbroken uniformity of the lower metamorphic, or syenitic gneiss, formation, is as follows:—

1. Chloritic slates and conglomerates.
2. Greenish sandstones.
3. Fossiliferous limestones.

1. *Chloritic Slates and Conglomerates.*—The finer parts of this rock are of a dark gray, weathering to a dark green. They are hard, and of a uniform grain, being at the same time argillaceous and siliceous, and present the aspect of a compact slate. Some parts, not quite so fine in texture, are a hard dark-gray sandstone, weathering to a dingy olive-green. With both these qualities, as a matrix, the rock frequently exhibits the character of a compact conglomerate, holding pebbles and boulders (sometimes a foot in diameter) of the subjacent gneiss, from which they are chiefly derived, the boulders displaying red feldspar, translucent quartz, green hornblende, and black mica, arranged in parallel layers, which occupy a direction according to the attitude in which the boulders were accidentally enclosed. Some of the pebbles consist of a compact green feldspathic stone, shewing no crystallization, not so hard as most others, and giving a white streak; and occasionally thick beds are composed of these green pebbles, enclosed in a matrix of much the same quality. Sometimes the rock has the semblance of porphyry, appearing to contain opaque white crystals of feldspar; but these are more probably small angular fragments of that mineral. Where there is a cleavage, or jointed structure in the rock, the plains of division cut cleanly and smoothly through the pebbles of the conglomerate, without the slightest deflection; and these are so thoroughly and intimately united to the matrix, and the two are so assimilated in hardness, that the blow of a hammer never forces the pebble out of its socket, but sends a fracture through it and the matrix, as if they were of homogeneous quality. The effects of weather and friction also appear to wear both equally.

In the finer parts of the rock the bedding is sometimes indicated by thin differently coloured layers, closely cemented together, without the slightest tendency to cleavage in their direction, and the colours are of different shades of green, with sometimes the addition of reddish-brown or even red, and black, giving a very beautiful and regularly striped rock. Another form which the finer parts present, is that of a very close grained compact dark-gray mica slate, cleavable with great difficulty in the direction of indistinct lines, and exhibiting on the planes of division, which are not very even, a surface glimmering from the effect of very minute and closely adhering scales of mica. A transverse fracture shews thin interrupted whitish streaks, interlocking among one another, and arising from the presence of quartz. In no part where the rock came under my observation, was there a cleavage of that perfect kind which would render it fit for roofing slates. But a firm slab, of about one-third of an inch thick, presented to me by Mr. Severight, and obtained by him from Mr. Taylor, who, I was informed, procured it from the Montreal River, about five miles up from the mouth, makes me aware that it must have such a cleavage in some parts of its geographical distribution. What the thickness of the formation may be, has not been ascertained. At a dip of eight to nine degrees, it rises into hills of about 400 feet in height, and its volume is probably not less, and may be very much more, than 1,000 feet.

2. *Greenish Sandstones.*—The quality of this rock appears pretty uniform throughout its whole mass. It is in general of a pale sea-green colour, weathering to light-brown for a short distance, seldom over a quarter of an inch, from the surface; sometimes it is of an internal brownish-green, weathering to the pale sea-green on the exterior, and in a few instances it is of a light gray, with specks of green in it. It appears to be composed of quartz and feldspar, with an occasional flake of silvery mica. It is in general moderately fine-grained, but coarse-grained beds are now and then interstratified, which approach the character of a fine conglomerate, with some pebbles of white translucent quartz. It is a strong and solid rock, resisting well the general influences of weather, and in common it is thick bedded. The total amount, as determined by the height of hills which it composes in nearly horizontal layers, is between 400 and 500 feet.

3. *Fossiliferous Limestones.*—The lower part of this formation is in general of an arenaceous quality, very often a conglomerate, containing large pebbles, fragments, and frequently huge boulders of the sandstone beneath in a calcareous cement; while higher up it is a buff or light-gray limestone, weathering white. The beds vary in thickness from a few inches to two or three feet, and are in some parts interstratified with green calcareous shales; some of the harder beds abound in chert; many of them are very fossiliferous, and the organic remains are very frequently replaced by silica. The thickness exposed in any one section did not exceed 100 feet, but it is probable that the total amount of the formation is not under 300 feet, and may attain 500 feet. The character of the organic remains leads to the opinion that the rock is equivalent to the Niagara limestone of New York.

The facts that have as yet come within my observation in respect to these formations have not been sufficient to enable me to determine to my own satisfaction what their relations are in respect to conformability. That the limestones are unconformable with the slates appears almost certain, but it is not in my power to state with which the intermediate sandstones are conformable, if they are so with either, or whether they are unconformable with both; nor can I assert whether the slates are conformable with the gneiss.

Ascending Lake Temiscamang, the slates come in upon the gneiss about three miles below the mouths of the Montreal and Metabeechuan Rivers, on the west bank, and about three miles above them on the east; and they occupy both sides to within two and a half miles of the Hudson Bay Company's Post. In this distance they may have a direct breadth of about seven miles, in which they are affected by at least one undulation, and probably more, and constitute hills of 300 to 400 feet. As gathered from the map of Mr. D. Taylor's exploratory journey from Lake Huron to the Ottawa by Lakes Nipissing, Temagamang and Temiscamang, these slates in a westerly direction run forty miles in a line about S. 40° W., from the latter Lake to Bass Lake, on the Sturgeon River, which discharges into Lake Nipissing on the north side, and it appears probable they will come upon some part of the north shore of Lake Huron. On Lake Temiscamang they are followed by the sandstones, which cross the lake with a strike of N. 60° E., and dipping northward at a very small angle, after having been piled up into a range of

about the same elevation as the slate hills, they reach the Company's Post, where, nearly flat, they run under a narrow gravel hill, 130 feet in height; emerging beyond, they continue to a distance of about half a mile above the Post, and there become interrupted on both sides of the lake by a mass of syenite. This syenite does not possess the gneissoid arrangement of the rock lower down the river, but it appears to be nearly similar in other respects, being composed of reddish feldspar, white or colourless quartz, and a sparing quantity of green hornblende. The breadth of this syenitic band is pretty nearly three miles on both sides of the lake. On the west it is succeeded by the sandstones, which run along the coast for a distance of four miles, nearly in the strike of the measures, dipping towards the water at a small angle, and are followed by the slates, which come from behind them, and continue in a straight line for nine miles to the western bay at the head of the Lake, forming high perpendicular cliffs for part of the way, and rounded hills for the remainder. On the east side, the syenite gives place to the slates, which there present the porphyritic appearance already mentioned. The sandstones come upon them on the south side of the southern large island, and the mainland near, dipping a little to the west of north at an angle of three degrees; and both they and the slates, with their associated conglomerates, make their appearance at occasional points along the coast, wherever denuded of the overlying limestones, the basset edge of which thinly covers them, to the island at the entrance of the eastern or Moose River Bay. Beyond this, the sandstones, gently dipping south, are seen in a projecting point to the east of the island. The slates are met with at the mouth, and at the first, second, and third portages, of the Rivière des Quinze, or Moose River, and their associated conglomerates in the bay to west of the Blanche.

The limestones constitute the two large islands north of the Company's Post, the two smaller ones between them, the island already mentioned planted at the entrance of the eastern bay, and a very small one on the west coast, as well as the promontory which separates the east bay from the west. The strata lie in the form of a shallow trough, based sometimes on the sandstones and sometimes on the slates, occupying the breadth of the lake,—from five to six miles,—and extending from the south side of the southern great island to some unknown distance northward, being probably

either a projecting point or an outlier of some more extended calcareous area nearer Hudson's Bay.

Tertiary Deposits.

Along the whole valley of the Ottawa, clays, sands, gravels and boulders are met with in many parts. To point out the exact boundaries between those portions of these deposits which belong to the tertiary and those appertaining to the alluvial or recent era would require a greater number of facts than have yet been collected. Marine testacea of the post-pliocene period were found imbedded in the clays and sands, in various sections of the country, on the lower parts of the river. The deposits in which they occur, cover the whole valley of the south Petite Nation, and its tributaries; and were found in Templeton, Hull, Nepean, Packenham, and Fitzroy, to the mouths of the Mississippi and Madawaska. The highest positions in which they were met with were in a deposit of sand on the road running south from Hubble's Falls, on the Mississippi, in Fitzroy 330 feet over the level of the sea, and in another on the sixteenth lot of the fourth concession of Nepean, thirty to forty chains from the rear, where *Saxicava rugosa* occurs in gravel 410 feet above the sea. At the mouth of the Gattineau, near Bytown, not only marine shells have been obtained, but, in a nodule of indurated clay found in the deposit there, Mr. McNab, of the Crown Lands Office, some years ago, procured a perfect specimen (now in my possession) of *Mallotus villosus,* or common capeling, a small fish, which still frequents the shores of the Gulf of St. Lawrence in vast numbers.

Glacial Action.

Fresh water shell-marls occur in many places in the alluvial deposits of the Ottawa, and among the phenomena which come within the recent period, rounded and polished rock surfaces, bearing parallel groves and scratches are of not unfrequent occurrence. They were met with on the Gattineau, half way between Farmer's and Blasdell's Mills, where the direction of the scratches is about S. 36° E.; on Glen's Creek in Packenham, where they are about N. and S.; on the Allumettes Lake at Montgomery's Clearing, where they are S. 25° E. But on the shores of Lake Temiscamang they are so numerous and are combined with other circumstances of so marked a character, as to deserve particular notice. The lake has

already been described as long and narrow. Its banks are in general bold and rocky, rising into hills 200 to 400 and sometimes 500 feet above its surface, with the exception of the mouths of several transverse valleys occurring on the left bank, among the slates, sandstones, and limestones on the north side of the anticlinal axis. The general valley of the lake thus bounded, presents several gentle turns, the directions connected with two of which, reaching down to the mouth of the Keepawa River (thirty-five miles) are 158°, 191°, 156°, numbering the degrees from north as zero round by east. The parallel groves in these reaches of the valley turn precisely with them, as if the bounds of the valley had been the guiding cause of their bearings, and they are registered on various rounded and polished surfaces projecting into the lake, and sometimes rising to thirty and forty feet over its level. It was not easy to follow them to higher surfaces, for these usually were covered with the moss and trees of the forest, but they were occasionally traced to spots where they thus became concealed. These projecting points never were found to deflect the grooved lines in the slightest degree, and one remarkable instance of this occurs on the east side of the lake about a mile above the lower large island, at the south horn of a pretty deep bay. The rock belongs to the slate conglomerates, and it is composed of pebbles and boulders of igneous origin. Its face is a clean smooth rounded surface cutting through the pebbles, which are polished down with other parts. It is very deeply grooved with parallel furrows in the bearing 160°, and from the water's edge they run obliquely up the face (an inclined plane of 60° in an upward direction of 102°,) and continue on in the same bearing of 160° on the rounded and rather flattened top, thirty-five feet above the lake; so that whatever body moving downward in the valley, may have caused the grooves, it was not deflected by meeting with a surface, presenting a thirty-five feet height of front, so steep as 60°, notwithstanding it impinged upon it at an angle of no more than 32°. On the summit of the rock, there is another set of parallel groves, not so deeply marked, which cross the former at an acute angle, the bearing being 185°. In another place, about six miles higher on the lake on the same side, a polished surface not over four or five feet above the water, belongs to the very base of the limestone formation. Vast boulders and fragments of the sandstone below lie in a calcareo-arenaceous cement, some of the imbedded circular slices

or half-boulders being nine feet in diameter, while in some parts the solid sandstone strata are seen, and great cracks or worn fissures in them are filled with the cement. The rock in short is a collection of great boulders and blocks of sandstone, which were lying immediately on the strata from which they were derived, when they became enveloped by the succeeding formation. The whole is planed to a smooth tesselated surface, and marked by parallel grooves. In the same vicinity the parallel grooves occasionally appear on the flat surfaces of successive steps, formed by one layer of sandstone resting on another. They, however, do not always come up to the vertical sides of the steps, and these ungrooved parts are usually rough and uneven, as if they had but recently been fractured or deprived of their protecting cover. The Company's Post stands on a point on the east side, which cuts the lake nearly in two, at about eighteen miles from the head, and it is opposite a less prominent point on the other side. These points approach to within a quarter of a mile of one another. Both are composed of sand and gravel, which on the east form a hill 130 feet high. The southern face of this hill runs in the bearing 65°, and the gravel towards the eastward rests on flat sandstone strata, which have a smooth and partially rounded surface. The gravel and the rock constitute the north side of a deep bay. The polished rock surface exhibits well marked grooves, which come from beneath the gravel hill, nearly at right angles to the margin of the water. There is here, as in some other instances, more than one set of parallel scratches. Two of these sets cross one another in the directions 140° and 196°. The gravel may once have been continuous across the lake, and may have been broken or worn down for the escape of the water, which now flows past in a gentle current through the gap. The mass is not unlike the remains of an ancient *moraine*, and, combined with the smooth rounded surfaces, and parallel grooves and scratches, and the changes in their direction, the circumstances of the case may well suggest that this part of the valley of the Ottawa may have been the seat of an ancient glacier. A difficulty appears to stand in the way of the hypothesis, in the horizontality of the valley. There is little fall in it for seventy miles, and the total height of the lake above the sea, is only 612 feet. What descent there may be in the valleys which lead into it on the north, having their origin in the water shed about forty-five miles distant, in which the ice behind might press on the

ice before, has not yet been ascertained, but it is not reported to be very great. But as Professor J. D. Forbes appears to have demonstrated in his Travels through the Alps, that in glaciers there is a flow, the particles of ice moving on one another, it must be the fact that uncounterpoised superincumbent pressure from unequal accumulation would be a perfectly good cause of movement, and thus the horizontality of the valley would be no difficulty. In the eastern bay, at the head of the lake, near the mouth of the Otter River, parallel grooves were remarked running in the bearing 105°, which is the upward direction of the valley of that stream; and about a mile westward of the Blanche, in the same bay, in the bearing 130°, partaking of the direction of the valley, bounded by the escarpment of the limestone, described as running back into the interior. The discrepancy between these bearings and those lower down, is considerable, but being in the general direction of valleys joining the main one, the grooves may be the result of tributary glaciers. It has already been stated that accumulations of boulders, gravel and sand are met with in several parts of the river lower down, occasionally so obstructing its course as to produce rapids. Some of these may owe their origin to the same causes which have produced the gravel hill of Fort Temiscamang. It is scarcely necessary to remark, that the present effects of the ice on the lake, appear wholly inadequate to account for even those parallel furrows least removed above its level, though it may sometimes produce results analogous, but less important and uniform. On the east side of the lake, three boulders were remarked, which had been moved by the ice of the previous winter. One of them, measuring thirty-two cubic feet, had been moved nine feet in the direction 90°; another, one hundred cubic feet, had been moved twelve feet in the direction 350°; another, eighty cubic feet, had been moved fourteen feet in the direction 350°; each had left behind it a deep broad furrow through the gravel of the beach down to the clay beneath. In front of the first was accumulated a heap of gravel, one foot high, with an area of nine square feet; and in front of the second was an accumulation of small boulders, weighing from 80 to 100 lbs. each. To move the second and third, the progress of the ice must have been up the lake, and the first, across it. Had the gravel rested on a surface of rock instead of clay, parallel scratches would have been the result in each case.

Among the phenomena of alluvial action may be mentioned the occurrence of deep water-worn holes in the rock on the banks of the Ottawa at heights considerably above the highest level it has ever been known to attain. One of these was met with on the left bank of the river, near the Chenaux, sixty feet over the existing surface of the water. It was eighteen inches in diameter; its depth was uncertain, as it was filled with vegetable mould up to within four feet of the top. Another of them was encountered on the island opposite the Saw Mill at Portage Dufort; its shape was oval, measuring two feet by two feet and a half; five feet of the hole were empty, and the bottom was concealed by decayed vegetable matter. Its height above the level of the water prevailing at the time, was twenty-five feet, which was about twelve or thirteen feet over the great flood of the previous spring.

SUBSTANCES CAPABLE OF ECONOMIC APPLICATION.

The substances capable of economic application, found associated with the harder and softer formations of the Ottawa, are of various descriptions. The chief of them are the magnetic and specular oxides of iron, bog iron ore, brown ochre, galena, copper ore, plumbago, limestone and serpentine fit for marble, building stones, flagging tile-stones and slates, second-class millstones, second-class grindstones and whetstones, stone for glass making, clay suitable for common pottery and common brick, stone yielding good common lime and hydraulic lime, peat, shell marl, and the waters of mineral springs possessing medicinal virtues.

Magnetic and Specular Oxides of Iron.

The great spread in the valley of the Ottawa of the metamorphic series of rocks with which these ores seem to be so abundantly associated in other parts of its extension, both in Canada and New York, makes it extremely probable that the banks of this river and its tributaries will be supplied with vast stores of them. Their existence in a considerable number of localities has been reported to me, and there are specimens in the Provincial collection from the tributary sources of the Rideau, in Bedford, in Bastard and in Sherbrooke, as well as from the Townships of Hull and McNab. The two latter localities came within the line of my exploration. In Hull the magnetic

oxide is met with in the southern part of the eleventh lot of the seventh concession, on the property of Mr. Wright. It is in a bed, of which the strike is N. N. W. and S. S. E., and being, as I am informed, again to be met with in the rear of the twelfth lot of the same concession, which is precisely in the direction of the strike, there is a probability it will be continuous the whole distance between the two points, which is about a mile. But as the range of the rock appears to be running an irregular course, occasioned by an undulation in the stratification, it seems probable it will gradually bend round to the eastward, and cross the Gattineau further up. Where seen in the south part of the eleventh lot of the seventh concession, the thickness, though it must be considerable, was not well displayed, but it probably will not exceed twenty feet. The hollow in which it runs, is not over from twenty to forty feet wide, and at the latter breadth it is limited on both sides by nearly vertical strata, consisting of syenitic gneiss, which to the west is interstratified with white granular limestone, holding mica and graphite; and white granular limestone is again seen out-flanking the syenitic gneiss on the east. There appears to be some difference of quality in different parts of the bed. The western side holds a mixture of graphite, disseminated in the ore, from which the eastern is free; but the chief bulk has the aspect of good pure ore, exhibiting a coarse granular structure. Where the mineral has been acted on by the weather, it breaks up with facility into grains related in form to the crystals of magnetic iron, and may be easily ground; but where free from atmospheric influence it is very tough. An easy pulverization adds considerably to the value of this species of ore where available for smelting purposes, for when in a comminuted condition, earthy impurities can be separated by means of a magnet. An ingenious contrivance for the purpose of effecting this purification on a large scale, is in use in the foundries of Lake Champlain, in New York. The quantity of iron the Hull bed contains, must be considerable. If its breadth be assumed at twenty feet, every fathom forward in it, with a vertical depth of a fathom, would probably yield not less than fifty to sixty tons of pure metal. The Sherbrooke bed occurs on the north shore of a beautiful sheet of deep water, called Myers' Lake, in front of the seventeenth as well as upon the eighteenth and nineteenth lots of the third concession of the township, and, agreeably to a description derived from Dr. Wilson, of Perth, it must contain a mass of ore of very great importance.

Another spot in which the magnetic oxide was met with, was in the Township of Ross, opposite Portage Dufort, about midway between the half portage and Poupard's Slide. In this instance the ore occurs in a vein which cuts white granular limestone, dipping northward at a high angle, and underlaid by a considerable thickness of a tough heavy dark-coloured syenitic gneiss, in which the hornblende and feldspar, with occasional large crystals of the former, constitute the preponderating minerals, rendering it very nearly a greenstone. The ore, concealed by the water on the north side of the limestone, could not be followed into the syenitic rock on the south. It was, therefore, difficult to determine the course of the vein with precision, from the small distance in which it is seen, but it appeared to wind across the limestone in a direction west of south, occupying a great number of reticulating ramifications, lacing the limestone, and filling up cracks, some of which are two to three inches thick, while others do not exceed one-eighth to one-sixteenth of an inch. Some of the ramifications turn off on each side, in the direction of the strike of the limestone, and run in it to the distance of some yards. In fresh fractured surfaces the ore exhibits a bright metallic lustre and highly crystalline structure; in some places, where it rests against the limestone, it displays large cubic crystals, and various modifications exhibiting a passage from the octohedron. The Ross vein would not yield a workable quantity of ore.

At Hudson's Wharf, on the Lac des Chats, on the second lot of the first concession of Bristol, specular iron exists in the micaceous form, at the junction of a bed of white granular limestone, holding mica and pyrites, with overlying reddish syenitic gneiss. The proprietor of the lot has dug down upon the bed a few feet, and has found it to be about five inches wide at the thickest part, and, partially mixed up with the limestone, running into small strings of one-quarter of an inch. The reddish rock lying on the limestone, occupies the south side of the bay, in which the wharf is situated, and at the extremity of the point it forms, there exists another small bed, or perhaps vein, of the same quality of ore. It is here, however, associated with quartz as a gangue, which coincides with the stratification of the gneiss, with a dip E. $< 45°$, and is traceable in a north direction, united with ore for twenty yards. A quartz vein of six to twelve inches thick is perceived to run on in a continua-

tion of the same direction without the ore, for sixty to seventy yards more. Though these veins are mentioned as indicating the existence of ore, they are not of a workable character.

A very fine bed of specular iron, however, exists on the opposite side of the lake, on the sixth lot on the line between concessions C and D in the Township of McNab. It is seen on the road between the Dochart and the Madawaska: after taking some trouble to expose it, it was found to be twelve feet thick. Its dip is S. 22° W. < 70°, and while it rests upon about 100 feet of the crystalline limestone belonging to the metamorphic series of rocks which come from below it on the north side, it is limited on the south by a compact gray limestone apparently belonging to the overlying arenaceo-calcareous deposit. Westwardly it was traced about 100 yards, while eastwardly, after running a short distance, it entered a marsh; but specimens of the ore were met with on the east side of the Madawaska, and Mr. Hilliers, who resides at the First Chute on the river, informed me that fragments of a similar quality were frequently turned up by the plough on the rear of the second lot of concession C, which would be in the eastern run of the bed at the distance of a mile from the spot where it was examined. The mineral presents a red earthy aspect on the exterior, but in fresh fractures it has a general purplish red hue, and exhibits an aggregation of minute shining scales. There are some impurities in the ore, arising from the presence of small patches of quartz and calcareous spar; but taking its breadth at twelve feet, it is probable the bed would yield not less than twenty-five tons of pure iron for every fathom forward in it with a vertical depth of a fathom.

Bog Iron Ore.

Of this species of iron ore, probably resulting from a deposit arising from the decomposition of the iron pyrites in the older rocks of the country, information was procured of several localities. It exists in some quantity on the farm of Mr. Lancaster, and a great many other lots in his vicinity, where it is said to have a thickness of four feet, on the Côte St. Charles, in the seigniory of the Hon. Mr. Harwood, at Vaudreuil. From the same seigniory, Mr. Teasdale of Rigaud presented me with specimens obtained from a patch on the Petit Côte, or Sac au Sable, not far from the road between the first and second concession, about a mile back from Cavagnol Point, on the Ottawa.

He mentioned the existence of it also in a patch at the extremity of Cote St. Guillaume, on the third concession of Rigaud Seigniory. Mr. H. Blasdell, of Bytown, informed me of five different localities in which bog ore is said to be found: namely, on the Blanche, in Templeton, above M'Arthur's Mills; in Hull, on the fourteenth lot of the seventeenth concession; in Eardley, at Upper Rocky Point; in March, on Constance Lake; and in the vicinity of the Chats; but of these I had an opportunity of verifying only one, that at Upper Rocky Point. The rock at this Point belongs to the arenaceous limestone, and it is covered by a deposit of sand of about six feet, with two or three feet of clay above it, and on the top of this clay is the deposit of bog ore. It lies in honey-combed nodules or masses, not quite continuously touching one another, of six inches to one foot in horizontal diameter, of which some are seven inches thick, with little soil above them. The surface of the land back from the shore is flat. There is a marsh on it, and a small creek flows through it, the water of which is coloured red with oxide of iron, and has an inky taste. This marsh has an extension of only three to four rods northward, but northeastward its length from the lake is about 100 rods. It is bounded to the north and northeast by a margin of metamorphic rock; from which to the lake in a southward direction there is a flat surface of clay. About one-third of a mile below there is another strong spring, with the same inky taste, and mixed up with the red oxide. The ore is chiefly on the twenty-first lot of the eighth range of Eardley, but the marsh extends back to the twentieth lot, and may comprehend ten acres. A locality was reported to me as existing two or three miles back from the lake in the lower part of Clarendon, on the flat land in the front of the township; but, disappointed of the guide who was to conduct me to the spot, I was unable to discover it.

Brown Ochre.

This substance, which is chemically the same as bog iron ore, but in an earthy condition, is of a deep red-brown colour. It is found in the marshes in which the other may exist, and, floating in suspension in the waters of such localities, it is frequently the means of leading to the discovery of the bog ore. Being easily reduced to a powder, and often occurring in the condition of one, it can, when in abundance, be advantageously employed as a paint. It occurs

in considerable quantity in the Grand Marais, opposite the most northern point of the Calumet Island; and also in Paint Lake or Pond, near Mr. Harwood Peirce's Clearing, at the Black River Chute, whence it has been taken for the use stated.

Iron Pyrites.

The chief uses to which this material is applied are the manufacture of copperas and sulphuric acid; and though, perhaps, it could not be turned to profitable account in this country at present, it may be mentioned that it occurs in considerable quantity in some of the syenitic gneiss near Portage Dufort, particularly on the twenty-seventh lot of the second concession of Clarendon.

Galena.

Indications of this ore of lead occur in several places on the Ottawa and its tributaries. Mr. Doran, of Bytown, exhibited to me a specimen which had been obtained by a raftsman on the Gattineau River; and Mr. Harwood Peirce of the Black River Chute presented me with a small quantity he had knocked out of a rock in the Black River, some distance up. In both these cases it was probably associated with the crystalline limestone of the metamorphic formation, as it undoubtedly is in a locality yielding it in the Township of Fitzroy. This is on the property of Mr. John Marshall, on the twentieth lot of the eighth concession, not far from his house. The white crystalline limestone greatly prevails in the vicinity, and a considerable breadth of it, holding as usual flakes of mica and graphite, crosses the road. The limestone is bounded on the north, by a highly inclined band of gneissoid rock, consisting chiefly of feldspar and quartz, running about fifteen degrees north of east and south of west. The lead ore occurs in a vein which cuts the limestone in the direction of the stratification, about twenty yards south of the feldspathic bed. It has been tried in three places in the space of ten rods, on the road and in the field on each side of it. In one of these Mr. Marshall obtained about 100 lbs. of the ore; in another Mr. Hays may have obtained about 80 lbs.; and in the third Mr. Henderson may have procured about the same quantity. The lode appears to be regular, and is composed of fragments of the wall rock, which is the limestone mentioned, cemented together by calcareous spar, shewing the form of

dog tooth in druses. In this mixture the galena is found irregularly interspersed. The largest lump of pure ore, without any admixture of the gangue or vein stone, seen by Mr. Marshall, was about the size of a man's fist, and the ordinary size much smaller. I could not obtain very satisfactory evidence of the breadth of the lode, but, judging from fragments on the surface, it may be at least six inches. There is a slight rising across the road, near the vein, occasioned by the band of hard gneissoid rock traversing it, and the surface in the eastern run of the lode gradually descends a few feet to a water-course; but, with the exception of such slight inequalities, the country is in general level in the vicinity, so that should the lode be found in any part of its course large enough to be deemed worthy of a trial, or any other of such a character be met with not far removed from the spot, the expenses of artificially freeing them from water must be kept in view.

Subsequent to my return from the Ottawa, a sample of galena, said to be procured from a vein recently discovered on the Seigniory of the Hon. L. J. Papineau, on the north Petite Nation, was presented to me by Mr. Brondgeest. As the locality has since been described to me by Mr. Townsend, from whom Mr. Brondgeest derived the ore, the crystalline limestone of the metamorphic formation is probably in this instance also, the rock in which it occurs. The direction of the lode appears to be nearly east and west, and its thickness is said to be six to eight inches, but how much of this may be pure ore, I am not able to state.

Copper Pyrites.

The quantity of this ore met with in the line of my exploration was so very small, that it might have been passed over with no further notice than the simple statement of its presence as an accidental mineral in the metamorphic rocks, were I not aware of its occurrence in the same formation between the Ottawa and the St. Lawrence, near Beverly, in Bastard, in a regular lode, which I have not yet seen, but which has been described to me as about one foot wide, with a well marked *gozan* on its back. And although I am not able to state whether the probable yield of the lode would be sufficient to promise a profitable return, the fact of its existence is sufficient to attract more pointed attention to the smallest indication in the same rocks elsewhere, notwithstanding they may not be considered very favourable as the site of copper veins.

On the Ottawa, copper pyrites was met with in two localities not far from one another. One of them was on the twenty-third lot of the ninth concession of Fitzroy, in the lower part of the Mississippi Channel, where it occurred on the face of a mass of white crystalline limestone, without any apparent connection with a vein; and the other near the bed of iron ore in the sixth lot on the line between the concessions C and D of McNab. Though the quantity in the latter case was less than in the former, it was of more importance, from the circumstance of its occurring associated with a vein. The vein cuts the crystalline limestone on the north side of the iron ore, and it is composed of brecciated limestone, cemented by calcareous spar, which assumes the form of dog-tooth spar in small *vughs* or druses. The copper ore presented thin seams of the sixteenth part of an inch among the breccia. In a small vein in the same rocks, on the Madawaska, not far off, sulphate of barytes is associated with calcareous spar, but no copper ore is present. The proximity of the iron ore in McNab, and the occurrence of the galena in Fitzroy, in the same vicinage, draws closer the analogy between this locality and that of Bastard; and the same combination of metalliferous minerals in the neighbourhood of one another, is said to exist where an unsuccessful attempt has lately been made to mine lead ore in Bedford.

Plumbago.

This mineral is of such common occurrence as a disseminated constituent in the crystalline limestone of the upper metamorphic group of rocks, that vast masses of the limestone emphatically deserve the appellation of plumbaginous. Indeed the calcareous portion of the group is seldom wholly free from the mineral, and it appears surprising it should not oftener be found collected in nests or veins of sufficient purity, and in sufficient quantity, to promise a profitable result. According to its purity (which consists in a freedom from gritty matter) the material is used for the manufacture of crucibles, for giving a shining surface to cast iron grates and stoves, for diminishing friction in heavy machinery, and for the manufacture of lead pencils. It is only the very purest description, possessing a granular fracture, which is applicable to the last-mentioned purpose, and this so rarely occurs in sufficient quantity to encourage the working of it, that the best pencil lead of the Borrowdale Mine, in Cumberland, in Great Britain, which is the finest known, sells

for 30s. to 40s. per lb., and it is said six weeks working of the mine has in some years been sufficient to give a net produce of between £30,000 and £40,000. Such as has been met with on the Ottawa is not of the purest description. One locality is on the tenth lot of the fifth concession of Grenville, within ten rods of the front. The plumbago occurs in a vein associated with feldspar, tabular spar, pyroxene, sphene and quartz, with carbonate of lime and serpentine, cutting the white micaceo-plumbaginous limestone of the metamorphic rocks. The Hon. Mr. Harwood of Vaudreuil attempted, some years ago, to work the mineral at this spot. In the excavation, which is on the back of the vein, the plumbago is confined to three small strings, each about five inches thick, which are comprised within the space of four and a half feet. Their course is about S. 46° W., with an underlie of 85° to the northwestward. The two outside strings keep parallel as they descend, but the middle one runs from the one towards the other by an increase of slope in the direction of the underlie of the other two. A trap dyke, running S. 68° W., with an underlie of 85° to the northward, cuts the vein, throwing it forward about two feet on the northward side, which, from the underlie of the vein, it will be perceived, would be the result of an upthrow on that side, of between three and four fathoms. As described to me by the miner who superintended the working, the quantity of the mineral was most abundant immediately on the southeast side of the dyke, in which part two of the strings widened out in such a manner as to touch. The various minerals mentioned as associated with the plumbago, seemed also to be more abundant near the dyke. Receding from it, the associated minerals assumed more of the character of the wall rock, consisting of an intermixture of albite, calcarean spar, and quartz, with small crystals of mica and graphite, and small specks of serpentine. The other minerals, however, were not wholly absent.

Two small parcels of the mineral were exported by Mr. Harwood to Britain. The first, which was, perhaps, selected with considerable care, realized, I am informed, a remunerating price. The second does not appear to have produced so favourable a result, but for what reason it is not in my power to explain. The vein is traceable some distance from Mr. Harwood's mine, and the mineral is reported to exist on the thirteenth and fourteenth lots of the fourth

concession of the township. Should this be in a continuation of the same vein, its course must turn up more to the west after leaving the fifth range.

At Mr. Moore's Clearing, on the twenty-first lot, front A of Westmeath, the proprietor, in excavating a root-house, came upon a rock holding a larger quantity of plumbago than is usually disseminated in the crystalline limestone. The rock consisted of red feldspar and translucent quartz of that large-grained description usually composing the dykes of the metamorphic formation. There appeared also to be limestone associated with some of the fragments, and, from the quantity of loose calcareous grains thrown up where the plumbago was dug out, it is very probable a layer of limestone may be near it; but whether the plumbago was concentrated in a vein was impossible to ascertain, without a greater expenditure of time than the occasion seemed to warrant. A specimen of the mineral said to have been obtained some distance up the Madawaska River has been presented to me by Mr. McNaughtan, and it is purer than any other I have met with.

Marble.

Limestones capable of a polish, rendering them fit for the purposes of ornamental architecture, exist in several parts of the Ottawa. Of these, some belong to the metamorphic rocks, and others to the fossiliferous deposits which are above them. Among the latter, the quarries of Terrebonne produce some layers which take a good polish, and exhibit a dark brownish-gray speckled surface, in which the spots arise from the presence of encrinites and other organic remains. The effect, however, is rather sombre, and the best stones of Isle Bizard would, perhaps, yield a handsomer marble, the general ground not being quite so dark, and many of the encrinital remains being tinged with a reddish colour, likely to produce a pleasing effect. Belonging to these deposits, a bed, met with at Packenham, on the Mississippi, yields a very peculiar clouded dark smoke or snuff brown marble. The stone takes a good polish; but small pieces of chert, I understand, are sometimes met with, which renders it necessary to be careful in selecting slabs to be worked up. Mr. Dickson, of Packenham, on whose property the bed occurs, had at one time fitted up apparatus, driven by the waste power of his mill, to polish slabs for chimney-pieces and other ornamental purposes,

but, I believe, it has now fallen into disuse. There is no consumption for the material in the vicinity, and no marble, unless for statuary purposes, will bear the expense of distant carriage.

Among the crystalline beds of the metamorphic limestones one occurs, on the south end of the sixteenth lot of the third concession of Grenville, on which experiments have been tried, by Mr. P. Charlebois, who erected a mill on the spot, for the purpose of cutting and polishing the stone. The stone, which takes a good polish, is moderately fine grained, and its colour white, marked with a number of small green spots, arising from the presence of serpentine, which occasionally runs into large patches. It appears to me, however, that the effect is best when the surface is speckled with the small spots only. The bed appears to be of considerable thickness, and it is overlaid by gneiss, which shews mica and garnets at the junction. The dip of the strata is N. 54° W. < 72°. A trap dyke cuts through the quarry, of which the general course is N. 73° E., and the underlie northward < 85°. It is four feet thick, and it produces a dislocation, by which the measures are thrown nine feet backward to the south, being a down-throw of four to five fathoms on that side of the dyke. There is an angular turn in the dyke, carrying its course eleven feet out of a straight line; and at one of the elbows formed by it, there is a subordinate crack in the original direction, carried on for some yards before it terminates. This is filled with trap, which is walled on each side with a thin sheet of serpentine, accompanied in some places by asbestus. The position of these thin sheets of serpentine would lead to the opinion that their presence was probably due to the action of the dyke when in a condition of heat, and that the peculiarity of the marble altogether may have some relation to the same cause. The marble mill is not now in operation.

At the mouth of the Madawaska, in McNab, an almost unlimited amount of the crystalline limestone is marked by gray bands, sometimes narrower and sometimes wider, running in the direction of the original bedding, producing a regularly barred or striped pattern where there are no corrugations in the layers, and where the beds are wrinkled, giving a pattern something like that resulting from curly grained wood when smooth-planed. The colours are various shades of dark and light gray, intermingled with white. The granular texture of the stone is rather coarse, but,

taking a good polish, a very pleasing marble is the result. Very good samples of it might be procured from a mass of limestone rock in front of Mr. Hilliers' house, on the path to the landing, and from various other places, both above and below the mouth, as well as up the river.

Notwithstanding the great amount of white limestone found among the crystalline beds, there occurs scarcely any place on the Ottawa where it would yield a good marble. When free from mica, plumbago, and other disqualifying minerals, it is in general of too coarse a grain to be of much service; and of those specimens that were brought to Montreal, as among the best samples that were seen, one only gives a tolerable result, after having been polished, either in purity of colour or in texture. This was from the immediate vicinity of the Saw Mill, at Portage Dufort. There was a bed, however, which had been cut through in making the Slide at the Calumet, which may be finer in the grain; but a large slab of it, which I hoped to receive for experiment, has never reached my hands.

A small specimen of a very beautiful quality of snow-white saccharoidal even fine-grained pure dolomite, or magnesian limestone, has been presented to me by Mr. Malcolm Cameron, the Member for Lanark, who informed me it was obtained from a mass on the Mississippi, near its source, to the rear of the Township of Barrie, where, according to his account, it is said to be procurable in large blocks. In external appearance it resembles the stone of Carrara; and if the mass is like the sample, it might be fit for statuary purposes, unless it be too hard, and the magnesia it contains be an objection. Dolomites are commonly more friable and crumbling than pure limestones, and less durable. To suit the sculptor, the stone, being of the requisite general fineness of texture, should be free from all inequalities of grain, from spots or even slight differences of shade in colour, from foreign minerals, and from flaws. The value of the best quality in the British Metropolis is about 30s. the cubic foot, or (the specific gravity of the material being 2.7) about £20 per ton. Though excellent qualities of statuary marble are known to exist in other places, none of them come into competition in the chief markets of Europe with that of Carrara, where there is a great supply. This superiority, however, arises from the commercial advantage enjoyed by the latter in a position which renders any

great amount of land carriage unnecessary, an element always carefully to be looked to, in considering a present useful application of substances.

Building Stone.

Those descriptions of stone which have been resorted to in the valley of the Ottawa for building purposes, have been chiefly obtained from the fossiliferous beds of the upper limestone. Some of these, in different parts, yield good solid blocks of a durable description, easily dressed, and presenting when freshly worked, a light gray colour, which is not the natural tinge of the stone, but the result of tooling, and is well suited for architectural effect. It is from quarries on the Island of Montreal, in which some of the best beds of the deposits crop out, that all the finest edifices of its city have been constructed. The stone, however, under the influence of the weather, after the lapse of several years, acquires an unequal yellowish tinge, which greatly impairs its beauty. The Terrebonne quarries are probably upon a continuation of the same beds, and that they produce at least as good a material may be seen in the work in which they have been used, at the new exit of the Lachine Canal. The beds of Isle Bizard are lower in the deposit; they yield a very good stone, which has been used in the construction of the locks of the Carillon Canal. The stone of Ross's quarry, in the front of Hawkesbury, resembles in some degree that of Isle Bizard. It may be in the continuation of the same beds, and, from their strike in this position, they will very probably be met with in several places further up the stream. Many of the beds that appear in the cliffs of Bytown, though of the same formation, have a more nodular character than such as have been mentioned, and they are affected by partial partings of bituminous shale, which greatly injures the appearance of the stone that comes from them, and must impair its durability, notwithstanding it may be serviceable material for immediate purposes; some of the beds, however, yield good building stone. But notwithstanding partial and local defects, there can be little doubt that wherever the general formation to which those beds belong extends, there will be no lack of material capable of application in any description of structure the country may require, and the greater and thicker, and more closely compacted, the accumulation of organic remains may be, and the more these remains are broken and mixed up, particularly where there is

a large share of broken encrinites among them, which seem to have possessed a peculiar tendency towards crystallization, the stronger, more durable, and uniform the stone will be.

The arenaceous deposits, which underlie the more purely calcareous, also afford some good building stones. Some of the beds of the upper or calcareous portion of them have yielded material for the construction of several of the locks of the Canal on the Rideau, above Bytown; and no doubt the same or others might be found on the Ottawa, even to its mouth, equally applicable to such purposes. But though the stone is tough, and apparently durable, preserving well its angles and corners, it soon changes its colour from a light-gray to a yellowish tinge. Holding a mechanical mixture of sand and lime, an exterior portion of the lime is soon dissolved by the operation of the rain, and the sand, left standing in relief, roughens the surface as well as renders it yellow. The Potsdam sandstone, or lower and more siliceous portion of these deposits, is furnished with some excellent beds for building purposes, which would be found prevailing in various parts from the Cascades to Rigaud, on both sides of the river, and in the islands, including Isle Perrot. They compose the whiter, finer grained and more even layers; but as yet no quarries have been opened on them. They would yield a very handsome stone, of great durability and unchanging colour, but it would be difficult and expensive to work, notwithstanding some of the beds seem to split into rather regular rectangular forms.

In the metamorphic series, the calcareous beds which have been mentioned as giving coarse marbles in McNab, Litchfield, and other parts, appear to be well suited for building purposes; but many of these granular limestones are very subject to disintegration when they come to the surface, and it would require an investigation into the cause of this decay before it would be safe to say much in relation to them. The masses of gneiss which are interstratified with the granular limestones and those lower down would often yield excellent building stones of a most durable quality, and of various lasting colours, from light-red, or salmon colour, to light-gray. One of the best looking beds that came within my observation was on the property of Capt. John Maitland, on the first lot of the first concession of Clarendon. It is a band of about forty feet in horizontal breadth, with a dip N. E. $< 45°$, and it gives a fine-grained strong and solid stone, composed of white feldspar, translucent white

quartz, with numerous small specks of black mica, obscurely arranged in fine dotted lines, giving a light-gray colour. The stone has the aspect of a fine-grained granite, and would in general be so called, as the dotted lineal arrangement of the mica would probably escape observation, unless the attention were particularly drawn to it. No doubt many beds such as this, and many of a more feldspathic quality, often of a reddish tinge, yielding good material, would be found on the Ottawa, particularly on the north side, nearly all the way to its mouth. The expense of working such a material however, appears at present to operate against its employment for building purposes.

Flagging Tile-Stones and Slates.

Where foot pavements are well floored, in such cities as Montreal, Quebec, and others in the Province, the material at present used is either cut limestone or wood, and the cheapness of the latter in this country will, probably for a long time to come, cause it to be resorted to, in preference to any thing else. But many of the more thinly bedded parts of the gneiss, where mica separates the layers, split with facility into such dimensions as would form very good flagging for the purpose, or for kitchen or dairy flooring, and occasionally into tile-stones fit for covering roofs. In the Ottawa country, such stones were observed in Bagot at the Calabogie Rapids on the Madawaska, in Horton and Clarendon at the Chenaux, and no doubt many localities might be found nearer the mouth of the river, on the Lower Canada side; but the locality in which the largest and best quality of slabs was seen was on that side, on Lake Temiscamang, about seven miles above the Galère, where five miles of the coast present a succession of cliffs which would yield a great abundance of almost any dimensions. The only roofing slates heard of, were those which have been mentioned as existing five miles up the Montreal River. The specimen obtained is very firm and strong, but it is perhaps rather too thick and heavy to be very serviceable. It measures five sixteenths of an inch, and does not seem capable of splitting any thinner.

Grindstones and Whetstones.

None of the arenaceous beds met with were of a sufficiently free grit to give good fast grinding surfaces. But in three separate localities, all probably in the spread of the same deposit, stones capable of giving a fine edge to axes, and all but the last touch to carpenters' tools, were found in abundance. These were at Whetstone Point, on Lake Chaudière; at Sheriff's Mills, near the Chats; and at the Falls of the Allumettes, near Sydenham. At the first of these places the layers are scarcely thick enough to yield grindstones, and they are resorted to only for whetstones, furnishing a very fair quality, of which the surfaces parallel with the bedding, grind better than those at right angles to them. These beds are traceable round to the second locality, where they have much the same quality. Mr. Sheriff has tried them, however, in the form of grindstones. They answer for a short time, when first used, but they soon become too hard, and, receiving almost a polish, lose their bite of the steel which may be applied to them. In the third locality the stone has been used for grindstones, which are well spoken of, by some of the carpenters and other tradesmen in Sydenham, for giving a fine edge.

Millstones.

All known descriptions of materials for millstones are but poor substitutes for the French burr; but other rocks are occasionally resorted to, and some kinds are met with on the Ottawa which have proved very serviceable. I have been informed that a quarry in granular limestone near Lachute, in Argenteuil, was formerly resorted to for millstones. It is said they were employed for upwards of fifteen years in Lachute Mills, and were carried to the Mascouche and other mills around. Such inferior stones could be obtained almost anywhere among the metamorphic rocks. The first burr stone used at Lachute Mills is still in operation there. On the Argenteuil Rouge River, boulders of a reddish or flesh-coloured gneiss are met with, from which good stones have been made, some of which are still in use in several mills in the lower part of the Ottawa; among other places, there is a set of them at Hoyle's Mills,

two miles below Lachute. Stones of a gray colour have been obtained from boulders in other places, of a similar quality. These millstone boulders are no doubt derived from the gneissoid syenite of the metamorphic series of rocks; and not only boulders, but the parent rock itself might be resorted to in a vast number of places. The boulders, however, are perhaps more convenient, as they are generally found transported to the vicinity in which they may be wanted, and if they are of the right sort, require only to be split and dressed, whereas solid ledges would require a good deal of quarrying. There are very few places on the Ottawa, in the vicinity of which some such boulders may not be found, and there is an enormous accumulation of erratic blocks between Grenville and Carillon, among which many of the proper description would be met with. In Britain, when burr stones could not be obtained, the beds of siliceous conglomerates were used as the best substitutes, and a formation, which was much resorted to, in consequence obtained the geological appellation of the millstone grit, in the nomenclature of British rocks. Siliceous conglomerates are occasionally to be met with in the Potsdam sandstone, and some of its beds bear this character at the Cascades, and at the Pointe du Grand Detroit, from one of the layers, at which latter place, millstones have been made.

Stone fit for Glass Making.

Some of the beds of the Potsdam formation yield a very excellent material for the manufacture of glass. They are opaque-white in colour, and are composed of a siliceous sand so nearly pure as to exhibit only the smallest possible traces of alumina and iron. The best beds met with are on the south side of Isle Perrot, where they are nearly on a level with the water, and may be several feet thick beneath its surface. Those on Mr. Cameron's lot, in Vaudreuil, have a little more iron, (equal with alumina to one half of one per cent,) and display a very slightly yellowish tinge. The quantity of iron, however, is so small that its effect could with facility be corrected by the use of a little peroxide of manganese. The very moderate dip of the stratification renders it probable that the Perrot beds will extend along the Vaudreuil bank of the river, and possibly the opposite one, and that a little trouble might expose it in several places.

Clay for Common Bricks and Common Pottery.

The bed of the tertiary ocean which once covered a large portion of Canada and the United States, furnishes the valley of the Ottawa with a great deposit of material fit for the manufacture of common bricks and common pottery. The testacea of this epoch are found on the Mountain of Montreal, at an elevation of 460 feet above the level of the sea. This would carry a level about 300 miles up the Ottawa, and there is no scarcity of clay within a moderate range of almost any part of the distance. It is extensively spread over the flat country between the Ottawa and the St. Lawrence, below Bytown, and good bricks are made from it in several parts as high up as Sydenham, on the upper Allumettes Lake. For the manufacture of common pottery, however, it is used only at St. Eustache and at Grenville. None of the clay that has come under my observation is without lime, and it is, therefore, unfit for fire-bricks; nor has any clay of a refractory description, within my knowledge, yet been discovered in the Province.

Water Lime.

The calciferous sandstone formation of New York is known to yield several valuable beds fit for hydraulic purposes, and the presence of the arenaceous limestones, which are its equivalent on the Ottawa, and which border its banks for such a distance, promises an abundant supply of the material. It has been reported to me, but I do not know how far to depend on the information, that successful trials of the deposit have been made in three places in the lower part of the river in the front of Hawkesbury, and in Argenteuil. On the right bank of the river near Bytown, a bed, which probably occupies a higher geological position, yields the stone which has been manufactured into cement for several years by Messrs. Wright, of Hull, and near its outcrop Mr. Christie has recently erected a mill for the same purpose.

Common Lime.

The bluish-gray limestones, which have been mentioned as yielding good building materials in the upper formation, are the source of the greater part of the quick lime used on the Ottawa, whether

for mortar, for potash making, or for agricultural purposes, and it does not seem to be universally known among the settlers that there are any other beds capable of yielding lime. Persons residing in the immediate vicinity of the white crystalline limestones have been known to send to the fossiliferous beds, the distance of nine and ten miles, for years in succession, for their supply, without being aware that they might satisfy themselves at home. In collecting information in respect to the geographical distribution of the rocks, it was often found in white limestone districts that a settler would be acquainted with every small accidental patch of the blue limestone to be met with in the woods for some distance, while it had never occurred to him that there was anything worthy of remark in the crystalline rocks on his own ground; and one respectable farmer, who had given me useful information in regard to the run of the upper calcareous rocks, and regretted he had no limestone on his own lot, saying, he would willingly reward any one who would discover it for him, would scarcely believe me in earnest when a bed of the white crystalline variety, which was in sight, was pointed out to him for limestone. There are, however, some kilns established on this description, particularly in the neighbourhood of Lachute, on the Rivière du Nord. One of them is at the third bridge above the mills, and another at the second. At the latter the limestone is of a dingy-white or light-gray, highly crystalline, holding small crystals of graphite, and of black, brown, yellow and white mica, and occasionally a few clear amber coloured grains of chondrodite, with some of iron pyrites, while crystals of quartz are sparingly disseminated through it. It makes good lime, and, according to those who have used it, takes a good mixture of sand; it pulverizes well, and does not require sifting for building purposes when stone is used, though it does with bricks, as well as for plaster. By the Scotch settlers on the light soils in the vicinity, it is used with advantage as a manure, returning to those who thus employ it a value in produce equal, as I was informed, to 7½d. the bushel for the lime. The white crystalline limestone has also been burnt at the Chats by Mr. McMullin.

Many of these granular limestone beds are subject to a rapid disintegration where they come under the action of the atmosphere. Some at their outcrops are occasionally found so loosely held together that a shovel or a pick can with the greatest facility tear them into small fragments, and in such cases the soil in the vicinity is ob-

served to be composed of their granular ruins. Such soils were almost in every instance found to be of a very fruitful description. To determine the causes of this rapid disintegration of the rock will require careful investigation; but with such beds numerous small crystals of iron pyrites were in some instances found associated, which by their decomposition, appeared to produce or aid the effect. In such cases, the decomposition of the pyrites, giving origin to sulphuric acid, would afford the means of converting a portion of the carbonate into the sulphate of lime, while the facility with which the rock could be ground up without burning would render it of easy application as a manure. The variety of minerals which these crystalline limestones contain make it appear probable that some of them may prove very advantageous for agricultural purposes. They are often much loaded with mica, which would be a source of potash; frequently with serpentine and various forms of hornblende, yielding magnesia; and occasionally, as at Blasdell's Mills on the Gattineau, at the Calumet Slide, and above the head of Moore's Slide, near the line between Ross and Westmeath, with apatite or phosphate of lime, the fertilizing power of which, in the form of bone manure, is well known.

Shell-Marl.

Another substance of agricultural value, occurring in the valley of the Ottawa, is fresh water shell-marl, which, being nearly pure carbonate of lime in a comminuted condition, requiring neither quarrying nor burning to put it in a state fit for application, though it appears to be disregarded at present, cannot fail, as the cultivation of the Province advances, gradually to rise in estimation among intelligent farmers. The localities in which deposits of it were either seen or heard of are—

1. On Heterick's farm, opposite Ste. Rose, on the road to Ste. Thérèse.
2. On M'Allister's farm, Grande Côte, between Ste. Thérèse Ferry and St. Eustache.
3. On Chenier's farm, on the Grand Brulé, St. Benoit.
4. In the rear of Cavagnol Point, Seigniory of Vaudreuil.
5. On the eleventh lot of the seventh concession of East Hawkesbury.
6. On Mr. Forbes' land, third lot of the first range of Argenteuil.
7. On the Hon. Mr. M'Kay's land, in Gloucester, near Bytown.
8. On Mr. Sparks' land, in Nepean, near Bytown.

9. In White Lake, in MacNab.
10. In Mink Lake, west of Bromley.
11. On Mr. Stevenson's land, twenty-third lot of the first concession of Clarendon.
12. On Calumet Island, one mile N. W. of Desjardins' Clearing, opposite Moore's Slide, and in several small lakes lower down the island.
13. On Calumet Island, in a small lake about two miles southeast from the house of Louis Martel, on the Campment des Plaines.

On Mr. Forbes' land the marl is covered by about nine feet of peat, or bog earth, and the marl was said to be in some places five to six feet deep, and in one place thirteen feet. The peat bog extends over an area of about twenty-two acres; and further back, on the same lot, there is another peat bog, which extends E. and W. about half a mile, with a breadth of 100 to 150 yards, beneath which marl was met with at the depth of twelve feet. The deposits are in the bed of an ancient lake, formed by the stoppage of a narrow valley by a beaver dam.

The deposit on the Hon. Mr. McKay's land is five feet thick. With a thin covering of vegetable mould, it supports a growth of large forest trees, under which it extends some distance. It is on the east side of a small lake, or pond, which occurs in the course of a small stream, discharging by a narrow ravine into the Ottawa, close by; the surface of the pond is about twenty-six feet above the river in summer, but only six feet in the freshets of spring. The marl bed lies on a level surface, twenty-five feet above the pond, and, after spreading over a breadth of about 200 yards, it appears to run under a step of five feet, which carries a flat surface further on. The pond is about 200 yards wide, and on the west side of it there are evidences of three periods of recession, in distinct terraces, which shew heights of thirty, sixty and seventy-five feet respectively, each with a sudden step rising to the next. The examination was not carried out sufficiently far on the east side, to ascertain the existence of corresponding terraces in that direction. The upper step may exhibit some former expansion of the Ottawa, or perhaps some former limit of a tertiary sea.

About 700 acres of the lower part of White Lake, in McNab, under a shallow depth of water, in some places insufficient to float a canoe, and in others not exceeding two or three feet, present a bottom of shell marl, which, where tried in several spots, was found to possess a

thickness of five to seven feet at least. There appears to be no deeper channel through it to the outlet than elsewhere, and by this but a small flow of water escapes, notwithstanding the lake has an area of several square miles. It is discharged over a rim of crystalline limestone, and the bed of the brook falls rapidly after leaving the lake, so that an artificial drain could easily be cut, which would dry a great extent of the marl, a large quantity of which, however, could be dug out of the lake without draining at all.

In the upper end of Mink Lake, north of the Bonnechère, near Jessop's Rapids, a deposit of marl extends out upwards of a quarter of a mile, where it has a thickness of more than nine feet, with two feet and a half of water over it, while there are only eight or ten inches of water nearer the shore. Other bays in the lake are also provided with marl bottoms. The length of the lake is about three miles, and a shoal composed of the marl exists in the middle of it. At the outlet the water runs rapidly over boulders for the distance of a quarter of a mile, and there would be little difficulty in draining a few feet of the lake, and laying bare a large quantity of the marl.

Peat.

The improvements which have within a comparatively recent period been effected, in applying peat to various economic purposes as a factory fuel, renders it a substance worthy of particular attention in a country like Canada, of which the geological structure seems to promise so little in respect to the existence of coal, while its climate will indispensably require so large a consumption of its growth of wood for domestic comfort merely. Prepared in a particular manner, and reduced in bulk by pressure, peat is found economical in steamboat navigation, even occasionally in comparison with pit coal. Peat and peat coke are used in several parts of France and Germany with advantage over wood charcoal, in making and refining iron; and it has been so clearly shewn by Sir Robert Kane in his work on the Industrial Resources of Ireland, that it may be applied there for the production of metal equal to that of Sweden and Russia at less than one-third to one-half the cost, that a movement seems to be taking place with a view to the establishment of iron smelting works in some parts of the Island.

It exists in several places in the valley of the Ottawa; but an adherence to a definite line of exploration rendered it impossible to penetrate in a reasonable time, to many of the localities in which it was reported, the very nature of the deposits causing their vicinity to be avoided for settlement, and making them difficult of access. In the flat country between the Ottawa and the St. Lawrence, peat occurs in some abundance in several of the extensive swamps in which the rivers have their sources. There is said to be a considerable area of it in the rear of the Seigniories of Vaudreuil and Rigaud; in Caledonia, where it does not appear to have a much greater thickness than three to four feet; at the sources of the Pain River, in Roxburgh, Osnabruck, and Finch; at the sources of Bear Brook, in Gloucester and Cumberland; and in Gloucester, Cumberland, and Clarence, where it constitutes some parts of the extensive flat and probably swampy district, called the Mer Blue, between Bear Brook and the Ottawa. It is met with also in three extensive patches of 1,000 to 3,000 acres in Nepean and Goulbourn, one of them to the east, and two to the west of Richmond; again in the eighth range of Beckwith, east of Mississippi Lake; and an area of about 3,000 acres occurs in Westmeath, in the rear of front A, and the first to the fifth concessions immediately behind it. To determine that the peat in all these localities is fit for fuel, would require a more detailed investigation than has yet been bestowed upon it. But where not suitable for fuel, it will still be applicable to agricultural purposes, as manure, when the country is more extensively cleared and cultivated.

Mineral Springs.

A considerable number of mineral springs are met with in the valley of the Ottawa, the chief part of which, in so far as they have come to my knowledge, are confined to the district underlaid by the unaltered rocks of the series which has been given, and particularly to the calcareous portion of it. Those exceptions, which are found in the metamorphic rocks, are in general so very weak to the taste, that they might be passed over without observation, were not the attention sometimes drawn to them by the fact of their being so well known to the hunters of the forest as deer-licks, as to render it probable that some mineral peculiarity must belong to them. In the Appen-

dix is a list of all, both weak and strong, in the valley of the river and its tributaries, of which the existence has been ascertained, either from report or inspection. The true qualities of the chief part of them have yet to be determined by a proper chemical analyses. The late Chemical Assistant to the Survey was instructed to examine some of them, and specimens of the waters of others were placed in his hands, but I regret to state that no quantitative analyses have been returned to me. In the meantime they are arranged under the heads of sulphurous, saline, and chalybeate, according to the description received of them, or the results given by the few that have been tested.

I have the honor to be,

Your Excellency's most obedient servant,

W. E. LOGAN,

Provincial Geologist.

REPORT

OF

ALEXANDER MURRAY, ESQ., ASSISTANT PROVINCIAL GEOLOGIST,

ADDRESSED TO

W. E. LOGAN, ESQ., PROVINCIAL GEOLOGIST.

MONTREAL, 29*th April*, 1846.

SIR,

I have the honor to submit to you the following Report of Progress made by me in connection with the Provincial Geological Survey, since receiving your instructions at Montreal on the 14th of June, 1845.

In compliance with your directions, the past season has been employed in examining certain portions of the Eastern Peninsula of the Province, situated between the Bay Chaleur and the Gulf of St. Lawrence; and surveys of three of its principal rivers—namely, the Matan, Ste. Anne, and St. John—have been accomplished.

The triangulation, commenced the previous season at Cape Chat, and afterwards continued across the Peninsula, was considerably extended; by which means, together with the measurement of the rivers, some important geographical information has been acquired.

The measurement of the rivers was effected, as in the surveys of the Chat, Cascapedia, and Bonaventure Rivers, the previous year, by Rochon's micrometer telescope, the courses being determined by

a Schmalcalder's prismatic compass; while a good theodolite, recording to single minutes, was used for the admeasurement of angles in the triangulation.

The survey was connected with that of the former season, by measuring a base line, nearly three miles in length, on the summit of a lofty mountain rising over the Ste. Anne River, from which we were enabled to fix our relation with certain well known points already determined—among them the Flag-staff Peak—and thereby our relation with Cape Chat; and having by the same base on the mountain, determined the mouth of the Ste. Anne River, the results of the survey, judged of by the agreement displayed, in respect to these two points, between it and Captain Bayfield's excellent Chart of the coast, afford another satisfactory proof of the accuracy attainable by a careful use of the micrometer telescope by which our base line was measured.

Specimens were collected of such rocks and fossils as were supposed to be necessary to illustrate the structure of the country; and some samples of mineral water were procured for analysis, which were forwarded to Montreal, and have since been deposited with the rest of the Provincial collection.

In consequence of the singular inclemency of the weather during the greater part of the month of August and the early part of September, much detention was experienced while we were engaged with the survey of the Ste. Anne, particularly while stationed on the mountain, where the triangulation was carried on; where for days together we were completely enveloped in clouds of dense mist, or torrents of rain, and it was only by narrowly watching the changes of the wind, which when it veered to the northwest generally cleared the air for an interval, that, by hurrying to our stations, and seizing the favourable moment, we at last succeeded in completing our observations.

Such detention, occasioned by similar causes, occurred frequently also while we were occupied in other parts of the mountain range; and in consequence it was nearly the middle of September before we eventually returned to Ste. Anne. Finding it here impossible to supply ourselves with new canoes, while our old ones were worn out, and quite unfit to encounter another river, and the season being

now far advanced, it appeared to me to be necessary to abandon the proposed survey of the Magdalen, and to proceed direct to Gaspé. From this, after equipping ourselves with new craft, we ascended and surveyed the St. John, with which our labours terminated about the middle of October.

It was my intention, had the weather been of a character to favour the attempt, to have again ascended the Bonaventure, and continued its survey, from the point we had reached the preceding season, to its sources; but shortly after arriving at Paspebiac, winter appeared to be so decidedly set in, that it was considered advisable to relinquish the undertaking, and to return homewards without delay.

TOPOGRAPHICAL DESCRIPTION OF THE RIVERS AND INTERIOR OF THE PENINSULA.

The Matan River falls into the St. Lawrence in lat. 48° 51′ N. long. 67° 33′ W., according to Captain Bayfield's Chart, about sixty miles below Bic Island, and thirty-five miles above Cape Chat.

A lagoon, comprising an area of about forty-five acres at the mouth, is separated from the Gulf by a long and narrow gravel barrier, at the western extreme of which there is a channel, measuring 363 feet across, by which the water of the river escapes to join that of the St. Lawrence. Schooners and other small vessels can pass through this channel, and when within, find a snug harbour, but the approach from without is dangerous, in consequence of a sand bar which is formed nearly opposite the entrance.

About three quarters of a mile south from the entrance, the basin contracts to a breadth of from 400 to 500 feet, the river falling rapidly into it, and at a little distance up from the head of the basin, a saw mill having been established there, the river is crossed by a dam, extending from bank to bank, which gives a fall of ten or twelve feet. Taking the mill dam as a starting point, the total measured distance on the Matan, including three lakes at its head, was a little over sixty miles; the upward courses of the stream, without attending to minor turns, with the measured and straight distances to the different and most remarkable points, being as follows:—

		Measured. Miles.	Chains.	Straight. Miles.	Chains.
From mill dam to Buteau's Brook, left bank,	S. 28° W....	9	31	6	54
From Buteau's Brook to Little Matan, right bank,	S. 45° E.....	8	98	5	67
From Little Matan to Tawagadee, left bank,	S. 20° E.....	11	45	7	15
From Tawagadee to Trout River, left bank,	S. 68° E.....	12	75	8	53
From Trout River to foot of Lower Lake,	N. 80° E.....	10	0	7	36
From foot of L'r Lake to head of U'r Lake,	N. 7° W...	7	55	6	15

Buteau's Brook, Little Matan, Tawagadee, and Trout River, are local names by which the principal tributaries are known to the Indians and others who frequent this region; they each join the river at one of its principal bends.

The height of some of those points above the level of the sea, at high water mark, was approximately determined by barometrical observations, and stands thus:—

	Feet.
Little Matan	176
Tawagadee	246
Trout River	433
Foot of Lakes	634
Head of Lakes	721

By this it will be observed that the average fall of the river amounts to about twelve feet per mile; but as these elevations are dependent upon observations by a single barometer, the results are not to be taken as precisely accurate. Judging from the general rate of the current, they may probably exceed the truth. The area of the three lakes at the head of the main branch of the Matan is about 667 acres, viz. :—

	Acres.
Lower Lake	400
Middle Lake	91
Upper Lake	176
	667

Taking its rise in the country to the north of the Notre Dame Mountains, where the uppermost of the three lakes is situated, the main branch of the Matan flows south, cutting a deep gorge through the range, which is occupied by part of the middle and the whole of the lower lakes, with their connecting stream. It then runs westerly, between the southern base of the mountains and an escarpment of limestone, to the Trout River branch, which discharges into it a large body of water. Thence sweeping around the western

extremity of the range, nearly opposite to the Tawagadee branch, it afterwards pursues a northerly course to the junction with the St. Lawrence. With its tributaries, the river probably drains an area of country extending over about 800 square miles.

The Ste. Anne River joins the St. Lawrence in lat. 49° 10′ N. long. 66° 28′ W., eleven miles below Cape Chat. The total measured distance up its stream was rather less than thirty-two miles, the river beyond that distance being found too broken and rapid to admit of a further ascent in canoes. The first general course from the mouth was S. 5° W. for a distance of thirteen miles, sixty-six chains, (ten miles, thirty chains, straight,) when it reached the base of the Notre Dame Mountains,—then S. 70° E. ten miles, eight chains, (eight miles, forty chains, straight,) falling very rapidly along the northern base of the range. At the end of the distance, it is joined by a branch from the north called Marten River, and then, turning S. 43° E., it bears that course for seven miles and fifty-eight chains, (equal to six miles straight,) to the end of the measured distance, where it splits into two streams, of about equal size; one sweeping round the great mountain from which we triangulated the surrounding country, and taking its rise from a lake about twelve or fourteen miles to the southward; the other, after an easterly course for three or four miles, bending round to the northward, and, after dividing into several minor forks, terminating among the mountains. The breadth of the stream below the junction of the two branches was about 190 feet, and the estimated height, at the same part, was 620 feet, giving an average fall of nineteen feet per mile; but by far the greatest part of the fall is included within the latter two courses, the first having comparatively a gentle current. The area drained by this river is probably upwards of 300 square miles.

One of the most remarkable features of the Gaspé Peninsula, is the chain of the Notre Dame Mountains. Its western extremity comes to within two miles of the eastern bank of the Matan, bearing from the mouth of that river S. 25° E., at a distance in a straight line of about twenty-one and a half miles. Its breadth does not here exceed two miles while the summit heights are on an average, about 2,000 feet above the level of the sea. The mountain range runs nearly due E. and W. magnetic, and it increases between the Matan and Ste. Anne in width and elevation, advancing eastward. At the Lakes of Matan it occupies a width

of four miles, and the highest summits are about 2,700 feet; while at the Chat, where this river intersects the range at the Old Man and South Mountains, as ascertained the previous season, there is a breadth of six miles, the most elevated peaks rising to upwards of 3,500 feet. From this until striking the Ste. Anne the highest summits on the northern crest maintain a pretty uniform elevation, and still bear directly east; but beyond that point the range appears to split, and after the valley of the river takes its upward turn S. of E., the highest summits on its south side recede from it three or four miles, while a range commencing on the north makes rather to the N. of E. for the lake at the head of Marten River, and appears to run ultimately to Mont Louis, on the coast.

At the Forks, where our measurement terminated, the deep valley, which cuts the chain, is rather wide. On the east, elevated mountains rise up, probably in continuation of the main chain, running on in that direction, and a spur from them, bounding the valley of the St. Anne in its southern turn, separates its waters from those of the Magdalen. On the west, a vast mountain rises over the Forks, which on ascending, we ascertained by barometrical observation, to attain an altitude of 3,224 feet above the point where we left the river, or 3,778 feet above the level of the sea. This mountain was named "Mount Albert," in honour of His Royal Highness Prince Albert, as it happened to be upon the anniversary of his birth-day, the 26th August, that we scaled its side. The summit is a barren waste, extending over an area of between seven and eight square miles, the most elevated parts being on the N. E. and S. W. extremities, from each of which the surface slopes gently towards the centre, where it is frequently soft and boggy, producing a short wiry grass, almost the only trace of vegetation met with.

From the highest point on the southwestern extreme, we had a commanding prospect of nearly the whole western range of the mountains, among which the lofty summits of the Flag-Staff Peak, and Mount Bayfield, were distinctly recognizable. The valleys of the upper branches of the Chat and Cascapedia lay to the west and south of us; and while many of the mountains of Gaspé and Bonaventure were presented to us on the southeast, the panorama was bounded on the northeast, by the range separating the waters of the Ste. Anne and Magdalen. From the northeastern station, the same Ste. Anne and Magdalen Mountains bounded our view eastward,

and the same peaks in Gaspé and Bonaventure were seen southeast; many of the same mountains to the westward; but northward of west the St. Lawrence to its northern shore was spread out, and the valley of the Ste. Anne could be traced extensively, while immediately below us, we could here and there distinguish its rapid torrent rushing along among the rocky cliffs.

Pools and springs of excellent water are observed in almost every direction over the bare surface of the great mountain, supplying numerous brooks and streamlets, several of which, uniting on the southeast side, form a considerable body, which flows rapidly in a deep gorge to the eastward, and joins the main south branch of the river; others, running to the northward, empty themselves into the main stream below the Forks.

Between Mount Albert and the eastern part of the high continuous chain from the Chat, the mountains do not appear generally to exceed from 2,000 to 2,500 feet in elevation, and have frequently small lakes on their summits; they stand at a distance of two or three miles south from the river. Crossing this part of the country from a point about two miles below Marten River, and pursuing a S. S. W. course along the banks of a small brook for a distance of about three miles, we came to a ridge separating the waters of the north from those of the south side of the Peninsula. On the opposite side of the water-shed, we followed the course of a brook flowing southerly, and keeping a parallel course for about one and a half or two miles, struck a lake, which we supposed to be at the head of one of the main branches of the Cascapedia. This lake measures rather upwards of two miles in length, the general bearing down it, being S. 60° W., and with an average breadth of about seventeen chains, it contains an area of about 290 acres. A stream flows from the S. W. extremity, measuring about 60 feet across, probably belonging to the Fork, observed the previous year to fall into the Cascapedia, about six miles below the Conical Mountain. The farthest point to which we could trace the valley of this stream by the eye bore, by compass from the lower end of the lake S. 65° W., and might be about three and a half or four miles from us. The position of the lake was ascertained from the summit of the hills that rise over its banks, by bearings to several different points already determined along the western range.

The whole of the range west of Mount Albert is covered with forest, except on the extreme summits of the highest mountains, which are bare rocks. The growth on the more elevated plains is chiefly dwarf spruce, and in smaller proportion white birch trees of diminutive size, standing widely apart, the intervals being generally carpeted over with a luxuriant growth of tall ferns. The mountain sides lower down are clothed with balsam fir, spruce, and white birch, with a few white pine and black birch trees at wide intervals, and cedars in the moist places. Mount Albert itself is almost entirely, both on its summit and its sides, a vast bare rock, while the mountains to the east of it, lying between the Ste. Anne and the Magdalen, seem likewise for the most part to be destitute of vegetation.

The country generally to the north of the great mountain range consists of a series of ridges running parallel to it and to one another, which decrease in elevation as they advance to the westward and as they approach the shores of the St. Lawrence. These ridges are entirely covered with a dense forest, consisting of balsam fir, spruce, white black and yellow birch trees, white pine, and white cedar; maple, elm, and ash likewise occur, but are comparatively rare. Pine trees of good size, and many groves of fine spruce, occur upon the hills, near the banks of the Ste. Anne and Chat, but on the main branch of the Matan such timber, although not altogether absent, is rare. This is the more to be regretted, as it affords facilities for *driving* far superior to any other river on the south coast of this part of the St. Lawrence, being easily accessible to the highest of its lakes.

Except on the flats, and on the low lands near the shores, the soil appears to be of a very light description, and holds out but few inducements for agricultural improvement; on them the quality is frequently very favourable, and of this the settlements at Matan, Ste. Anne, and Cape Chat are examples. South of the mountain range, on the Matan, the size and character of the forest growth indicate a better description of soil than on the north, and the country being less broken or mountainous than that to the eastward, might, were it less remotely situated, be cleared and cultivated. Hitherto it has been but rarely visited, except by Indians or hunters in pursuit of fish or furs. Game abounds through the whole of

these forests, and the rivers are amply supplied during the summer season with fish and water-fowl. The Chat and Ste. Anne abound with the finest description of salmon and sea-trout; but since the erection of the saw mill, being unable to get over the dam, they have entirely disappeared from the waters of the Matan, where they are said to have formerly been more numerous than in any other river on the coast.

The St. John or Douglas Town River falls into the Bay of Gaspé, in lat. 48° 46′ N. long. 64° 30′ W. At the mouth of the river there is a wide open bay, occupying an area of between two and three square miles, which is entered from the sea through a channel 365 feet across, between two sand barriers, one joining the main land on the south, at the village of Douglas Town, the other on the north side, near the road to Gaspé Basin. A solid jam of drift wood has blocked up the river about two miles above the head of the bay, diverting the current across the low flat land of the intermediate shore, which it intersects with innumerable channels, cutting it up into a cluster of islands. Through this labyrinth, the experience of those acquainted with the river was found absolutely necessary for guidance; but after passing the jam, there is no further impediment to the ascent of the river in canoes, so far as our survey extended. The total measured distance along the course of the stream was forty-eight miles, seventeen chains, in a general bearing upon N. 71° W. Above this, the valley takes a N. W. direction, and I was informed by the Indians, who were acquainted with the country, that the river branches off into several small streams at a distance of about three or four miles above the point we reached, ultimately terminating among the mountains, near the sources of the Bonaventure, and Southwest River of Gaspè. Where we stopped, the river had a breadth of about sixty feet, but, increasing in its downward course proportionally with the supply from its tributaries, it was at a short distance above the jam upwards of 300 feet across. The estimated average fall in the whole measured distance was thirteen feet per mile, the height of the highest point being 643 feet above the level of the sea.

There are four considerable tributaries to the St. John; two joining it within the first seven miles from the mouth, the other two at the respective distances of thirty-nine and a quarter and forty-six and a quarter miles from the entrance, and all coming from the south,

besides many smaller ones falling in on either side. The two upper Forks are supposed to take their rise very near the sources of the upper N. E. branch of the Bonaventure, and the lower of the two sweeps past the western base of a mountain known by the Indians by the name of " Mount Alexander," one of the high points fixed in our triangulation from Mount Albert.

The lower part of the river, for a distance of about thirteen miles, flows through a level country, producing white pine, spruce, and a species of larch, frequently of considerable size and of valuable quality; balsam fir, cedar, and three varieties of birch, with maple, elm, and ash, in less abundance. But where the country has been denuded of its original timber by the ravages of fire, which has run over a very large area, a thick growth of small trees occupies the surface, chiefly white birch and pine.

A range of hills bounds the southern extent of this flat tract, commencing near the sea coast at Malbaie, which, running in a N. W. direction, and gradually approaching the river, strikes it at the end of about thirteen miles of its upward course. On the north side of the river, the country continues to maintain its level character across to the Southwest River of Gaspé; and, appearing to be covered with a good soil of sandy loam, it is doubtless well qualified to be brought into a state of cultivation, and might probably become as valuable an agricultural tract as any in the Peninsula.

The whole of the upper part of the stream flows through a mountainous region; the valley in some places is wide, with extensive alluvial flats, which occupy the intervals between the river and the mountains, while at others it contracts to a deep narrow gorge, the hills rising precipitously over each bank to the height occasionally of 300 or 400 feet. The hills increase in elevation with the ascent of the stream, and the highest we ascended measured 845 feet above the level of the sea. From the hill which rose directly over the point where our survey terminated, we saw Mount Alexander bearing directly south, which, by its long and straight roof-like top, as well as superior elevation, was easily distinguished as one of the most conspicuous points seen on our eastern horizon from Mount Albert.

A vast portion of this region, including nearly the whole of that part of the river flowing among the mountains, and the eastern country between Mount Alexander and the upper Forks, has been

completely denuded of its forest by fire, and the hill sides, being covered over with bare poles and charred logs, among which no new growth has hitherto sprung, saving a few short shrubs and berry bushes, present a very dismal and dreary scene, and render travelling almost impossible.

COAST SECTION BETWEEN CAPE CHAT AND RIMOUSKI.

The " pillar sandstones," described in last year's Report, were observed to occupy the greater portion of the coast between Cape Chat and the small settlement of Little Matan, where they disappear, and the coast is bounded by high clay banks, or sand and gravel beaches, concealing the older strata altogether, but about four and a half miles above the Great Matan River the upper members of the same formation are found associated with red, green, and black shales. Again disappearing about one mile to the east of Little White River, they are not seen any more till getting to Little Metis, where they are displayed in considerable thickness, and continue to occupy the coast, towards the Great Metis River. Here they are succeeded by red and green shales, and these hold the coast line, which runs directly on their strike, as far as the Village of Rimouski.

The character of this sandstone formation, wherever it was observed, but especially at Little Metis, partakes very much of the same peculiarities, for which it was remarkable, as displayed below Cape Chat. Its colour is usually of a greenish tinge, and it varies in texture from that of a fine conglomerate to a fine-grained sandstone. The aggregate is chiefly siliceous, holding flattened patches of black shale, and the surface of the rock often displays a spotted appearance, occasioned by the presence of numerous small pebbles of white quartz. The rock likewise has a tendency to wear away into pillar-like shapes, when the strata are highly inclined; and the same description of cellular fretted surfaces were observed to occur in this locality as at Turettes and Cape Chat. No opportunity offering to obtain a measurement of these rocks, their thickness is uncertain, but at Little Metis the amount must be of considerable importance.

The shales which rest upon the sandstones are either red with green stripes and spots, red altogether, red and green alternately, or green in colour, and overlying them were occasionally seen some shales of a dark-gray or blackish colour, containing thin beds and

nodules of limestone. The whole appear to be of inconsiderable thickness, but we were unable to ascertain it, owing to the violent disturbances by which the strata have been twisted and broken. Within the distance of about two miles, between the River Matan and Little White River, the rocks are seen to be affected by several undulations, and are frequently broken by small faults, generally running in a N. W. and S. E. direction, slightly oblique to that of the stratification.

Proceeding westward along the coast towards Little White River, the strata are concealed for about one mile, up to the mouth of that stream, where a brecciated rock presents itself, composed of irregular sized and angular pieces of limestone, sandstone and shale. The general colour of the rock is a drab or gray, spotted with patches of black shale, and frequently streaked with rusty stains, occasioned by the decomposition of iron pyrites, with which it abounds. The fragments of limestone, forming part of the mass, are gray or dark-blue in colour on fracture, and are usually hard and compact. The sandstone fragments are of a greenish tinge, and resemble the varieties of the pillar sandstones in texture and appearance, from whence they probably may have been derived. The general colour of the shale patches is black, occasioning the spotted appearance already referred to. Many of the fragments, particularly among those of limestone and sandstone, are upward of a foot in diameter, and are frequently over twenty pounds in weight; but the average weight of the pieces, which chiefly compose the aggregate, is probably not more than three or four pounds. The thickness of this breccia band, at this point, is about twenty-five feet, and it dips $97° < 85°$. It has well defined planes of cleavage, of which the underlie is $340° < 52°$, cutting through the harder and softer materials indifferently, and the divisional surfaces are usually encrusted with a thin coating of calcareous spar.

Besides this strong band of breccia, there appear to be some minor beds of similar character, associated with black or dark-green pyritiferous shales, interstratified with beds of blue limestone. These are seen up the Little White River for about 100 yards, and at the end of that distance there is a cascade of about twenty feet in height, breaking over brecciated beds dipping in the direction 150°, the strata nearly vertical. No fossils whatever were observed among any of these rocks.

RIVER SECTIONS.

The rivers on the north coast of the Peninsula, running for a considerable portion of their course directly transverse to the general strike of the stratification, afford the best, if not the only, means of obtaining exposed sections of the older rocks in the interior; the whole country elsewhere, except on the summits of the highest mountains, being clothed with a dense forest; but as even on the rivers the exposures are but partial, their banks being frequently, for long distances, composed of drifted material, or overgrown with shrubs and trees, it is a matter of the greatest difficulty to establish a regular order of superposition; and there is to be added to the perplexing embarrassment, resulting from the nature of the surface, the usual difficulty incident to a geological examination of a highly disturbed and altered region.

For the sake of distinction and convenience, we may divide the rocks that have been examined, into four groups:—

1. Red and green shales, black and dark-green shales with calcareous bands, and brecciated limestones.
2. Metamorphic rocks of the Notre Dame Mountains.
3. Gaspé limestones and shales.
4. Gaspé sandstones.

1. The first group occupies a breadth on the Matan of twenty-one miles; on the Chat twelve miles; and on the Ste. Anne from twelve to thirteen miles.

On the Matan, red shales occur in two different places; one about three and a half miles below the tributary called the Little Matan, the other about one and a half miles above it. They are usually striped or spotted with green, and are associated with shales altogether of that colour. The red colour is less bright than that displayed by the shales on the coast, but the rocks otherwise bear a general resemblance to one another; nevertheless, as the sandstones which underlie the coast shales were nowhere recognized on the river, it is impossible to say with certainty that they are the same part of the formation, although there appears to be some evidence to suppose such to be the case. Superior to the red shales, the most conspicuous and well marked rock in this group, is a brecciated limestone conglomerate, corresponding in its constituent parts with the rock seen at the Little White River, which, though of little

importance as regards its thickness, is remarkable for a uniformity of character wherever it has hitherto been observed. Ascending the Matan, it is first seen about two miles above the entrance of that river, the main band being about twenty or twenty-five feet in thickness, underlaid to the north by black or dark-green calcareous slates, which are interstratified with thin beds of blue limestone, and a few minor beds of brecciated limestone, while over the main brecciated band there is a limestone bearing in some degree an oolitic character, succeeded by dark-blue calcareous slates. A short distance above the Little Matan, large angular masses of breccia in the river, indicate the probability of the same parent rock occupying a position somewhere in the centre between the two exposures of the red and green shales. Its presence is again indicated at the northern base of the Notre Dame Mountains, though it is not there well exposed.

Corresponding with the position on the Matan, calcareous breccia occurs on the Chat, from five to eight miles up that stream, resting upon red and green shales which are underlaid by the pillar sandstones. The thickness of the breccia is there about twenty feet, and the character of its associated rocks is much the same as before.

About six miles up the Ste. Anne a breccia occurs, composed of large flattened pieces of limestone and black shale, and gray or greenish coloured fragments of an arenaceous rock in smaller quantity, in one strong band, and in a few minor ones interstratified with black shale, resting on dark-gray or black slates, holding in the upper beds numerous nodules of dark-blue limestone, some of which are as large or larger than a thirty-two pound cannon shot. Both the shales and the brecciated conglomerates hold great quantities of iron pyrites, sometimes in the form of balls or nodules, and at other times in aggregated crystals. The predominant colour of the breccia is a dark-gray, and it is spotted with the dark shale, and pieces of sandstone weathering rusty brown. These rocks occur again in exactly the same order, and bearing identically the same character, at the bend which the river takes to the eastward, at the base of Notre Dame Mountains, and their outcrop may frequently be seen, for a distance of about nine miles above that point, the course of the river being nearly along the strike of the stratification.

The remainder of the breadth occupied by this group, displays dark-green slates, or indurated black shales, frequently interstratified

with beds of dark blue, generally bituminous and siliceous limestone. In one instance, black bituminous matter resembling coal in appearance, was found in the cracks of a blue limestone which underlaid the brecciated rocks.

The resemblance which exists between the brecciated band, with its associated rocks, and the rocks on the coast between Ste. Anne and Cape Chat, as described in the previous Report, suggests the probability of their being identical; but if such be the case, it must follow that the rocks at Ste. Anne are completely overturned, shewing an inverted dip, as there the conglomerates appear to plunge below the pillar sandstones, whereas in the position they occupy in the river sections on the Matan, the Chat, and the Ste. Anne, they appear to be above them. Such facts indicate a very corrugated condition of the strata in the country north of the mountain range. In every part of the region there is evidence of vast and violent disturbances, and in some sections exposed on the Matan, as in many of those observed the previous year on the coast, a complete inversion of the strata is traceable on the face of the cliffs.

The limestone beds having an oolitic appearance, mentioned as sometimes associated with the brecciated rock, are of good quality for burning into lime, and on the Matan have been quarried and used for that purpose. Among the black slates, tolerably good roofing material may occasionally be found. One locality where this might be procured, is a short distance above the Tawagadee, on the Matan.

2. The character of the range of the Notre Dame Mountains, from the Matan to Mount Albert on the Ste. Anne, exactly corresponds with the description given in last year's Report of the mountains of the Chat. The colour of the rocks is invariably more or less green, resembling the green of epidote. In some instances they are of a pale yellowish-green, striped or mottled over with red jaspery patches, and are very hard, compact, and siliceous. At other times they are found of an olive-green colour, as a fibrous splintery slate, and occasionally they possess a character allied to mica schist. Talc and steatite were sometimes observed among loose fragments on the surface. Wherever the inclination could be determined, it was invariably found to dip to the southward at a very high angle, or to be quite vertical.

Mount Albert is composed of a dingy-green and brown or buff-coloured micaceous earthy trap, which in many parts is strongly magnetic. This trap is bounded on its northeast edge by a ridge of black hornblende slate containing garnets, which dipping 204° < 45° appears to plunge below the trap; and on its northern side by green siliceous metamorphic slate, of similar character to the slates which compose the greatest proportion of the rest of the mountain chain. Veins of rotten jasper intersect the trap, one of which was observed on the south side of the mountain, at the place occupied as a station there. Boulders of red syenitic rock, sometimes of large size, weighing probably three or four hundred pounds, but more frequently smaller, and a few of red indurated slate, almost converted into jasper, were found in the brooks which descend the mountain sides, and in the bed of the main river. The former of these is almost wholly composed of small crystals of red feldspar and translucent white quartz, and was supposed to be derived from veins intersecting the mountain mass, but neither the syenite nor the jaspery slate were found *in situ*. The red slates, and the mountains themselves, may probably be found to belong to the stratified group already described, in an altered mineral condition, but our evidence is still insufficient to state such to be the case with certainty.

3. The calcareous and fossiliferous group which was last year observed at the Forks of the Chat, resting on the southern base of the mountain range, strikes from them nearly due west (magnetic,) and occupies a similar relative position to the range, on the south bank of the Matan. At the bottom of the group, there is a band of white quartzoze sandstone spotted with red ferruginous stains and weathering of a rusty yellowish colour; it attains a thickness of about seventy feet at the mouth of the Tawagadee, and shews an occasional outcrop on the Matan, between that tributary and Trout River. The latter stream, intersecting the group, exposes a section of the lower members of the calcareous portion of it, about 500 feet thick, consisting of beds of blue limestone, occasionally containing a few fossils, and gray calcareous shales, with thin blue limestone bands. The dip of the lowest beds seen on Trout River was found to be 164° < 54°, but at the end of the section the inclination decreases to 28°, and probably becomes nearly horizontal to the southward, corresponding with the level character of the country. The limestone escarpment rises boldly over

the south bank of the Matan, between the Trout River and the lake gorge, to the height of 500 or 600 feet, and the upper part of the ridge is composed of massive beds of blue or gray limestone, holding numerous fossils, which however are generally in a very obscure condition; among the fossils were observed *Conularia, Leptena, Atrypa, Spirifer,* numerous univalves, (principally of one species,) and a few orthoceratites and encrinital columns. Both the sandstones at the bottom and the limestones at the top might become serviceable for building purposes; but I am inclined to think the latter to be generally too siliceous to be capable of being burnt into lime.

Near the source of a small brook, which falls from the limestone ridge, and joins the Matan about five miles above the junction of Trout River, some springs of a mineral character were observed; a strong sulphurous odour was perceptible on approaching their issues, and there was an incrustation of a yellowish white material, sometimes varied with a pinkish tinge, around their edges, and in the bottom of the brook for a short distance below where their waters united; the water was limpid and the mineral taste very weak; a feeble evolution of gas was perceived at intervals of several minutes, and their temperature at mid-day was 48° Fah., while in the open air the thermometer stood at 66°. These springs are greatly resorted to by herds of caribou or rein-deer, and numerous broad paths beaten by their feet, diverge from them in all directions.

Although this group has not hitherto been met with on the south side of the Notre Dame Mountains, east from the Three Forks of the Chat, its direction at that point, which is parallel with the general run of the range, would bring it to a position between three and four miles south from the lake described as the presumed head of the north branch of the Cascapedia. But farther east the presence of trap in Mount Albert, and its probable presence in the Barn-shaped Mountain of last season, renders it not unlikely that, disturbed by volcanic action, its regularity may be discontinued. Having however no canoes on this lake, nor the means of making them, we were unable to descend the stream issuing from it, without risking the loss of much time by a pedestrian excursion, to gain the information that might have been acquired. Supposing the limestone formation to be disturbed as suggested,

dislocations and mineral veins will be the probable result, and as the rock is known to be a lead-bearing one in other places, the ores of this metal in connection with such veins might be the result. The formation is supposed to be the equivalent of the lead-bearing limestone of Wisconsin, and indications of that metal having been observed in it in the nearer locality of Gaspé, where two veins exist within the space of two and a half miles of one another, the vicinity of Mount Albert seems to be a region worthy of research.

The St. John River runs on the strike of this formation from about thirteen miles above its entrance, to the highest point we reached, nearly along the course of an anticlinal axis, which would appear by the direction of the hills, to come out upon the coast near Malbaie. The rocks displayed by the river section belong to the upper part of the series, and consist of blue hard siliceous limestone weathering dark-brown, blue and gray thin-bedded limestones, and gray calcareous shales. The thin-bedded limestones are frequently nodular and shaly, and chert is found associated with them in some parts. Some beds may be found to yield good material for burning into quick lime, but I should suppose that they are generally too siliceous to be well adapted for such a purpose. The only fossils detected in this formation on the St. John were a few fucoides, among which was one resembling the *Fucoides cauda-galli* of Vanuxem.

On each side of this valley of elevation, the strata slope at a sharp angle, dipping to the northward on one, and to the southward on the other side of the river, and are succeeded at a short distance from each bank by the sandstone formation, which chiefly occupies the interior between this river and the heads of the Bonaventure in one direction, and between it and the Southwest River of Gaspé in the other.

4. The lower thirteen miles of the St. John flows over a portion of the Gaspé sandstones, keeping so nearly in the direction of their strike, that the same beds are seen for considerable distances. On the river, the immediate junction of these rocks with the inferior limestones is concealed, but at a little distance below the point at which it probably occurs, a strong bed of drab coloured sandstone, of a moderately close texture, is seen turned up at a very high angle, the dip being 36° < 81°, but gaining on

the measures about a mile further down the stream, the inclination becomes very moderate, and points to the northward the rest of the distance towards the mouth, at an angle varying from 7° to 20°. The general character of these rocks is that of drab coloured coarse-grained sandstones, sometimes in thick massive beds, at others in thin irregular strata, interstratified with greenish-gray arenaceous shales, the sandstone beds sometimes parted by thin beds of carbonaceous shale, composed almost entirely of carbonized and comminuted vegetable remains. Various sized pebbles are frequently scattered through the sandstones irregularly, although nowhere sufficiently numerous to constitute a conglomerate. Red or brownish coloured nodules are distributed through some of the beds, from which proceed extensive ferruginous stains, and the divisional plains of the rock are generally thickly covered over with carbonized and comminuted remains of plants. Shells were likewise frequently met with, among which the genus *Spirifer* was common, and large loose masses were found on the banks and in the bed of the river, composed almost exclusively of shells inclosed in an arenaceous matrix, which so strikingly resembled the fossil bed found the previous season on Mr. Becharvaise's lot, near the Southwest Arm of Gaspé Basin, both in the character of the shells and the mode of their deposit, as to favour the probability of their having proceeded from a continuation of the same stratum.

The inferior members of the formation were seen at a turn of the river a short distance above the Alexander Fork, resting on the limestone group, and turned up at a very high angle, inclining to the southward. The lowest beds exhibited were dark-brown, hard, fine-grained, pyritiferous sandstones, having carbonized and comminuted remains of plants sprinkled over their divisional plains; they were stained with ferruginous spots and streaks by decomposing pyrites, interstratified with calcareous slaty beds, and parted by thin layers of black carbonaceous shale. These were succeeded by thick beds of a fine conglomerate, chiefly composed of small pebbles of transparent quartz and lumps of black shale, imbedded in a hard calcareous matrix.

This formation appears to occupy the greater proportion of the space between the St. John and Mount Alexander, (which from its appearance I suppose to be trap,) and thence probably across to the Bonaventure. Sandstones and fine conglomerates,

of similar character to those seen on the river, were invariably found at a short distance south from the river, and the gravel found at the mouth of the Upper Forks was mainly composed of fragments of the same description of rock, mingled with trap boulders and pebbles.

TERTIARY DEPOSITS.

At the mouths of the rivers there was usually observed a deposit of clay, generally of a blue colour, with sand or gravel over it, forming the banks. Over the clay, in some cases, as at the mouth of the Chat, marine shells were found deposited in layers: the genera *Mytilus*, *Mya*, *Tellina*, and *Balanus*, some of them apparently specifically identical with those which now inhabit the St. Lawrence, were met with at the height of thirty feet above high water mark. At the mouth of the Matan, the clay and gravel banks are upwards of eighty feet high; but I did not observe any organic remains, either there or at Ste. Anne. At Matan, a good example of the recent encroachment made by the sea, is observable in an isolated conical mound, which stands near the entrance to the river; it is evidently the remains of what at one time formed part of the bank, although now a quarter of a mile apart from it. The older residents state that within their recollection there was an area of about an acre of arable land upon its summit, on which they had seen grain growing; it is now reduced to about eight or ten square feet, and it appears by no means improbable that before many more years have passed away, the mound itself will have altogether disappeared.

These clays may be found in some instances to be of good quality for the manufacture of bricks, but I have not heard of an instance where any attempt has been made along this coast to use them for the purpose.

I have the honour to be,

Sir,

Your most obedient servant,

A. MURRAY,

Assistant Provincial Geologist.

APPENDIX.

List of various Mineral Springs met with or reported as existing on the Ottawa and its tributaries, arranged under the heads of Sulphurous, Saline and Chalybeate.

	Sul.	Sal.	Cha.
Terrebonne :—			
On the farm of Mr. M'Allister, on the Grande Côte, between St. Rose Ferry and St. Eustache, there is a spring, which is reported to have a strong sulphurous odour	1	0	0
On the property of Capt. Buchanan, about a mile westward of St. Thérèse, a well was sunk twenty-seven feet, through clay; at this depth gravel occurred, and from it issued a spring which rose up six or seven feet, with a strong sulphurous taste	1	0	0
Lake of Two Mountains :—			
On the farm of Mr. Ogilvie, of Côte des Anges, there is a spring, giving a small quantity of water with a taste of iron	0	0	1
On the property of Mr. Inglis, not far from St. Eustache and Grand Brulé, there is a spring, reported to be of saline quality.	0	1	0
On the property of the late Mr. Colin Robertson, in the vicinity of Lachute, there is said to be a chalybeate spring	0	0	1
On the Rivière du Nord, about a mile and a half below Hoyle's mills, there is a sulphurous spring	1	0	0
East Hawkesbury :—			
On the property of Mr. M'Kinnon, third (?) lot, sixth concession, there is said to be a saline spring	0	1	0
On the ninth lot, sixth concession, on the right bank of the Rivière a la Graisse, there are three springs close to one another. Two of them appear to be saline and one of them sulphurous	1	2	0

Sul. Sal. Che.

CALEDONIA :—

On the twentieth lot, first concession, are Parker's Springs, so well known to the public; one of them has been analysed by Professor Williamson of Kingston,..... ..... 2 2 0

ALFRED :—

On Horse Creek, flowing into the Petite Nation from the ninth concession, there are said to be two strong springs, one of them sulphurous and the other saline..... ..... 1 1 0

PLANTAGENET :—

On George's Lake, on the boundary between Alfred and Plantagenet, there is a saline spring, which has been analyzed by Dr. Hall of Montreal,..... 0 1 0

On a small creek on the right side of the Petite Nation, a little below Hatt's mills, there is a sulphurous spring, which is said to emit inflammable gas..... 1 0 0

On the same creek, about sixty yards below the former, there is said to be a saline spring, covered by the water of the creek..... 0 1 0

About two miles from the mills, and on the opposite side of the river, to the north of the road, there is a great deer-lick, much frequented by pigeons. The water has a slight saline taste..... 0 1 0

CLARENCE :—

On the fifteenth lot, second concession, on the north side of Cobb Lake, there is said to be a sulphurous spring, called "The Stinking Spring."..... ..... 1 0 0

On the eighteenth lot, first concession, on the south side of Cobb Lake, there is said to be a strong saline spring..... 0 1 0

GLOUCESTER :—

At the head of Bear Brook, in the rear of the township, there is said to be a sulphurous spring..... 1 0 0

On Green's Creek, sixteenth lot, second concession,(New Survey,) at the Bishop's Wells, there are two mineral springs,—one sulphurous and one saline,—and there is another lower down the river..... ..... 2 1 0

TEMPLETON :—

Within three-quarters of a mile of M'Arthur's mills, on the Blanche River, there are said to be two springs, within nine feet of one another; one sulphurous and the other saline..... 1 1 0

Sul. Sal. Cha

HULL :—

On the twelfth lot, seventh concession, immediately in the middle of the front, there is a good deer-lick. The water is slightly sulphurous. It issues from the metamorphic rocks..... 1 0 0

NEPEAN :—

On the seventeenth lot, fifth concession, there is a slightly sulphurous spring, which is a good deer-lick..... 1 0 0

BECKWITH :—

On the twenty-second or twenty-third lot, sixth concession, there is said to be a sulphurous spring : it is near Ferguson's farm... 1 0 0

FITZROY :—

On the twelfth lot, sixth concession, twenty-five yards from the seventh concession, towards the northeast corner, there is a copious spring, which is slightly sulphurous. It comes from beneath twelve feet of clay, and it is mixed with a large quantity of fresh water, which issues into the spring from the bank, it is called Grant's Spring,..... 1 0 0

On the nineteenth lot, fourth concession, there is said to be a saline spring..... 0 1 0

On the fifteenth lot, fourth concession, on Mr. Quigley's land, a saline spring issues from the base of a bank of reddish clay. It oozes from a breadth of thirty yards, but the supply at any one place is small..... 0 1 0

On the tenth lot, second concession, on the property of Mr. Gillon, there is a saline spring. It is supposed to yield sixty gallons in twenty-four hours. It is situated on the margin of a small brook, called Gillon's Brook, which flows in a dingle about twenty feet below the level of the country. The banks are composed of stiff clay. There is a slightly sulphurous spring, not far from the same place, in the bed of the brook..... 1 1 0

PACKENHAM :—

Behind the church, in a dingle, at the village of Packenham, there is a fine abundant spring, which is slightly sulphurous. It was formerly a great deer-lick..... 1 0 0

On the twenty-seventh lot, twelfth concession, on the left bank of the Madawaska, about half a mile above the mouth of the Wabolac River, there is an abundant saline spring. The soil in the vicinity is clay..... 0 1 0

Sul. Sal. Cha.

BAGOT:—

On the fifteenth lot, third concession, about a mile from the left bank of the Bonnechère, there is said to be a saline spring..... 0 1 0

WESTMEATH:—

On the twenty-third lot, sixth concession, on Tucker's Creek, a copious spring issues from the summit of a mound, which is five feet high, and is surrounded by the creek. The water is chalybeate, and leaves a deposit of the oxide of iron..... 0 0 1

In the middle of the thirteenth lot, sixth concession, there is a copious spring, which issues from the summit of a mound about five feet high and about eighteen feet in diameter at the base. The mound appears to be composed of moss, with a few twigs and small fragments of wood, all encrusted with carbonate of lime. The spring is called the Petrifying Spring. It deposits a large quantity of carbonate of lime and oxide of iron. The water has a very slight sulphurous taste..... 1 0 0

20 18 3

Since the foregoing Report of Progress was transmitted to the Government, Mr. T. S. Hunt, very recently appointed Chemist to the Geological Survey, has analyzed various substances from the Ottawa, of which mention had been made. A list of them is contained in the following communication.

To W. E. LOGAN, ESQ., *Provincial Geologist.*

MONTREAL, 20*th April*, 1847.

SIR,—A short time since I received from your hands a number of specimens of ores and mineral waters designed for chemical analysis, and have now the honor to submit the following results obtained with those from the region of the Ottawa. In the analysis of the ores from each locality, I have endeavored to select from a variety of specimens, such as would afford an average result.

Magnetic Iron Ores:—

1. Magnetic ore from Myers' Lake, Township of Shebrooke South, 100 parts of this yielded

Magnetic oxyd of iron,.....	87.00	=63.00 metallic iron.
Silica and mica mechanically mixed,	12.08	
	99.08	

2. Magnetic ore of a granular texture, with scales of graphite intermixed, from the eleventh lot of the seventh concession of Hull. 100 parts of an average specimen gave

Magnetic oxyd of iron,.....	96.09	=69.65 metallic iron.
Silica and graphite,.....	3.18	
	99.27	

Specular Iron Ore. A compact specimen of this ore from the Madawaska, on the sixth lot between concessions C and D of the Township of Mac-Nab was examined. 100 parts yielded

Peroxyd of Iron, ...	84.10	=58.87 metallic iron.
Silica,.....	4.00	
Carbonate of lime, ...	8.80	
Water by loss,.....	3.10	
	100.00	

The silica and carbonate of lime are accidental impurities, and are disseminated in little spots and veins. The ore is when pure, a peroxyd of iron only.

Bog Iron Ores. These consist of peroxyd of iron combined with water and some organic acids derived from the decomposition of vegetable substances, which are included with the water under the title of organic matter. In the analyses, regard was had to the detection of lime and manganese, but although frequently present, in no instance was their quantity sufficient to be estimated.

1. Bog ore from Petite Côte, Vaudreuil. 100 parts gave

Peroxyd of iron,.....	74.50	=52.00 metallic iron.
Alumina, ...	0.30	
Silica,.....	7.10	
Water and organic matter,.....	18.95	
	100.85	

2. Bog ore from Mr. Lancaster's lot, Côte St. Charles, Vaudreuil. 100 parts gave

Peroxyd of iron,	76.95=53.8 metallic iron.
Alumina,	0.80
Silica,	1.50
Water and organic matter,	19.80
	99.05

3. Bog ore from Upper Rocky Point, Township of Eardley. 100 parts gave

Peroxyd of iron,	57.15=40.00 metallic iron.
Alumina,	1.60
Silica,	21.60
Water and organic matter,	18.85
	99.20

Lead Ores. Specimens of Galena from the Townships of Bedford and Fitzroy, from Black River and Mr. Papineau's Seigniory, on the North Petite Nation River, have been assayed for silver and antimony: they contain neither, but are pure sulphuret of lead.

Dolomite. A specimen of a fine grained white marble from the rear of the Township of Barrie, was found on analysis to be composed of

Carbonate of lime,	53.90
Carbonate of magnesia,	45.90
	99.80

It is consequently a pure dolomite or double carbonate of lime and magnesia.

Mineral Waters. Qualitative analyses of the waters of the following springs have been made.

Grant's Spring on the twelfth lot, sixth concession, of Fitzroy. This water is feebly saline and sulphurous to the taste; when boiled, it deposits a precipitate of carbonate of lime, which in the recent water is held up by carbonic acid. It contains chlorids of sodium, calcium and magnesium, carbonate of lime dissolved by carbonic acid, and a little sulphuretted hydrogen.

Packenham Spring, in the village of Packenham. This, like the former, is slightly saline and sulphurous; it contains in small quantities chlorids and sulphates of sodium, calcium and magnesium, with carbonate of lime dissolved by carbonic acid, and sulphuretted hydrogen.

The *Petrifying Spring*, on the thirteenth lot, sixth concession of Westmeath, appears to be one in which a large quantity of carbonate of lime is dissolved by carbonic acid; it is feebly saline and contains a small quantity of chlorids, besides a little sulphuretted hydrogen. A small quantity of dissolved carbonate still remained in the specimen examined.

Tucker's Spring, on the twenty-third lot, sixth concession of Westmeath, is slightly chalybeate, and holds a large quantity of carbonate of lime in solution. In other respects it is as pure as any natural water, containing only traces of the usual chlorids and sulphates.

The two latter springs resemble each other closely in their character, and being, as I have been informed, found in the same vicinity, and with the same rocks, have doubtless a similar origin. Each spring you have informed me is surrounded by a large mound of calcareous tufa, doubtless deposited from the waters.

A specimen of water brought by Mr. Murray from a spring upon the Matan River, Gaspé, was found to be feebly saline, and to contain small quantities of chlorids of sodium, calcium and magnesium, besides a little carbonate of lime. This last ingredient is invariably present in those waters which flow through calcareous rocks, and is of little importance in a medicinal point of view. It exists as an acid carbonate, which is decomposed by boiling, the carbonate being deposited as a white incrustation. Mr. Murray observed that the water at the spring appeared to be sulphurous, but the specimen by exposure to the air must have lost all its sulphurous odor.

All of these waters are so feeble as not to be worthy of a quantitative analysis.

During the ensuing summer I shall visit some of the more important springs, with a view to collect waters for examination, and to determine their gaseous contents.

I have the honor to be,

Sir,

Your most obedient and humble servant,

T. S. HUNT,

Chemist to the Provincial Geological Survey.