

2. The submergence of part of eastern North America, during which the marine beds of the Champlain period were formed, was not participated in by the southern coast of Nova Scotia.
3. To explain the movement of land ice from the Arctic regions southwards, it is not necessary to suppose that the continent to the north must have been greatly elevated, nor do the facts connected with the distribution of the drift agree with such a supposition.
4. That there was some elevation of northern lands during the glacial period is, however, probable: *Firstly*, because all the oscillations of level of the lands in the northern hemisphere since the glacial period, with which we are acquainted, have been greatest towards the pole; and *secondly*, because a rise of land sufficient to prevent the entrance of heated currents to the polar basin, would occasion a great accumulation of ice in the circumpolar regions, by the heat of the tropical and sub-tropical waters being spent in evaporation instead of, as at present, in melting the ice within the Arctic circle.
5. The drift-beds were formed during the retreat of the ice, and not during its greatest development.
6. Terraces and stratified beds in lateral valleys, were formed when these were filled with water, dammed back by the glaciers that still flowed down the main valleys.

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ART. XII.—GEOLOGY OF ANTIGONISH COUNTY, N. S. BY REV. D. HONEYMAN, D. C. L., F. G. S., MEMBER OF THE GEOL. SOC. OF FRANCE, HON. MEMB. OF GEOL. ASSOC. LONDON, &c.

[*Read May 8, 1866.*]

THIS county, known until lately as the county of Sydney, is the north-east county of Nova Scotia proper. It is bounded on the north by Northumberland strait, which separates it from Prince Edward Island,—on the east by St. George's Bay,—on the south by the county of Guysboro',—and on the west by the county of Pictou. It is somewhat mountainous, and contains numerous small lakes and streams. The principal mountains are the Antigonish mountains, whose corner nearest to the town of Antigonish is about three miles to the north-west. Considering this range as sub-triangular, one



side stretches in a westerly direction into the county of Pictou, its length being about thirteen miles, terminating in the Marshy Hope, and in its progress forming one of the lofty walls of this beautiful valley; the eastern side stretches northerly, terminating near Malignant cove, and extending about eight miles; the remaining side begins with the sub-conical mountain which terminates the side just described, and extending in a general south-west direction until it unites the Pictou termination of the first side. The Arisaig mountains, of my Geology of Arisaig, form the Antigonish part of this side of the triangle. Another range commences about two miles south-east of Malignant cove, and runs parallel to the shore of Northumberland Strait, until it reaches about two miles from the north side of Cape St. George. The Sugar Loaf mountain, which rises a mile and a half from the town, begins another range, which extends in a northerly direction to Morrystown, a distance of about seven miles. The last range is the Ohio mountains, which this county has in common with Pictou county. These nearly meet the Antigonish mountains at the Marshy Hope, and form its other wall. The eastern side of this range, beginning at the Beaver Meadow about two miles from the entrance of the Marshy Hope and about eight miles west of Antigonish, trends in a southerly direction about nine miles, sending off a spur towards Lochabar lake. This lake is about twelve miles south-west of the town; it is five miles in length, reaching a little beyond the county line into Guysboro' county. About three or four miles east of this lake we have Polson's lake and South River lake. Besides these there are Gaspereaux lake, about four miles south-west of Antigonish, and the North and South lakes of Morrystown. The streams are the South River, which rises in South River lake, is fed by Polson's lake, winds through fertile intervalles receiving numerous small streams, and at length flows into Antigonish harbour. Ohio River rises in the Ohio mountains, flows through beautiful and fertile meadows, and unites with James' River, which rises in the Antigonish mountains, in West River. This last after flowing and winding through fertile meadows, receives at the town the tributaries of Rights River and Braley Brook, which also rise in the Antigonish mountains, and then it flows into the harbour. Besides these there is North River, which flows into the north side



of the harbour. In the north of the county there are Malignant brook, Doctor's brook, Arisaig brook and McAra's brook.

As a field for the practical geologist this county is of the highest importance. Here we have all the geological formations that are known to exist between the old silurian of our gold fields and our Bay of Fundy triassic, and situated in a line connecting distinguished representatives of both. We appear to have in this county the lineal and direct descendants of the formation, which extending through Guysboro' on the south, has the gold fields of Sherbrooke, Wine harbour and Isaac's harbour—as we have the direct predecessors of Prince Edward Island triassic on the north. The greater number of the formations in the county are represented in Arisaig on Northumberland Strait. In my paper on the Geology of Arisaig I have already explained the character of the group, designating the lowest member of the series A, and the others in ascending order B, B', C, D. By comparing a large collection of the fossils of D with the figures of the Upper Ludlow fauna in Nicholson's *Siluria*, I was convinced that D was equivalent to the Upper Ludlow. Dr. Dawson simultaneously designated it Lower Helderberg, of which the other is the British equivalent. This was the first step in the proper designation of the Arisaig series, this opinion being subsequently confirmed by Mr. Salter on an examination of my specimens in the exhibition of 1862. Dr. Dawson and Prof. Hall had given it as their opinion, that B' was equal to the Clinton, as a characteristic of this is a graptolithus not distinguishable from the *G. Clintonensis* (Hall). Mr. Salter regarding the specimens in the exhibition as *G. Ludensis* considered B as Ludlow, while he considered the specimens from C as equivalent to the Aymestry limestone. The fossils of B were not discovered until I made the minute examination of the district of which my Arisaig paper is the record. The bed of graptolites found in B led me to regard it as of age prior to the Upper Ludlow. Shut up by Mr. Salter's opinion on A, which he was led to consider from the few specimens then collected as equivalent to the May Hill sandstone, I was induced to regard B as the equivalent of the Lower Ludlow. I had thus come to the conclusion, that the Arisaig group was wholly Upper Silurian.

Hall's noble work on the Canadian Graptolites, has led me to consider that there is yet something to be done in the correct deter-



amination of the equivalency of the Arisaig group, as the graptolites of B appear to have the facies of the graptolites of the Hudson River group, so that A and B may be the Arisaig equivalent of this group. Instead therefore of beginning with the upper silurian age, it may begin with part of the lower silurian, so that in Arisaig

A and B are probably equivalent to the Hudson River Group  
—Lower Silurian

B = the Clinton,  
C = the Niagara Limestone, } Upper Silurian.  
D = the Lower Helderberg, }

It may be interesting to observe that graptolite life in Nova Scotia appears to range higher than in the United States, as according to Hall and Dana, *Graptolithus Clintonensis* existed alone there, and was the last of its race, while with us *Graptolithus Clintonensis* is associated with several other monoprionideans, and in 1864 I found in c, associated with crinoids, in shale interbedded among strata containing noble *cephalopoda*, a *diprionidean* graptolite of singular size and form. This graptolite is being examined by Prof. Wyville Thomson, and is to be described and figured in his work on Graptolites. Since I wrote the paper on the Geology of Arisaig referred to, I have had occasion to make a more particular examination than I had before made of the junction of the silurian with the carboniferous, at McAra's brook, and I am led to believe, by comparison with other localities, especially with Lochaber, which we shall shortly examine, that the apparent unconformability is not real, and that the strata exposed on the shore and up the brook, are a formation intermediate between D, the equivalent of the upper Ludlow or lower Helderberg, and the lower carboniferous that forms the adjacent mountain west of the brook, in other words that the strata in question are Devonian. From these observations it would appear that in Arisaig we have a series ascending from the Hudson River age into the lower carboniferous, without any break in succession. These observations tend to modify the opinion expressed by Prof. Leslie, quoted by Dr. Bigsby in his paper read before the Geological Society—"On Missing Sedimentary Formations." It appears from this that Prof. Leslie is of opinion that the lower carboniferous at Arisaig lies unconformably on the Clinton equivalent. At Lochaber lake, which was mentioned in an introduc-



tion as in the extreme south of the county, while Arisaig is on its northern boundary, we have a group of strata of Arisaig age. My attention was first directed to this locality by finding a beautiful cast of a *Petraia Forresteri*—*Salter*. Subsequent examination of the rocks on the west side of the lake disclosed a set of strata with organisms of a peculiar kind and different from any of our former acquaintance. I found the *Petraia* in abundance and evidently characteristic, associated with casts of strange *orthes* and *rhyconellæ*, and a trumpet shaped cornulite. The containing strata rest on the syenitic rocks of the spur of the Ohio mountain already referred to. Similar *Petraia* led to the discovery and identification of the same formation at Arisaig, Marshy Hope, James river, and at Barney's river, French river and East river in the county of Pictou, all occupying the same position in relation to the syenitic, except at Arisaig, where the strata in question are synclinal. These strata, which I designated in the Arisaig group, A, are at Lochaber associated with other strata, which appear lithologically identical, but are distinguishable into Arisaig A, C, D, by the fossils which we find in the loose rocks. In these we find the *Homalonatus* of C, the *Dalmania Logani*, *Crania Acadiensis* of D, and *in situ* at the side of the lake I have found Nova Scotia *Chonetes* of D. Succeeding the strata containing the *Chonetes* and occupying the same relative position as the strata which I consider as Devonian at Arisaig, is a very broad band of reddish brown and grey argillaceous slates, which form an island in the lake extending to Polson's lake and beyond it. In their strike they extend to the west of Lochaber lake in the one direction, and through South River lake and the river itself in the other direction; and at right angles to the strike they pass into Guysboro'. On the western side of Lochaber lake there are magnificent exposures of the brownish red strata, in the course of a small brook that enters the lake. To the south of the brook there is a thick band of laminated limestone, altered and contorted, containing blue fluor spar. Between Lochaber lake and Polson's lake these slates contain veins of quartz of considerable thickness, interspersed with plates of specular iron ore, and at one of the streams that flow into South river grey and brownish red slate is associated with quartzite, which contain crystals of colourless quartz of considerable size and beauty. We also find garnets at Polson's lake and rhombic duodecahedral



crystals of iron pyrites to the west of Lochaber lake, but these are not found *in situ*. The upper part of this band of Devonian slates at Polson's lake, is of a darker hue than the others. In these are found a vein of specular iron ore of considerable thickness, highly micaceous, and among the drift are masses of oxide of iron with cupriferous iron pyrites. Attached slate show decisively that these have been derived from the underlying slate, and it is probable that the massive oxide of iron was originally a carbonate of iron. Small veins of carbonate of iron with copper pyrites have been found in the slates exposed by mining. I would observe that these strata in this locality have been complicated by trap dykes, and considerably eroded and obscured. I have been unable to discover fossils in this extensive formation. In the Marshy Hope which is intermediate between Arisaig and Lochaber, there are certain hard slaty rocks outcropping about ten and eleven miles from the town, where the Antigonish mountains come near to the highway. After the discovery of the *Petraia* (A) rocks of Lochaber, I observed those of Marshy Hope, and was struck with the resemblance between the two, and on examination I found that they were identical. In the latter locality I discovered *Lingulæ*, then *Petraia Forresteri*, *Orthoceres*, *Orthes*, *Cornulites*, and *Cornulites* (trumpet-shaped), &c. Subsequently I found, although not *in situ*, still nearer to the town, near the Antigonish mountain road and near a small tributary of James' river, other fossils of the same age. These discoveries led to the conclusion that the one is the extension of the other, and that they do exist or have existed as a band skirting the Antigonish mountains. This opinion was confirmed by a still farther discovery of similar rocks containing similar organisms at the western extremity of these mountains, on the side of the road at the western entrance of the Marshy Hope. I have not yet succeeded in ascertaining their eastern termination. In the place where I first discovered the strata in question in the Marshy Hope, I also found a specimen of the *Avicula Honeymani* (Hall). This fossil is one of the characteristics of Arisaig D. It is found in abundance in this position, both at Arisaig and East River, Pictou, and in this position only. I am persuaded that we have here Arisaig A and D, or the equivalents of the Hudson (?) and lower Helderberg in contact, while B, B' and C are missing. We have several out-crops of rocks from this



onward to the town of Antigonish for a distance of about five miles, —which furnish a section of the sedimentary rocks of this side of these mountains. In the first mile the order is descending, as in the next outcrop we have only A. About a mile nearer the town we have a large outcrop of quartzite, which I regard as Devonian. One mile nearer we have outcrops of lower carboniferous conglomerate, succeeded by limestone, and then six miles from Antigonish we pass between gypsum pits. The Devonian quartzite which is of greenish hue, appears to be of considerable thickness. It is exposed in various places on the flanks of the Antigonish mountains. There is a grand exposure at the falls of James' river. These rocks form an elevated peak which rises abruptly above the falls. The water flows in great volume over precipitous rocks, and from a height of about one hundred feet into a capacious basin, the whole presenting a scene of impressive grandeur. These strata appear also to constitute, to a great extent, "the mountain," at the south-east angle of the range, and after a break of about two miles they appear outcropping near the top of the Sugar Loaf mountain.

I have thus directed attention to the earlier sedimentary formations existing in this county—the Silurian and Devonian. It will have been observed that there has been considerable irregularity in the deposition of the strata that have passed under review. Comparing as I have done, the respective localities with the Arisaig type, we find that B and B' are missing at Lochabar, and that B, B' and C are missing at the Marshy Hope, while in both of these localities there is a greater development of the Devonian than we find at Arisaig, so that it is impossible to lay down any trustworthy rule in regard to the occurrence of any member of the series, where we have no outcrop or other superficial indications; in other words we may have Silurian, and no Devonian underlying more recent formations, and *vice versa*. As to origin, the strata are marine—A, the lowest of the series having been deposited in comparatively shallow water, possibly about seventy fathoms, while B, B' manifest deposition at a greater depth, and the aggregate thickness of the Silurian and Devonian would appear to require still greater depth of water for their deposition. This shows that in the process of their formation there was subsidence as well as deposition. Their present superficial position, their great elevation, especially at Lochaber, above the sea



level, and the vertical position into which they have been thrown, show that they have been subjected to a great elevating process. The conformability in these respects of the Devonian and Silurian in this representative district, shows that the elevation took place after the deposition of the Devonian, while the unconformability of the succeeding formation, the lower carboniferous, and other considerations to which we shall yet allude, show that the elevation took place prior to the latter period. In the Marshy Hope we find a similar order of things, showing that the elevation of Silurian and Devonian, and the formation of the mountains of this county, was *post* Devonian, and generally *pre*-carboniferous. The Silurias and Devonias of Arisaig with their synclinal arrangement (*vide Geology of Arisaig*) show the effects of a later upheaval, to which I shall yet refer. These formations which I have just examined are only a skirting of the mountains of the county. These mountains are mainly composed of metamorphic felspathic rocks of uncertain age and origin, or syenite and diorite, &c. Whatever may be their age and origin, I believe that as regards both they resemble the granite of the Nova Scotia auriferous zone. I also believe that while it is probable that the latter was elevated prior to the deposition of A, it may not have been exempt from subsidence coeval with that to which I have already referred. Be this as it may there can be little doubt that the felspathic rocks under examination, formed the bottom of the shallow sea in which strata A were deposited. That the metamorphism of the one was antecedent to the deposition of the other is evident, from the fact that organisms of A in closest proximity to the rocks in question remain unaltered, while at Arisaig the typical strata A in contact with trap of a subsequent period, are altered into a jaspideous rock, stratification and organisms being thoroughly obliterated (*vide Geology of Arisaig.*) Succeeding the sedimentary rocks already examined in the localities so often referred to, we find a certain amount of obscurity, and then sedimentary rocks of coarser material, which cannot be confounded with those preceding. Dr. Dawson has named these lower carboniferous; so far as I have observed in this county, they may be called *sub*-carboniferous. In these there are three degrees of coarseness observed. The finest strata occur at upper South river, succeeding the Devonian of the Lochaber series. Here the carboniferous approximate nearest in



fineness and colour to the preceding Devonian. Still, however, the difference between them is obvious, as the carboniferous is arenaceous, and the difference of inclination manifests unconformability. At Arisaig near McAra's brook, the carboniferous strata are much coarser than at upper South river, but of the same brownish red colour. Here we find the carboniferous sandstones forming mountains equal in elevation to the Silurian, having been upheaved by the trap which appears between the supposed Devonian up McAra's brook and the sandstone of the mountain. But the conglomerate is by far the most extensively distributed. We find it on the north-east side of Arisaig, and largely developed at Cape St. George. It is found at the south-east side of South river lake, occupying the same position in relation to Devonian here, as the fine brownish red sandstones to the Devonian at upper South river. It occurs on the south side of the Sugar Loaf north of the town, filling up the great break between this range and the Antigonish mountains. Here its width, or north and south extension, is about five miles. About six miles from the town it attains to a mountain elevation. It runs along the foot of the Antigonish mountains, and terminates apparently where it outcrops near the entrance to the Marshy Hope. I have already noticed this outcrop as succeeding the Devonian. This conglomerate unmistakably declares its age and origin. It was accumulated on the shores of the post Devonian sea, and formed from the felspathic rocks and slates of the mountains. Oxide of iron is its colouring matter, and streaks of green show the existence of thinly distributed carbonate of copper, while carbonate of lime largely agglutinates. The malachite is seen chiefly in the Sugar Loaf and Antigonish mountain conglomerate. Succeeding the upper South river lower carboniferous sandstones we have a thick bed of limestone, which probably owes its existence to organic agency, although it has not yet been found to contain organisms. On the road to Lochaber I found what appears to be a continuation of the same limestone, containing a deposit of beautiful brown ochre, and on the banks of the Ohio river the limestone continues; this is exposed in the bed and on the lofty banks of a small brook which runs into the river. Here the limestone is black and shaly, and contains numerous fossils, among which are *spiriferi sp.?* *producta spinosa*, and the *pygidium* of a *Phillipsia*. This is now the second locality



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


# Northumberland Strait

MAP OF

# Antigonish County

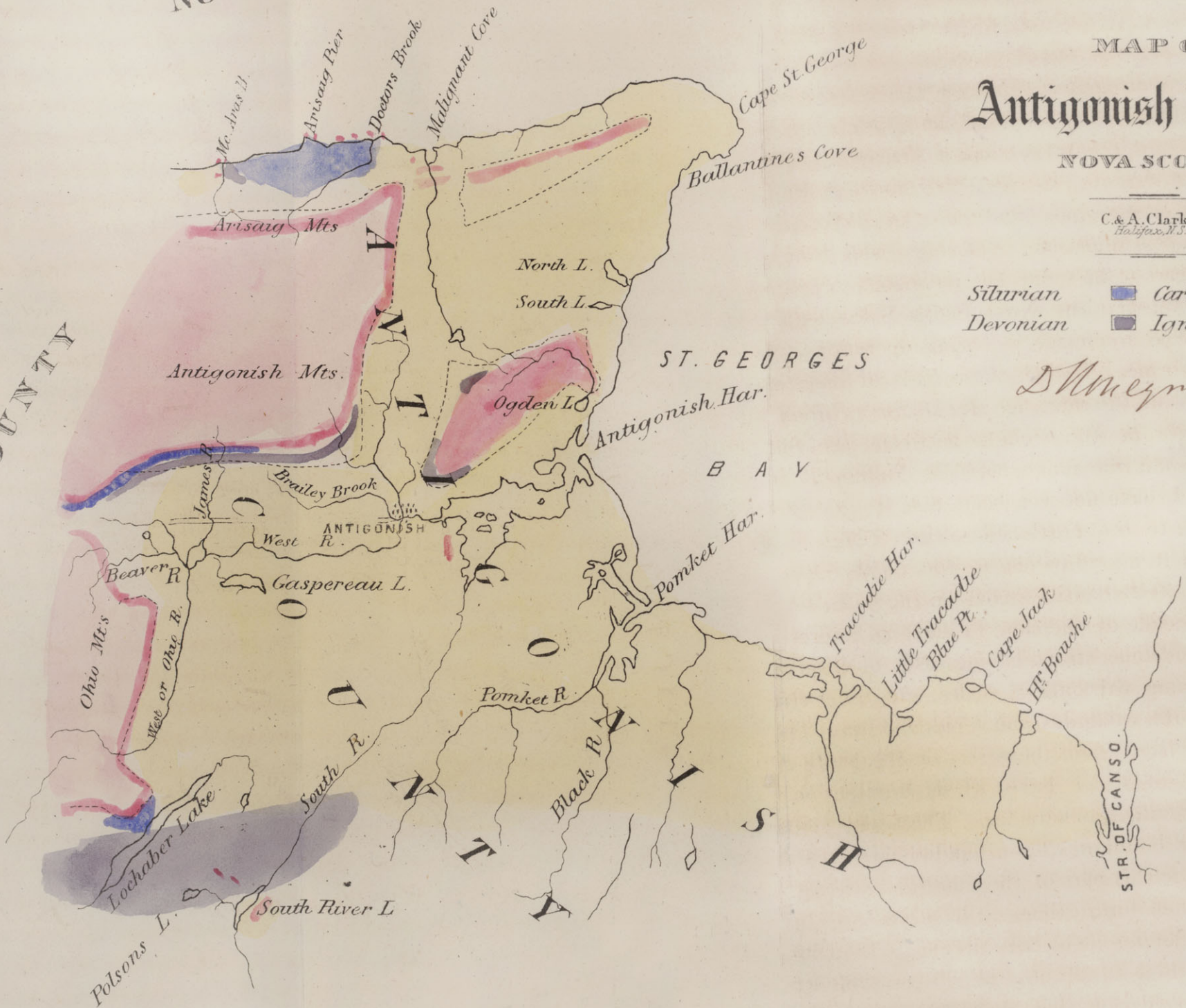
NOVA SCOTIA.

C. & A. Clarke.  
Halifax, N.S.

Silurian		Carboniferous	
Devonian		Ignéus	

*D. McEzma D. C. L.*

PICTOU COUNTY



GUYSBOROUGH COUNTY

CAPE BRETON

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in the Province where the lower carboniferous limestone is found to contain the trilobite, the *Phillipsia Howi* having been found by Dr. How in the Kennetcook limestone in 1862. These limestones in the possession of this genus of trilobite, correspond with the mountain limestone of the British Isles, so that the one and the other are undoubtedly approximately contemporaneous. Succeeding the conglomerates of the Antigonish mountains and reposing directly upon them, we have limestone of considerable thickness; this can easily be traced continuously from the Marshy Hope to Morristown, a distance of about sixteen miles. In several places where it is quarried for building stone, large deposits of brown ochre are found, and the slabs are often coloured with films of carbonate of copper, and in one quarry where Braley brook issues from the mountains, I found some years ago imbedded in ochre several pieces of copper pyrites of considerable size.

Succeeding these limestones of the Antigonish mountains, we have an enormous bed of gypsum; its length is nearly equal to that of its associated limestone. It appears at the forks of James' river and the Ohio river; it passes over nearly in the course of James river until it reaches within one hundred paces of the limestones; its mountain side runs parallel with the limestones, Braley brook running between and along the bottom of the abrupt and lofty gypseous wall for about three miles. After parting with the brook the gypsum pursues its course until it reaches Right's river, nearly a mile north of the town. After an apparent break of two miles it again appears on the east side of the Sugar Loaf and proceeds onwards into St. George's bay, its land terminus being Ogden's lofty cliff.

Dr. Dawson shows this cliff in a plate in his *Acadian Geology*, where he examines very fully and satisfactorily the gypseous formation from Right's river to St. George's bay, so that in examining this part we traverse the ground which he has already rendered so familiar to the geologist. The breadth of this great gypsum deposit is duly proportioned to its length. It stretches from the mountains at North river, through the harbour and up the west side of South river, presenting at its southern terminus as well as on either side of the harbour and elsewhere in its course, a striking conical aspect. The southern terminus is seen by the traveller on the



right and left of the road to the Strait of Canso, about three and a half miles from the town. Again, beginning with the outcrop at Right's river, the pits in Trotter's pasture, and the great conical outcrop on the road to Braley brook settlement in front of the mountain break, the gypsum beyond a doubt passes under the town and to the south of it, until it outcrops on the banks of West river. Some years ago an attempt at sinking a well in the immediate vicinity in the west of the town disclosed the gypsum bed, and I there obtained specimens of fibrous gypsum of surpassing beauty. Associated with this bed of gypsum and apparently above it, we find limestones with lower carboniferous limestone, *brachiopoda*. In addition to this there are also numerous salt springs rising from this deposit; it therefore appears to be somewhat analogous to the *sub-carboniferous* of Michigan; and the Nova Scotia Salt Company, have thereby been induced to engage in boring operations, with the hope of discovering brine. Besides these beds of limestones there are also limestones of the same age at Doctor's brook in the Arisaig district, and in the trough between the Sugar Loaf range of mountains and the range between Malignant cove and Cape St. George. I have not yet been able to determine whether the latter belong to the north side of this trough or the south side. They appear to me to belong to the north side, like the gypsum which occurs at Ballantine's cove on the S. E. side of Cape St. George. At the side of the cape we have an interesting small section exposing sandstone strata having casts of shrinkage cracks, and others containing *palæoniscus* scales, and other strata containing carboniferous flora, calamites, and lepidodendria. These strata appear to be the equivalents of the strata on the south side of the same trough, some of which have attracted attention on account of their highly bituminous character. These also contain scales of *palæoniscus* and carboniferous flora, lepidodendria, cardaites. I expect to investigate this part of the country more rigidly if opportunity presents at some future time. I have yet to examine properly the remaining carboniferous or S.E. district of the county. In the meantime I have nothing to add to the observations which Dr. Dawson has already made on that district—(*vide Acadian Geology.*)

The questions now occur, by what agency have these post



Devonian strata been elevated, fractured and distorted? and when did this event happen? We have no difficulty whatever in ascertaining the cause by which the effects referred to were produced, and we seem to have no difficulty in determining that the event did not happen until after such and such a period; but the question of time remains unanswered. About the geological base of the carboniferous system we find trap rocks, intervening between these basal strata and the strata of a preceding age. These rocks appear in enormous mass in contiguity with the lower carboniferous conglomerates on the eastern side of South river lake, and they extend backwards to Polson's lake, disturbing the Devonian strata in that locality, as we have elsewhere observed. At McAra's brook, at Arisaig, we have already observed their occurrence between the Devonian and the lower carboniferous sandstones, elevating the latter to the altitude of lofty mountains. As we approach Malignant cove and near it, we observe on the road and either side, trap in closest contact with lower carboniferous conglomerate, the latter being metamorphosed into a hard jaspideous rock by the original contact with its igneous associate. These are seen in the same connection in Malignant brook, and crossing it in such a manner as to form the foundations of two mill seats, and the opposite abutments of a bridge; and in the same relation extending westward to Doctor's brook, forming an elevated ridge which runs between the older sedimentary or Silurian strata and the metamorphic mountains—(*vide Geology of Arisaig.*) In that paper it was shewn that this trap also bounded the other side of this silurian series from their eastern terminus, east of Doctor's brook, extending along the shore, and much altering strata A, as far as Arisaig pier, and being in the space intervening obscured by the sea, it reappears at the shore at McAra's brook, and up the brook as already indicated. From this it would appear that the upheaval of the Arisaig silurian group took place at the period of this trappean eruption, and that it was still in depths of the sea after the others of the same geological age were subaerial. I know not how we can otherwise account for the occurrence of the lower carboniferous limestones and associated strata of the same age at Doctor's brook, as indicated in my map and section,—(*vide Geology of Arisaig.*) It seems that this upheaval of sedimentary strata was at least post



lower carboniferous, but how long after this period it is difficult to determine. On the opposite coast of Cape Breton an interesting shore section at the new coal mines of Mabou, north of Mabou harbour, seems to illustrate the subject I am now investigating. We find in this section the lower carboniferous conglomerate of immense thickness, succeeded by a thick bed of rose coloured gypsum, succeeded by sandstones, with flora, a thick seam of coal, modiola shale, shale with calamites, clays with bands of clay iron stone, thick sandstones with flora, impure coal, clays and shales. The whole of these strata have been thrown into their present highly inclined position at the same time, and that too doubtless at the period of the trap eruptions in Antigonish county. I consider that the Mabou section represents geological time at least equivalent to that of the whole carboniferous formation of Antigonish county, and therefore conclude that all the carboniferous rocks of the county and the silurian of Arisaig assumed their present position at one and the same time. The formations in this county which we have thus examined, having become subaerial, continued so while deposition was in progress in the north of what is now the county of Antigonish. I have already brought under your notice lower carboniferous conglomerate, sandstone and limestone, with associated trap, at Malignant cove, Doctor's brook and McAra's brook. These undoubtedly are a part of a carboniferous series, which extending into Northumberland Strait and into the Gulf of St Lawrence, constitute part of the foundation on which Prince Edward Island triassic sandstone rests. In an age long posterior to the formation of the rocks of Prince Edward Island and their elevation, another very characteristic feature of the geology of the county was formed. I refer to the great deposits of drift which occur in every direction, obscuring the subjacent rocks and rendering the work of exploration often difficult and perplexing. The more prominent accumulations are the hills that occur in the break between the Antigonish mountains and the Malignant cove and Cape St. George range. At the north about one mile from the Malignant cove there are low mounds; gradually they increase in size and number, until at the distance of three miles south of the cove or at the south entrance of the break, the last of the series forms the elevated site of a Catholic chapel, which is conspicuous for several miles. On the banks of the Ohio river are numerous mounds



of the same character, and in and around the town of Antigonish are similar elevations of peculiar interest. My attention was specially directed to these about three years ago by the sinking of a well on the side of the one on which the old court house stands. After passing through several feet of gravel a bed of clay was struck which was peculiarly dry, compact and light in colour, containing imbedded fossil wood in abundance, well preserved, in the centre of which was phosphate of iron of a beautiful blue colour, which might be used as a pigment. On examining other mounds on the bank of Right's river I discovered sections of these exhibiting the same structure, and also having the same fossil. A great part of this superficial deposit is evidently derived from the subjacent rocks of the particular locality in which the deposit is found, and hence we naturally look at these deposits for information regarding the character of the prevailing rocks of the locality, especially in regard to the existence or probable extent of the distribution of these rocks. Of course great caution is to be observed in the application of this principle, owing to the fact that a part of this deposit and that possibly the larger, may consist of transported material which has been so triturated and rolled as to leave the question of its source open to all sorts of conjecture. In regard to the transportation of these I am disposed to consider that it was the effect of glacial agency. I have not yet been fortunate enough to discover so satisfactory indications in the region in question as we have elsewhere, of the existence of the glaciers. It will appear not at all astonishing that such a deposit derived largely from felspathic and calcareous rocks, and so extensively distributed, should give the county a character for agriculture. To a great extent, however, this character has arisen from a partial redistribution of the deposit, which I have just described, with the addition of organic matter, and in some instances with an addition of lime, gypsum, salt and felspathic constituents. This new deposit forms flats on the sides of rivers, past or present, and a great delta at their confluence. These are commonly called intervalles. We have thus the rich and extensive intervalle of the Ohio river and the Beaver meadow—the great intervalles of West river and South river, and the smaller ones of Right's river, James' river and Braley brook, and what is by the old inhabitant often called the "great intervalle," or the delta on which the town of Antigonish is chiefly built. These intervalles,



although comparatively recent, are still doubtless of high antiquity, and were probably the haunts of the mastodon and his confreres, as the deposits are doubtless coeval with the interval of Middle river, Cape Breton, which produced, upwards of thirty years ago, the thigh bone of *Mastodon Ohioticus*, now in the Provincial museum, and the flats of Baddeck, C. B., in which was found about seven years ago, the tooth of *Mastodon Ohioticus*, now in my own collection. It is the confidently expressed opinion of intelligent inhabitants who have been in the habit of observing landmarks for upwards of half a century, that the land is slowly subsiding. I have not yet ascertained precisely the grounds upon which this opinion rests. This point and others already indicated, may be the subject of notes on a future occasion.

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ART. XII. NOVA SCOTIAN CONIFERS. BY COLONEL HARDY;  
PART I.

[*Read May 3, 1866.*]

A GLANCE at a physical map of North America, will shew how the great prairies, extending diagonally through the continent, from the Gulf of Mexico to the shores of the great Slave Lake in the North-West, at this latter point appear to divide into two streams the evergreen forest, here composed solely of coniferæ, which forms a broad and continuous belt from the eastern shores of Labrador to the Pacific.

These fir forests in their northern extension, ever growing more stunted, gloomy and monotonous, at last merge into the treeless and snow-covered barren, where the small Arctic cariboo and musk ox obtain a scanty living on the lichens of the rocks, and grass-tufts of the valleys. Their character is sombre in the extreme; their growth and appearance indicate the severity and hardships of the climate; the twisted trunk, the bare and bent top, and the profuseness of the moss-beards clinging to the limbs of the spruce and scrub pine, the almost exclusive trees of the region, shew how slow has been their growth, and with what difficulty it has been attained. Dr. Richardson states that, on the borders of the Great Slave Lake,