TRANSACTIONS
OF THE
Nova Scotian Institute of Natural Science.

ART. I.—A MONTH AMONG THE GEOLOGICAL FORMATIONS OF NEW BRUNSWICK. BY REV. D. HONEYMAN, D. C. L., F. G. S., &c., *Director of the Provincial Museum, Halifax.*

(*Read November* 9, 1874.)

SAINT JOHN.

THIS City and its surroundings abound in the picturesque. Metamorphism, upheaval, pressure, and glaciation, have hardened, tilted, faulted, twisted, hewn, polished, and striated its ancient rocks, giving boldness to the rock sculpture, and intricacy and variety of lineament. The rock formations of the City are regarded as Huronian (Cambrian), Lower Silurian and Devonian. Carleton has Laurentian; on this the Suspension Bridge rests. Laurentian heights, separated from St. John by a valley in the rear, extend eastward, (?) westward, (?) and northward to the Kennebeckasis. I have thus indicated the four geological formations which occur in this district. In making my observations, I shall start from the Kennebeckasis. We shall thus *generally* ascend geologically. Near Torryburn we have an outcrop of grey granite. This is part of an apparent granite band, which skirts the south side of the Kennebeckasis, to some distance towards Rothsay, and then retreats south. It also runs westward, and is well exposed on the road from St. John to Sandpoint. There the rocks are Syenite, being largely granitoid. The feldspar of the Syenite is red and the hornblende light green. The granite of Torryburn closely resembles that found in the Cobequid mountains near Sutherland's lake, and the syenite (gneissoid) is not much different from that associated with the marble of Five Islands, in the same mountains, so that this granite band of the Kennebeckasis

may be regarded as corresponding with the central band of the Cobequid, and the syenite and other granitoid rocks of the Lower Arisaig series of Nova Scotia. Following the granite gneissoid syenite we have the great limestones for which the district is celebrated. These are largely crystalline; some are dolomitic. Lime is manufactured in large quantities, in several localities. One quarry on the road from Rothesay to St. John, with kilns, was examined. The limestone is bluish and not obviously crystalline. The limestone was parted by a bed of diorite (?) It was seen outcropping in all directions. Quarries are abundant, and sections are seen on the St. John and Shediac Railway; diorites are also seen in connection with the limestone. Massive crystalline crypto-diorites of the I. C. R. type are often met with. I would particularize. Near the Suspension Bridge the limestones are graphitic. The bridge on the Carleton side rests upon graphitic rock and schists. On the south side of the harbour there are eminences formed by a siliceous rock. This *seemed* to be the upper rock of the band of crystalline rocks.

I have no hesitation whatever in regarding this band of rocks as a counterpart of the Lower Arisaig series of Nova Scotia. This is the first opportunity I have had of examining a series of this kind out of Nova Scotia, with the exception of the George's Mountain series, Cape Breton. The resemblance of the Cape Breton series to that of Arisaig of Nova Scotia, is sufficiently obvious, but not more so than of that before us. The great lithological characteristics of the three series are identical, *e. g.* syenites, diorites, calcites. Each has also its lithological peculiarities. (Vide Papers by the author in Transactions of the Institute, and Report of Bayley and Matthews.) This is reasonably to be expected, as *precisely* similar conditions of formation could not be expected to exist in separate localities.

The New Brunswick Geologists seem to have established the Laurentian age of the series of rocks that we have been examining. They are older than the primordial (Lower Silurian). They are even older than another series which underlies the primordial, and which is found intervening between the Lower Silurian and the rocks in question. There are no fossils in either of the series

underlying the primordial. Their lithological character, however, is strikingly dissimilar, and therefore the descending series is regarded as established, viz: Primordial (Lower Silurian), Huronian (Cambrian), and Laurentian. I consider that from this point of view, we are led to regard the Laurentian age of the Lower Arisaig series as probable.

At Coldbrook I observed rocks strikingly different from the preceding Laurentian, conglomerates and quartzites. This is the upper part of the Coldbrook or Huronian series of the New Brunswick geologists, from what I have observed of this series, and from the described characteristics of the lower part of the same series. (Vide report of Bayley and Matthew.) I am disposed to establish a relationship between them and the conglomerates, quartzites, jaspers and crypto-crystalline diorites of the northern part of the section of the I. C. R. in the Cobequid. (*Vide paper by the author in Transactions*, 1873–'74.) This series intervenes between the Laurentian and the Primordial. It is said to extend to the cove below the Suspension Bridge, on the St. John side.

Succeeding this is the St. John Primordial (Lower Silurian) strata. These were seen outcropping on Coldstream Brook, at Iron Works. This is regarded as the lower part of the series. The corresponding part is in the cove below the Suspension Bridge on the Carleton side. Here the Lower Silurian is in contact with the graphitic schists of the Laurentian series, the Huronian being missing.

The Lower Silurian slates of the cove are peculiarly interesting, as they produced the Primordial Fauna which determined the age of the slates, and consequently the age of the series already described. This series of slates is generally dark in colour. They have been metamorphosed, and remarkably twisted, folded and faulted. The beautiful sections on the sides of the streets in St. John, show these characters in a very striking manner. The slates are also well exposed on the shore of Courtenay Bay. My attention was particularly directed to a fine exposure of crystalline rock, near the cross roads, near the old Episcopal cemetery. This rock is very dark, hard and glistening, being crypto-crystalline

diorite, precisely similar to those of fossiliferous series of the I. C. R. The St. John slates are well exposed in close proximity to the rock, or associated with it. I have already referred to this in a note on my paper on the I. C. R. sections; I have been led to regard these slates and the fossiliferous strata of the I. C. R. as belonging to the same great period (Lower Silurian.) I must at the same time acknowledge that I am rather disappointed in not discovering some lithological resemblance between the St. John slates and those of our City and environs.

On the shore of Courtenay Bay, I found *apparently* overlying the St. John slates, a dissimilar series consisting of conglomerate. Finely laminated red slate having crystalline limestone disseminated in amygdal form, silicious schists, slates and diorites. It will be observed that the lithology of this series is much more varied than the preceding.

The sequence *seems* to be regular, and therefore was once regarded by the N. B. geologists as a more recent formation than the Lower Silurian slates. It was called the Bloomsbury group, and was regarded as of Devonian age. I was guided in the examination of the locality by the paper communicated to the Geological Society of London, by Prof. Bayley and Mr. Matthew.

I may mention that although I now generally quote their *Report* of the Canadian Survey, it was only after my return to Halifax that I examined it, and compared it with my observations.

I had had so much to do with supposed Devonian in Nova Scotia, which had invariably turned out to be something else, that I could not altogether accept the rock in question as Devonian. I found however from the Report that these rocks are now regarded as of Huronian age, the regularity of sequence being only apparent: the older series having been brought up, and the seeming regularity having been induced by a peculiar folding of the lower silurian series—*the folding on itself.* (*Vide the Report.*) This arrangement was ascertained by a more extended observation.

In this way the Devonian of the locality became curtailed in its proportions. Succeeding the Huronian there is another distinct series also exposed on the shore of Courtenay Bay, consisting of

metamorphosed grits, conglomerates, sandstones, and shales. At first sight one might regard this as a hardened carboniferous series, the *black shales especially* at the top have a carboniferous aspect. This impression might be confirmed by the frequent appearance of Flora having a carboniferous aspect. The unusual hardness of the rock, especially evident when struck by the hammer, tends to unsettle this opinion. I was fortunate enough to find, and at the base of the series opposite Sheffield street, a fine specimen of the characteristic *Dadoxylon Ouangondia num. Dawson*, associated with *calamites*, &c. It was apparently in a favorable position for easy detachment. My hammer and chisel were of no service. Mr. Brittain, of the Gas Works, kindly gave me the assistance of a workman, who with crow-bar and sledge-hammer, succeeded in extracting the specimen. The rock is not distinguishable from the quartzites of our gold fields, and equally hard.

The constitution of the Fossils is also another peculiarity. The bark of the calamites at this point has the appearance of graphite, instead of coal or lignite, and the Dadoxylon, seems to be generally calcified, sometimes converted into a beautiful marble, and the bark converted into graphite; this is the case with the specimen which we extracted. In the Museum there is a beautiful polished section of a trunk, found in the same locality by Mr. Brittain. Its diameter is from eight to nine inches. It shows the internal structure of the tree very strikingly. On the south shore of Carleton there are ledges of slate which are regarded as the highest part of the series. These produce a beautiful flora of asterphyllites, cordaites and filices. The general character of the *flora* is considered to be different from the carboniferous, and is regarded by Dr. Dawson as Devonian. I received a beautiful collection for the Museum from Mr. Brittain.

Proceeding on toward Mispeck Point, we come to a very rough and rocky region. There is a great band of conglomerates, red and grey slates. These are seen traversed in all directions by quartz veins—some of them are of great thickness. They were formerly regarded by the N. B. Geologists as Devonian—(*vide Geological Journal*—paper already referred to; now they are regarded as Huronian. *Vide Report.*

Mr. John M. Walker positively assures me that he found a sight of gold in a piece of quartz in this region, some years ago. On the shores of Courtenay Bay and Carleton are seen boulders, sometimes of immense size, of a very coarse conglomerate. This is largely composed of angular pieces of limestones and diorites, in an arenaceous and calcareous cement. On the road to Sandy Point these were seen, *in situ*, succeeding (on the north) the Laurentian Syenitic gneiss, limestone and diorites, from which they have been largely derived. These conglomerates are of Lower Carboniferous age. To the east of these at Drury Cove and Long Island, the St. John slates, with primordial fossils, are said to succeed the Laurentian series. I was not aware of this when I was examining the region. I hope next summer to have an opportunity of looking at these rocks.

I have thus given the results of a personal examination, and a busy week's work among the Formations of St. John and vicinity. I do not claim to have made any new discovery. All that I profess to have done is to have scanned the work of others, and to have indicated, more precisely than was previously done, the very natural relationship of the formations in two Provinces, which require the construction of a canal to separate them; the two being more immediately connected than two parts of the same Province, Nova Scotia (Proper) and Cape Breton, which are separated by the Strait of Canso.

I cannot help contrasting this week with another spent in the same region about fifteen years ago. Then the formations were regarded as few in number, comparatively recent and uninteresting, Carboniferous, Devonian, Upper Silurian (?) and igneous rocks.

There are now sufficient number and variety, some of them dating to the remotest antiquity—Carboniferous, Devonian, Lower Silurian, Huronian and Laurentian. For the present state of things we are chiefly indebted to the zealous and successful labours of Matthew, Hart and Bayley. For guidance to localities, facilities of travel, and hospitality provided throughout my whole month's exploration, I am very much indebted to my excellent friend, John M. Walker, Esq., of St. John and Halifax. I may be allowed

to add fifteen years extra experience in the examination of cognate formations in Nova Scotia and Cape Breton as also of considerable service.

ST. JOHN TO BATHURST.

Leaving St. John by the St. John and Shediac Railway, we start from the primordial slates, traverse the Huronian and the Laurentian. The last is exposed by a fine series of sections on either side of the road. At a distance of about eighteen miles we pass into the carboniferous formation—the older formations retreating on either side. On our way we pass through Sussex Vale, with its lower carboniferous limestones having saltsprings and manganese deposits, and at length we reach the Gulf of St. Lawrence at *Point du Chene*, with its exposure of soft sandstones. We are thus on the base of the great carboniferous triangle of New Brunswick, having cut off its southern angle. From Point du Chene to Miramichi, we pass along the base by sea to a distance of about seventy miles. Reaching Miramichi we sail up the river to Newcastle, where carboniferous sandstones are seen quarried on the river bank. Driving across the country from Chatham to Bathurst, we reach the northern side of the carboniferous triangle, at the same time cutting off the northern angle.

SOMERSET VALE

was our head quarters in this part of New Brunswick. This lovely spot is the property of Francis Ferguson, Esq. of St. John. It is situate about three miles north of Bathurst. The property is of great extent—through it flows the River Tattagouche, which winds beautifully through the vale with its green meadows, fertile fields, venerable homestead and spacious buildings. The retirement and quietness of the vale with its meadows shaded by numerous and graceful elms, its fairy river, abounding in salmon and sea trout, the kindness and hospitality of Mr. and Mrs. Ferguson, with an enthusiastic disciple of Isaac Walton (Mr. Walker) supplying the establishment with salmon and sea trout, together with delightful weather, combined to make the retreat, after a hard day's work

among rocks, rivers, wilderness, horse flies and mosquitoes, perfectly enchanting.

The rocks exposed on the sides of the Tattagouche, and in a cutting of the I. C. R. beyond it, showed that we had passed the boundary of the carboniferous formation. It is to the geology of the region that the Tattagouche is indebted for its salmon-holes. These have been formed by direction given to the waters and the eddies made by jutting rocks. These rocks are slates of uncertain age; I have little doubt from their lithological character that they are of upper silurian age. I failed to discover any fossils in them. The first of the slate exposures occur a little above the Railway Bridge. Up the river about nine miles from this point are seen the Falls of Tattagouche. The rocks of the falls and on either side of the river for some distance below the falls are lofty and precipitous; they consist chiefly of red and grey slates, cave adits, and other arrangements, show that this has been the scene of mining operations. Copper and other metals were sought for in these rocks in economic quantity, but without success. These rocks also are of uncertain age; they are probably upper silurian.

I have referred to a Railway Bridge on the Tattagouche. The quietness of Somerset Vale is soon to be disturbed by the noise of the railway. The I. C. R. passes through the vale, and crosses the Tattagouche by a magnificent iron bridge. The top of it is sixty feet above the river, and seventy feet above the sea level. I give this measurement as I intend to make a practical use of it in a subsequent part of this paper.

In the second cutting across the bridge are the only remaining rocks met with in this locality. These rocks are crystalline diorites, homogeneous, porphyritic and amygdaloidal. I did not ascertain their relation to the Silurian slates of the Tattagouche. They are also seen outcropping on the post road, making themselves uncomfortably felt by the jolting of the carriage.

Exposed rocks are therefore a rarity in this region. The carboniferous rocks to the south of Tattagouche lie at a gentle inclination, and the older and harder rocks are much covered by drift. The magnificent pillars of the new bridge across the Tattagouche are

formed of fine blocks of a peculiar granite. The peculiarity arises from the prevalence of large crystals of red feldspar in a base of quartz, black mica, and red feldspar.

NEPISIGUIT RIVER.

We were urged to examine the copper mines on this river.

On our way we came to the I. C. R., about six miles above Bathurst. Here the navvies were hard at work cutting into a deep deposit of drift, consisting of the very coarsest material with overlying clays and sands. I now notice these by the way.

The principal work here is the construction of even a grander bridge than that of Tattagouche, over the Nepisiguit. The great columns are of the porphyritic granite, already described. Here they have the solid granite for their foundation. This granite is spendidly exposed on the river, and it is quarried on its sides. The granite band is exposed down the river as far as the Rough Waters, about three miles above Bathurst. Proceeding about three miles farther we cross the Pabineau river, and come to the Pabineau Falls, on the Nepisiguit.

The exposure of granite is extensive. The great riven rocks rounded, with the great rush of waters dashing and splashing, are indescribably striking. The mosquitoes came in clouds, marring enjoyment. The granite is homogeneous. We had passed over the porphyritic. I was interested in the *pot-holes*. These were hollowed out in the solid granite by the revolving of boulders by the agency of the rushing waters. Some of them are large, round, deep and entire, with the rounded boulders at rest in the bottom; others surviving only in part, the revolving and excavating boulders having worn their way out of the sides of the pots, to be hurried away with the rushing waters. I examined them and collected specimens in spite of the mosquitoes. About two miles farther we had passed over the band of granite. The bands of rocks succeeding were examined on the side of the river opposite the Copper Mines.

Owing to a disaster—the maddening of our horses by swarms of horse flies—their rushing into the water, smashing our carriage, and a similar treatment of the horse and carriage of our guide,

we were prevented from crossing the river and examining the copper mine.

In spite of our misfortune we examined the rocks accessible; characteristic specimens of rock were also brought from the mines. These enabled me to form an opinion of the rocks containing the deposit of copper. We were disappointed however in not being able to examine the mines and deposits. The prevalence of schists and magnesian rocks indicate an age and condition of formation similar to Tilt Cove, Newfoundland. I consequently concluded that the band of rocks was of lower silurian age, (metamorphic).

Afterwards, we visited the Grand Falls, about twelve miles farther up the river. On our way we glanced at the rocks on the river, as they appeared at intervals. They seemed to be similar to those of the Copper Mines; at length we reached the Falls, coming upon them from above. The scene far surpassed that of the Pabineau Falls, but our old enemy the mosquitoes, of monstrous size, and in numbers formidable, assailed in every direction, so that I could hardly manage to secure a characteristic specimen of the rocks over which the waters rushed. The rock is a schist, highly siliceous, having the appearance of an amygdaloid. Its hard constitution has enabled it to resist the degrading action of the waters; its elevation has given them great scope for descent. I had no hesitation in regarding the rocks as a continuation of the band of the mine, and as being of lower silurian age.

Subsequently we ascended the river from the bridge at Bathurst. On the sides of the river, below and above the bridge, exposed layers of a red sandstone shewed that we were within the area of the carboniferous *triangle*. Ascending the river on the south side the same kind of sandstone continued until we reached the Rough Waters. I was shewn *nodules* of copper ore (grey sulphuret) which were found in this sandstone. The ore is rich, but the supply is limited, as Nova Scotian experience, under similar circumstances, would lead us to expect.

At the Rough Waters I found matters altogether different from what I anticipated. I expected to find the granite of the Rough Waters overlaid by Lower Silurian (metamorphic) slate, as we have

already observed on the northern side, and as indicated in our geological map. Instead of this I found the carboniferous sandstone lying almost flat upon the granite with only a few feet of rotten granite intervening. I must, however, in justice state, that while the Atlas map of the Canadian Survey inserted a broad lower silurian band between the granite and the carboniferous, I afterwards found that the arrangement was well understood, as it is well described in the volume accompanying the Atlas. *Geology of Canada, page* 451.

The granite of the Rough Waters is fine grained. The constituents are the same as of the porphyritic granite of the higher waters. The large crystals of red feldspar only are absent. The arrangement of the formations ascending the Nepisiguit as far as the Grand Falls, is—

Carboniferous,	Sandstones, &c.
——?——	Granites,
Lower Silurian,	Slates, Schists, &c.

I would observe in regard to the age of the granites:—There can be no question that they are pre-carboniferous; the arrangement at Rough Waters proves this. If we regard them as intrusive then they may be of Middle or Upper Silurian, or Devonian age. I regard them as of the same age as the granite near Purcell's Cove and other localities on the North West Arm, Halifax. Halifax granite is sometimes porphyritic, having large crystals of white feldspar,—both seem to be bedded. If Halifax granite is a Laurentian gneiss, so is that of Nepisiguit. Both are associated with Lower Silurian (metamorphic.) In the western extension of this granite, Mr. Robb, of the Canadian Survey, considers that he has convincing proof that the granite is igneous. I can produce many cases at Halifax where such a conclusion seems to be inevitable.

The Rough Waters, the Pabineau Falls and the Grand Falls have given the Nepisiguit fame as a resort of the angler.

The extension of the rocks, which we have been examining on St. John River and its tributaries, and the Miramichi River, has been the sphere of the operations of Mr. Robb, of the Canadian Geological Survey.

It will be evident by a glance at the Geological map of New Brunswick, that the pre-carboniferous formations traverse the country in approximate parallels, running N. E. and S. W. The so-called central band of granite appears as one of those parallels, traversing the whole of New Brunswick. Of this the granite of the Nepisiguit is the N. Eastern extremity. Although there is nothing intervening between the carboniferous and the granite on the Nepisiguit, there is an intervention of another formation, between the granite and the carboniferous to the west. In this fossils were found, but not sufficiently distinct for determination. On the north side of the granite *graptolites* were found, but not in *situ*. It was regarded as probable that they came from the strata that occupy the position of the metamorphic slates of the copper mines, which we have regarded as Lower Silurian.

SOMERSET VALE TO D LHOUSIE.

On our way we had to pass over the crystalline rocks of the railroad cutting, north of the Tattagouche. At *Petit Rocher*, about twenty miles distant, we saw a limekiln on the road side in active operation. This led to inquiry after the position of limestone. It was seen at a short distance crossing the road. Search was made for fossils but we found none; the limestone was dark in colour. We passed over a considerable width of diorite and grits before we reached *Belledune*.

At Chambers' inn I found that the Rev. Mr. Fowler had kindly told our host to send me to the shore. I here found a very interesting series of rocks, replete with fossil-corals. I collected a large and fine specimen of *Halysites*, *Catenulatus* (chain-coral), fine specimens of *Favosites*, *Gothlandica,? Stromatopera,?* a large branching coral, gen. and spec.(?), and a beautiful *Cyathophyllum*. The rocks were singular in colour and having trap interbedded. There was no difficulty in determining their age. The *Halysites Catenulatus* indicates Niagara limestone (Upper Silurian). Prof. Hall, in a paper read before the American Association, August, 1873, "On the relations of the Niagara and Lower Helderburg

Formations," thus observes: "The upper limit of *Halysites Catenulatus*, so far as known in New York, is in the *Niagara limestone*."

Before reaching Jacquet River we observed a point with singular looking rocks; on closer examination they were found to consist of conglomerates, very much resembling the new red sandstone conglomerates of Nova Scotia. These repetitions of *post Silurian* rocks seemed somewhat perplexing, occurring in a supposed Silurian region. It was only afterwards that I found them to be carboniferous. We crossed the mountain and reached Dalhousie without understanding the character of the rocks which formed the elevation. We then crossed the Restigouche and landed in the province of Quebec, just in time to examine the rocks on the shore by twilight. We had landed among sandstones. In these I found the part of a fossil fern. I walked along the shore and examined the junction of the sandstones with the conglomerates of new red sandstone? apart by moonlight. I took note of an enormous mass of the conglomerate which had recently fallen. I retraced my steps to our boat and we recrossed to Dalhousie. Mr. Walker promised to take me to a locality where he understood that curious rocks were to be found.

Early in the morning (5 o'clock) we were found in our boat of the previous evening. We rounded the Island and landed somewhere at Cape Bon-ami. We had passed slate which seemed to be sandstone. The rocks which we first met were Traps. I had come expecting to find fossils and was rather disappointed; I could never expect to find fossils in Trap rocks. However, the rocks themselves were a study. Their rugged form and arched gateway; their columnar and amygdaloidal structure, were sufficiently interesting. Their minerals too, veins and amygdals of agate and calcites, and geodes of quartz crystal, merited attention. Beyond the first Trap, in the cove, we unexpectedly found what we most wanted—Silurian strata perfect coral reefs. *Favosites gothlandica?* in abundance, and *Cyathophylla*, *Strophomena depressa*, *Atrypa reticularis*, *Athyrus nitida*, *Orthoceras*, *Crinoidea*.

My perplexity was great, and also regrets at having before me

such a rich field, so little time, hunger an impatient companion, and a long day's journey. However, by diligence, perseverance, abstinence and good fortune, I succeeded in making a valuable and interesting collection.

I at once recognized the Niagara limestone — the C. of Arisaig—and with so good an exposure I expected to find the other members of the Arisaig series. Considering this as of even greater importance than the collection of fossils, I proceeded with the examination of the rocks. Where I expected to find Clinton strata I found Trap. In this I saw a beautiful shaped *Amygdal*, which turned out to be a fossil. *Favosites* sp? This led to a further search for fossils, and another was found; a beautiful section in a small portion of the original stratum, the slate and Trap being so closely connected that a line of connection could not be distinguished. All along the shore beyond was Trap, with intercalary beds of Niagara limestone.

These exposures seem to be cross sections of the rocks of the mountain which we crossed the preceding evening, and which I crossed on my return overland to Dalhousie, and recrossed shortly after on our way to Somerset Vale. These Trap rocks and coral reefs give boldness and variety to the scenery of Dalhousie, and fertility to the fields and meadows. The phenomenon of Fossils in the Trap shews :—

1.—That the Trap of Cape Bon-ami and Niagara Limestone are not contemporaneous.

2.—That the formation of the Trap was posterior to that of the Niagara Limestone.

3.—That the Trap was in molten state when the fossils detached from the sedimentary strata dropped into it.

4.—That organic structure may be preserved in molten Trap, especially when in a condition adapted for the formation of Amygdaloid.

POST PLIOCENE.

I have already in passing referred to a deep cutting on the north side of the new bridge of the Nepisiguit. This is in the deep drift overlying the granite. That this is the glacial drift is evident from the great coarseness of the material—the massiveness of the enclosed boulders—the want of the stratification—and the absence of marine relics (fossils).

I also noticed the first cutting across the Tattagouche.

This is of a different character from the preceding. The material here is stratified. It is of marine origin. The abundance of shells to be found in the beds unmistakably indicate the origin of the deposits. The Rev. C. H. Paisley, of Bathurst, has described the various beds as they appeared when the cutting was fresh, giving the measurements and characteristics of each. When I examined the cutting, the sides were washed and run down, consequently the thinner beds were obscured. For Mr. Paisley's description, vide Canadian Naturalist, vol. 7. 1. From 1 to 7 of Mr. Paisley's section were indistinct. 8 and 9, the two to which Mr. Paisley gives an average thickness of about ten feet, are the most interesting; these consist of clay and sand. Springs of water issuing from them, wash out the shells from the beds and expose them in the furrows. Besides shells I noticed peculiar sandy concretions washed down by the water. These were of varying shape, circular and irregular; many of them have the shape of ginger root; one of them of the *pelvis* of a mammal. The fossils which I collected out of clays 8 and 9, are the following:—

Saxicava rugosa,	*Leda truncata,*
Tellina grœnlandica,	*Buccinum undatum,*
Tellina proxima,	*Natica grœnlandica,*
Fusus tornatus,	*Natica clausa,*
Mya arenaria,	*Balanus Hamerui,*
Mya truncata,	*Balanus crenatus.*

On our way to Dalhousie, when approaching the Jacquet River, we found the road crossing the I. C. R. On the road to the right

at a distance of about a quarter of a mile, I entered a deep cutting, similar to the fossiliferous section at Somerset Vale. Here the beds were obscured, still the clays were sufficiently distinct for recognition. From these I collected the same fossils as in the preceding section.

This section is south of Jacquet River, I. C. R. bridge. To the north of the bridge I examined another deep cutting. A road bridge was in the course of construction, spanning the cutting. In this I found as before, clay with gravel and sands overlying. These beds are now somewhat famous as the sepulchre of the *Beluga vermontana* (?). [Dr. Gilpin's paper in the Transactions.] I was enabled to identify its bed by clay and fossils found in the neural arches of the vertebrae. In the clay bed of the section I found the same fossils as before.

A quarter of a mile from Dickie's, four miles farther north, I examined a deep cutting and found beds similar to those already described. In the clay bed I found fossils of the same genera and species as in the others. The fossils in the last cutting were better preserved than those found at Tattagouche. This may arise from the difference in the moisture of the clays. We have thus in a distance of eighteen miles examined four localities, all containing Post Pliocene beds of the Champlain epoch, with characteristic fossils.

I examined cuttings in the vicinity of River Charlos, but the clay beds, if they exist, did not appear. I also examined others, south of the Tattagouche, with the same result. When I was leaving Bathurst, the Hon. John Ferguson, senator, gave me a small oyster, said to be taken from beds in a cutting on his farm near Bathurst.

I have this evening directed your attention to the principal Geological Formations of New Brunswick.

These are the Laurentian; Huronian or Cambrian; Lower Silurian; Upper Silurian; Devonian; Carboniferous; Igneous; Post Pliocene.

In time we have ranged from the far remote past, to time comparatively of yesterday.

We have begun with a period when life was eozonal. Passing

through a period when life was rare and doubtful, we entered on a period which is termed Primordial, Lower Silurian, an age of crustaceans and mollusks, principally the former, having forms peculiar to extreme antiquity, living and enjoying life, where now we have the busy harbours of Saint John and Kennebeckasis, the choice waters for modern aquatic contests. We have also roamed among the coral reefs of Upper Silurian seas, with their abounding *trilobites*, *cephalopods*, *brachiopods* and *favosites*. These and their tombs give geological interest to the Bay des Chaleurs. We have wandered among Devonian fields examining their peculiar vegetation, among which sported the earliest winged insects—the remains of these are found at Courtenay Bay. From these we passed easily and naturally into the carboniferous region—the period of luxuriant ancient vegetation. In this period we saw submarine volcanoes in vigorous operation, shaking and rending the Upper Silurian foundations of the carboniferous period in the north—the ancient coral reefs being elevated, parted and broken—the coral polypedoms and their tombs are seen dropping into the molten lava, and narrowly escaping destruction.

A great leap brought us into the Post Pliocene period, with ice sheets—glaciers and icebergs—the debris of rocks accumulated in the railway path attesting their existence.

A later stage of the same period brought us into seas with their walruses, seals and cetaceans and molluscs, with specific names that chill, *Grœnlandica*, of Greenland, the land of ice. These at the same time introduce us to the *molluscs* of the time in which we live.

Art. II.—On the Smaller Cetaceans inhabiting the Bay of Fundy and Shores of Nova Scotia. By J. Bernard Gilpin, A. B., M. D., M. R. C. S.

(*Read Jan.* 11, 1875.)

In making out five distinct species of this order, I have had much difficulty from the want of material. Some species abound in our waters, but being useless, are rarely taken, and are thus